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DJANGO *for* BEGINNERS

Build websites with Python & Django

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William S. Vincent

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Introduction

Welcome to *Django for Beginners*, a project-based approach to learning web development with the Django web framework. In this book you will build five progressively more complex web applications, starting with a simple "Hello, World" app, progressing to a blog app with forms and user accounts, and finally a newspaper app using a custom user model, email integration, foreign keys, authorization, permissions, and more.

By the end of this book you should feel confident creating your own Django projects from scratch using current best practices.

Django is a free, open source web framework written in the Python programming language and used by millions of programmers every year. Its popularity is due to its friendliness to both beginners and advanced programmers: Django is robust enough to be used by the largest websites in the world–Instagram, Pinterest, Bitbucket, Disqus–but also flexible enough to be a good choice for early-stage startups and prototyping personal projects.

This book is regularly updated and features the latest versions of both Django (2.1) and Python (3.7x). It also uses Pipenv which is now the officially recommended package manager by Python.org for managing Python packages and virtual environments. Throughout we'll be using modern best practices from the Django, Python, and web development communities, especially the thorough use of testing.

Why Django

A web framework is a collection of modular tools that abstracts away much of the difficulty–and repetition–inherent in web development. For example, most websites need the same basic functionality: the ability to connect to a database, set URL routes, display content on a page, handle security properly, and so on. Rather than recreate all of this from scratch, programmers over the years have created web frameworks in all the major programming languages: Django and Flask in Python, Rails in Ruby, and Express in JavaScript among many, many others.

Django inherited Python's "batteries-included" approach and includes out-of-the box support for common tasks in web development:

- user authentication

- templates, routes, and views
- admin interface
- robust security
- support for multiple database backends
- and much much more

This approach makes our job as web developers much, much easier. We can focus on what makes our web application unique rather than reinventing the wheel when it comes to standard web application functionality.

In contrast, several popular frameworks–most notably Flask in Python and Express in JavaScript–adopt a “microframework” approach. They provide only the bare minimum required for a simple web page and leave it up to the developer to install and configure third-party packages to replicate basic website functionality. This approach provides more flexibility to the developer but also yields more opportunities for mistakes.

As of 2018 Django has been under active development for over 13 years which makes it a grizzled veteran in software years. Millions of programmers have already used Django to build their websites. And this is undeniably a good thing. Web development is hard. It doesn’t make sense to repeat the same code–and mistakes–when a large community of brilliant developers has already solved these problems for us.

At the same time, Django remains under active development and has a yearly release schedule. The Django community is constantly adding new features and security improvements. If you’re building a website from scratch Django is a fantastic choice.

Why this book

I wrote this book because while Django is extremely well documented there is a severe lack of beginner-friendly tutorials available. When I first learned Django years ago I struggled to even complete the official polls tutorial. Why was this so hard I remember thinking?

With more experience I recognize now that the writers of the Django docs faced a difficult choice: they could emphasize Django’s **ease-of-use** or its **depth**, but not both. They choose the latter and as a professional developer I appreciate the choice, but as a beginner I found it so…**frustrating!**

My goal is that this book fills in the gaps and showcases how beginner-friendly Django really is.

You don’t need previous Python or web development experience to complete this book. It is intentionally written so that even a total beginner can follow along and feel the magic of writing their own web applications from scratch. However if you are serious about a career in web development, you will eventually need to invest the time to learn Python, HTML, and CSS properly. A list of recommended resources for further study is included in the Conclusion.

Book Structure

We start by properly covering how to configure a local development environment in **Chapter 1**. We're using bleeding edge tools in this book: the most recent version of Django (2.0), Python (3.7), and Pipenv to manage our virtual environments. We also introduce the command line and discuss how to work with a modern text editor.

In **Chapter 2** we build our first project, a minimal *Hello, World* application that demonstrates how to set up new Django projects. Because establishing good software practices is important, we'll also save our work with *git* and upload a copy to a remote code repository on Bitbucket.

In **Chapter 3** we make, test, and deploy a *Pages* app that introduces templates and class-based views. Templates are how Django allows for DRY (Don't Repeat Yourself) development with HTML and CSS while class-based views require a minimal amount of code to use and extend core functionality in Django. They're awesome as you'll soon see. We also add our first tests and deploy to Heroku which has a free tier we'll use throughout this book. Using platform-as-a-service providers like Heroku transforms development from a painful, time-consuming process into something that takes just a few mouse clicks.

In **Chapter 4** we build our first database-backed project, a *Message Board* app. Django provides a powerful ORM that allows us to write concise Python for our database tables. We'll explore the built-in admin app which provides a graphical way to interact with our data and can be even used as a Content Management System (CMS) similar to Wordpress. Of course we also write tests for all our code, store a remote copy on Bitbucket, and deploy to Heroku.

Finally in **Chapters 5-7** we're ready for our final project: a robust blog application that demonstrates how to perform CRUD (Create-Read-Update-Delete) functionality in Django. We'll find that Django's generic class-based views mean we have to write only a small amount of actual code for this! Then we'll add forms and integrate Django's built-in user authentication system (log in, log out, sign up).

In **Chapter 8** we start a **Newspaper** site and introduce the concept of custom user models, a Django best practice that is rarely covered in tutorials. Simply put all new projects should use a custom user model and in this chapter you'll learn how. **Chapter 9** covers user authentication, **Chapter 10** adds Bootstrap for styling, and **Chapters 11-12** implement password reset and change via email. In **Chapters 13-15** we add articles and comments to our project, along with proper permissions and authorizations. We even learn some tricks for customizing the admin to display our growing data.

The **Conclusion** provides an overview of the major concepts introduced in the book and a list of recommended resources for further learning.

While you can pick and choose chapters to read, the book's structure is very deliberate. Each app/chapter introduces a new concept and reinforces past teachings. I **highly recommend** reading it in order, even if you're eager to skip ahead. Later chapters won't cover previous material in the same depth as earlier chapters.

By the end of this book you'll have an understanding of how Django works, the ability to build apps on your own, and the background needed to fully take advantage of additional resources for learning intermediate and advanced Django techniques.

Book layout

There are many code examples in this book, which are denoted as follows:

Code

```
# This is Python code
print(Hello, World)
```

For brevity we will use dots `...` to denote existing code that remains unchanged, for example, in a function we are updating.

Code

```
def make_my_website:
    ...
    print("All done!")
```

We will also use the command line console frequently (starting in **Chapter 1: Initial Set Up** to execute commands, which take the form of a `$` prefix in traditional Unix style.

Command Line

```
$ echo "hello, world"
```

The result of this particular command is the next line will state:

Command Line

```
"hello, world"
```

We will typically combine a command and its output. The command will always be prefaced by a `$` and the output will not. For example, the command and result above will be represented as follows:

Command Line

```
$ echo "hello, world"
hello, world
```

Complete source code for all examples can be found in the official Github repository.

Conclusion

Django is an excellent choice for any developer who wants to build modern, robust web applications with a minimal amount of code. It is popular, under active development, and thoroughly battle-tested by the largest websites in the world. In the next chapter we'll learn how to configure any computer for Django development.

Chapter 1: Initial Set Up

This chapter covers how to properly configure your computer to work on Django projects. We start with an overview of the command line and use it to install the latest versions of both Django (2.1) and Python (3.7). Then we discuss virtual environments, git, and working with a text editor.

By the end of this chapter you'll be ready to create and modify new Django projects in just a few keystrokes.

The Command Line

The command line is a powerful, text-only view of your computer. As developers we will use it extensively throughout this book to install and configure each Django project.

On a Mac, the command line is found in a program called Terminal located at `/Applications/Utilities`. To find it, open a new Finder window, open the Applications folder, scroll down to open the Utilities folder, and double-click the application called Terminal.

On Windows, search for the `PowerShell` application which is a dedicated command line shell.

Going forward when the book refers to the "command line" it means to open a new console on your computer using either Terminal or PowerShell.

While there are many possible commands we can use, in practice there are six used most frequently in Django development.

- `cd` (change down a directory)
- `cd ..` (change up a directory)
- `ls` (list files in your current directory)
- `pwd` (print working directory)
- `mkdir` (make directory)
- `touch` (create a new file)

Open your command line and try them out. The `$` dollar sign is our command line prompt: all commands in this book are intended to be typed **after** the `$` prompt.

For example, assuming you're on a Mac, let's change into our Desktop directory.

Command Line

```
$ cd ~/Desktop
```

Note that our current location `~/Desktop` is automatically added before our command line prompt. To confirm we're in the proper location we can use `pwd` which will print out the path of our current directory.

Command Line

```
~/Desktop $ pwd
/Users/wsv/desktop
```

On my Mac computer this shows that I'm using the user `wsv` and on the `desktop` for that account.

Let's create a new directory folder with `mkdir`, `cd` into it, and add a new file `index.html`.

Command Line

```
~/Desktop $ mkdir new_folder
~/Desktop $ cd new_folder
~/Desktop/new_folder $ touch index.html
```

Now use `ls` to list all current files in our directory. You'll see there's just the newly created `index.html`.

Command Line

```
~/Desktop/new_folder $ ls
index.html
```

As a final step return to the Desktop directory with `cd ..` and use `pwd` to confirm the location.

Command Line

```
~/Desktop/new_folder $ cd ..
~/Desktop $ pwd
/Users/wsv/desktop
```

Advanced developers can use their keyboard and command line to navigate through their computer with ease; with practice this approach is much faster than using a mouse.

In this book I'll give you the exact instructions to run–you don't need to be an expert on the command line–but over time it's a good skill for any professional software developer to develop. Two good free resources for further study are the Command Line Crash Course and CodeCademy's Course on the Command Line.

Instructions are included below for Mac, Windows, and Linux computers.

Install Python 3 on Mac OS X (click here for Windows or Linux)

Although Python 2 is installed by default on Mac computers, Python 3 is not. You can confirm this by typing `python --version` in the command line console and hitting Enter:

Command Line

```
$ python --version
Python 2.7.15
```

To check if Python 3 is already installed try running the same command using `python3` instead of `python`.

Command Line

```
$ python3 --version
```

If your computer outputs `3.7.x` (any version of 3.7 or higher) then you're in good shape, however most likely you'll see an error message since we need to install Python 3 directly.

Our first step is to install Apple's Xcode package, so run the following command to install it:

Command Line

```
$ xcode-select --install
```

Click through all the confirmation commands (Xcode is a large program so this might take a while to install depending on your internet connection).

Next, install the package manager Homebrew via the longish command below:

Command Line

```
$ /usr/bin/ruby -e "$(curl -fsSL https://raw.githubusercontent.com/Homebrew/\
install/master/install)"
```

To confirm Homebrew installed correctly, run this command:

Command Line

```
$ brew doctor
Your system is ready to brew.
```

And now to install the latest version of Python, run the following command:

Command Line

```
$ brew install python3
```

Now let’s confirm which version was installed:

Command Line

```
$ python3 --version
Python 3.7.0
```

To open a Python 3 interactive shell–this lets us run Python commands directly on our computer–simply type `python3` from the command line:

Command Line

```
$ python3
Python 3.7.0 (default, Jun 29 2018, 20:13:13)
[Clang 9.1.0 (clang-902.0.39.2)] on darwin
Type "help", "copyright", "credits" or "license" for more information.
>>>
```

To exit the Python 3 interactive shell at any time type `Control+d` (the “Control” and “d” key at the same time).

You can still run Python shells with Python 2 by simply typing `python`:

Command Line

```
$ python
Python 2.7.15 (default, Jun 17 2018, 12:46:58)
[GCC 4.2.1 Compatible Apple LLVM 9.1.0 (clang-902.0.39.2)] on darwin
Type "help", "copyright", "credits" or "license" for more information.
>>>
```

Install Python 3 on Windows

Python is not included by default on Windows, however we can check if any version exists on the system. Open a command line console by entering `command` on the Start Menu. Or you can hold down the SHIFT key and right-click on your desktop, then select **Open Command Window Here.**

Type the following command and hit RETURN:

Command Line

```
$ python --version
Python 3.7.0
```

If you see output like this, Python is already installed. _Most likely it will not be!

To download Python 3, go to the downloads section of the official Python website. Download the installer and make sure to click the *Add Python to PATH* option, which will let use use `python` directly from the command line. Otherwise we'd have to enter our system's full path and modify our environment variables manually.

After Python has installed, run the following command in a new command line console:

Command Line

```
$ python --version
Python 3.7.0
```

If it works, you're done!

Install Python 3 on Linux

Adding Python 3 to a Linux distribution takes a bit more work. Here are recommended recent guides for Centos and for Debian. If you need additional help adding Python to your PATH please refer to this Stack Overflow answer.

Virtual Environments

Virtual environments are an indispensable part of Python programming. They are an isolated container containing all the software dependencies for a given project. This is important because by default software like Python and Django is installed *in the same directory*. This causes a problem when you want to work on multiple projects on the same computer. What if *ProjectA* uses Django 2.1 but *ProjectB* from last year is still on Django 1.10? Without virtual environments this becomes very difficult; with virtual environments it's no problem at all.

There are many areas of software development that are hotly debated, but using virtual environments for Python development is not one. **You should use a dedicated virtual environment for each new Python project**.

Historically Python developers have used either `virtualenv` or `pyenv` to configure virtual environments. But in 2017 prominent Python developer Kenneth Reitz released Pipenv which is now the officially recommended Python packaging tool.

Pipenv is similar to `npm` and `yarn` from the Node ecosystem: it creates a `Pipfile` containing software dependencies and a `Pipfile.lock` for ensuring deterministic builds. “Determinism” means that each and every time you download the software in a new virtual environment, you will have *exactly the same configuration*. Sebastian McKenzie, the creator of Yarn which first introduced this concept to JavaScript packaging, has a concise blog post explaining what determinism is and why it matters.

The end result is that we will create a new virtual environment with `Pipenv` for each new Django Project.

To install `Pipenv` we can use `pip3` which Homebrew automatically installed for us alongside Python 3.

Command Line

```
$ pip3 install pipenv
```

Install Django

To see `Pipenv` in action, let’s create a new directory and install Django. First navigate to the Desktop, create a new directory `django`, and enter it with `cd`.

Command Line

```
$ cd ~/Desktop
$ mkdir django
$ cd django
```

Now use Pipenv to install Django.

Command Line

```
$ pipenv install django==2.1
```

If you look within our directory there are now two new files: `Pipfile` and `Pipfile.lock`. We have the information we need for a new virtual environment but we have not activated it yet. Let’s do that with `pipenv shell`.

Command Line

```
$ pipenv shell
```

If you are on a Mac you should now see parentheses on your command line with the environment activated. It will take the format of the directory name and random characters. On my computer, I see the below but you will see something slightly different: it will start with `django-` but end with a random series of characters.

Note that due to an open bug Windows users will not see visual feedback of the virtual environment at this time. But if you can run `django-admin` `startproject` in the next section then you know your virtual environment has Django installed.

Command Line

```
(django-JmZ1NTQw) $
```

This means it’s working! Create a new Django project called `test_project` with the following command. Don’t forget that period `.` at the end.

Command Line

```
(django-JmZ1NTQw) $ django-admin startproject test_project .
```

It’s worth pausing here to explain why you should add a period `.` to the command. If you just run `django-admin startproject test_project` then by default Django will create this directory structure:

Layout

```
└── test_project
    ├── manage.py
    └── test_project
        ├── __init__.py
        ├── settings.py
        ├── urls.py
        └── wsgi.py
```

See how it creates a new directory `test_project` and then within it a `manage.py` file and a `test_project` directory? That feels redundant to me since we already created and navigated into a `django` folder on our Desktop. By running `django-admin startproject test_project .` with the period at the end–which says, install in the current directory–the result is instead this:

Layout

```
├── manage.py
└── test_project
    ├── __init__.py
    ├── settings.py
    ├── urls.py
    └── wsgi.py
```

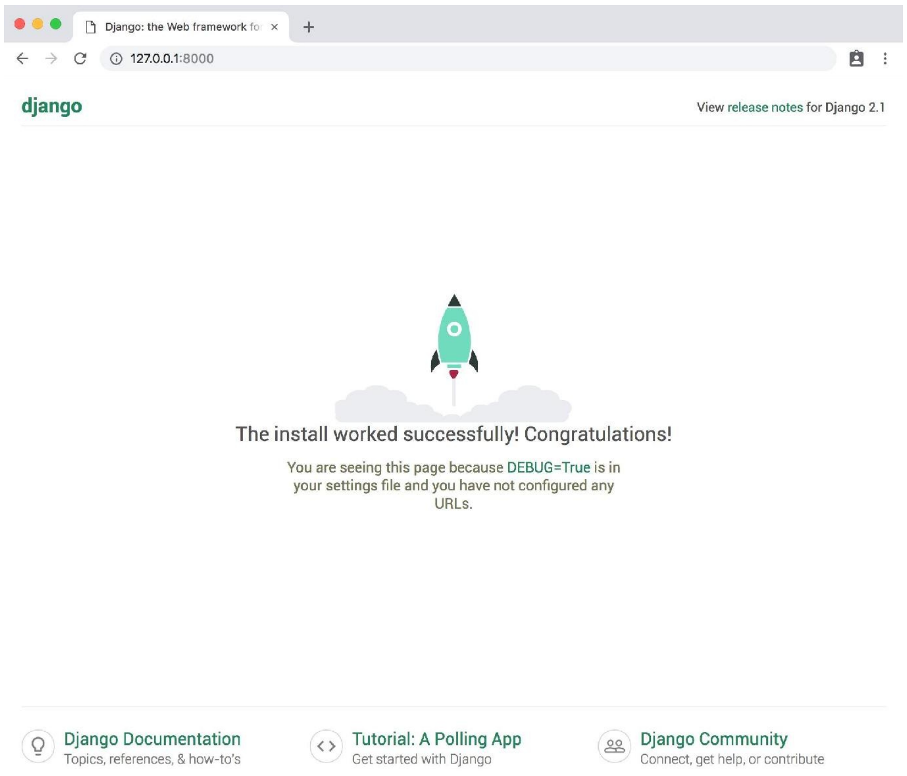
The takeaway is that it **doesn’t really matter** if you include the period or not at the end of the command, but I prefer to include the period and so that’s how we’ll do it in this book.

Now let’s confirm everything is working by running Django’s local web server.

Command Line

```
(django-JmZ1NTQw) $ python manage.py runserver
```

If you visit http://127.0.0.1:8000/ you should see the following image:



Django: the Web framework fo
127.0.0.1:8000
django
View release notes for Django 2.1
Django Documentation
Topics, references, & how-to's
Tutorial: A Polling App
Get started with Django
Django Community
Connect, get help, or contribute

The install worked successfully! Congratulations!

You are seeing this page because DEBUG=True is in your settings file and you have not configured any URLs.

Django welcome page

To stop our local server type `Control+c`. Then exit our virtual environment using the command `exit`.

Command Line

```
(django-JmZ1NTQw) $ exit
```

We can always reactivate the virtual environment again using `pipenv shell` at any time.

We'll get lots of practice with virtual environments in this book so don't worry if it's a little confusing right now. The basic pattern is to install new packages with `pipenv`, activate them with `pipenv shell`, and then exit when done with `exit`.

It's worth noting that only one virtual environment can be active in a command line tab at a time. In future chapters we will be creating a brand new virtual environment for each new project. Either make sure to `exit` your current environment or open up a new tab for new projects.

Install Git

Git is an indispensable part of modern software development. It is a version control system which can be thought of as an extremely powerful version of *track changes* in Microsoft Word or Google Docs. With git, you can collaborate with other developers, track all your work via commits, and revert to any previous version of your code even if you accidentally delete something important!

On a Mac, because Homebrew is already installed we can simply type `brew install git` on the command line:

Command Line

```
$ brew install git
```

On Windows you should download Git from [Git for Windows](). Click the “Download” button and follow the prompts for installation.

Once installed, we need to do a one-time *system* set up to configure it by declaring the name and email address you want associated with all your Git commits (more on this shortly).

Within the command line console type the following two lines. Make sure to update them your name and email address.

Command Line

```
$ git config --global user.name "Your Name"
$ git config --global user.email "yourname@email.com"
```

You can always change these configs later if you desire by retyping the same commands with a new name or email address.

Text Editors

The final step is our text editor. While the command line is where we execute commands for our programs, a text editor is where the actual code is written. The computer doesn’t care what text editor you use–the end result is just code–but a good text editor can provide helpful hints and catch typos for you.

Experienced developers often prefer using either Vim or Emacs, both decades-old, text-only editors with loyal followings. However each has a steep learning curve and requires memorizing many different keystroke combinations. I don’t recommend them for newcomers.

Modern text editors combine the same powerful features with an appealing visual interface. My current favorite is Visual Studio Code which is free, easy to install, and enjoys widespread popularity. If you’re not already using a text editor, download and install Visual Studio Code now.

Conclusion

Phew! Nobody really likes configuring a local development environment but fortunately it’s a one-time pain. We have now learned how to work with virtual environments and installed the latest version of Python and git. Everything is ready for our first Django app.

Chapter 2: Hello World app

In this chapter we’ll build a Django project that simply says “Hello, World” on the homepage. This is the traditional way to start a new programming language or framework. We’ll also work with *git* for the first time and deploy our code to Bitbucket.

Initial Set Up

To start navigate to a new directory on your computer. For example, we can create a `helloworld` folder on the Desktop with the following commands.

Command Line

```
$ cd ~/Desktop
$ mkdir helloworld
$ cd helloworld
```

Make sure you’re not already in an existing virtual environment at this point. If you see text in parentheses `()` before the dollar sign `$` then you are. To exit it, type `exit` and hit `Return`. The parentheses should disappear which means that virtual environment is no longer active.

We’ll use `pipenv` to create a new virtual environment, install Django and then activate it.

Command Line

```
$ pipenv install django==2.1
$ pipenv shell
```

If you are on a Mac you should see parentheses now at the beginning of your command line prompt in the form `(helloworld-XXX)` where `XXX` represents random characters. On my computer I see `(helloworld-415ivvZC)`. I’ll display `(helloworld)` here in the text but you will see something slightly different on your computer. If you are on Windows you will not see a visual prompt at this time.

Create a new Django project called `helloworld_project` making sure to include the period `.` at the end of the command so that it is installed in our current directory.

Command Line

```
(helloworld) $ django-admin startproject helloworld_project .
```

If you use the `tree` command you can see what our Django project structure now looks like. (**Note**: If `tree` doesn't work for you, install it with Homebrew: `brew install tree`.)

Command Line

```
(helloworld) $ tree
.
├── Pipfile
├── Pipfile.lock
├── helloworld_project
│   ├── __init__.py
│   ├── settings.py
│   ├── urls.py
│   └── wsgi.py
└── manage.py

1 directory, 7 files
```

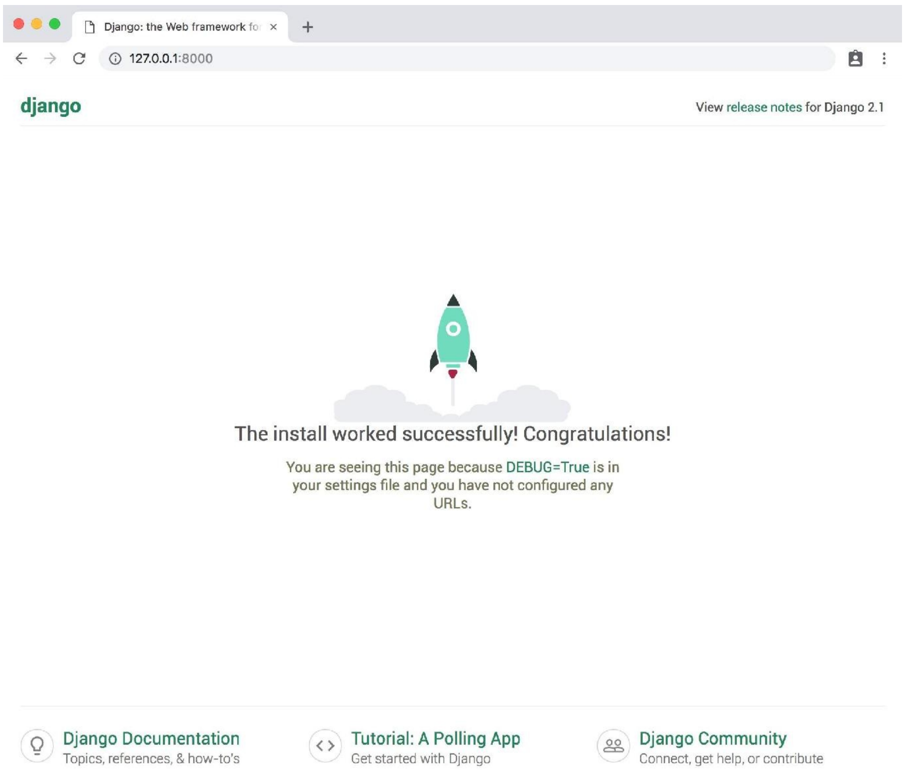
The `settings.py` file controls our project's settings, `urls.py` tells Django which pages to build in response to a browser or URL request, and `wsgi.py`, which stands for web server gateway interface, helps Django serve our eventual web pages. The last file `manage.py` is used to execute various Django commands such as running the local web server or creating a new app.

Django comes with a built-in web server for local development purposes. We can start it with the `runserver` command.

Command Line

```
(helloworld) $ python manage.py runserver
```

If you visit http://127.0.0.1:8000/ you should see the following image:


Django: the Web framework fo
127.0.0.1:8000
django
View release notes for Django 2.1
The install worked successfully! Congratulations!
You are seeing this page because DEBUG=True is in your settings file and you have not configured any URLs.
Django Documentation
Topics, references, & how-to's
Tutorial: A Polling App
Get started with Django
Django Community
Connect, get help, or contribute

Django welcome page

Create an app

Django uses the concept of projects and apps to keep code clean and readable. A single Django project contains one or more apps within it that all work together to power a web application. This is why the command for a new Django project is `startproject`! For example, a real-world Django e-commerce site might have one app for user authentication, another app for payments, and a third app to power item listing details. Each focuses on an isolated piece of functionality.

We need to create our first app which we'll call `pages`. From the command line, quit the server with `Control+c`. Then use the `startapp` command.

Command Line

```
(helloworld) $ python manage.py startapp pages
```

If you look again inside the directory with the `tree` command you'll see Django has created a `pages` directory with the following files:

Command Line

```
(helloworld) $ tree
├── pages
│   ├── __init__.py
│   ├── admin.py
│   ├── apps.py
│   ├── migrations
│   │   └── __init__.py
│   ├── models.py
│   ├── tests.py
│   └── views.py
```

Let’s review what each new `pages` app file does:

- `admin.py` is a configuration file for the built-in Django Admin app
- `apps.py` is a configuration file for the app itself
- `migrations/` keeps track of any changes to our `models.py` file so our database and `models.py` stay in sync
- `models.py` is where we define our database models, which Django automatically translates into database tables
- `tests.py` is for our app-specific tests
- `views.py` is where we handle the request/response logic for our web app

Even though our new app exists within the Django project, Django doesn’t “know” about it until we explicitly add it. In your text editor open the `settings.py` file and scroll down to `INSTALLED_APPS` where you’ll see six built-in Django apps already there. Add our new `pages` app at the bottom.

Code

```
# helloworld_project/settings.py
INSTALLED_APPS = [
    'django.contrib.admin',
    'django.contrib.auth',
    'django.contrib.contenttypes',
    'django.contrib.sessions',
    'django.contrib.messages',
    'django.contrib.staticfiles',
    'pages.apps.PagesConfig', # new
]
```

We should always add our own local apps at the bottom because Django will read our `INSTALLED_APPS` in top down order. Therefore the internal `admin` app is loaded first, then `auth`, and so on. We want the core Django apps to be available since it’s quite likely our own apps will rely on their functionality.

Another thing to note is you might be wondering why we can’t just list the app name `pages` here instead of the much longer `pages.apps.PagesConfig`? The answer is that Django creates an `apps.py` file with each new application and it’s possible to add additional information there, especially with the Signals framework which is an advanced technique. For our relatively basic application using `pages` instead would still work, but we’d miss out on additional options and so as a best practice, always use the full app config name like `pages.apps.PagesConfig`.

We’ll build and add many more apps to our Django projects in later chapters so this pattern will become familiar with time.

Views and URLConfs

In Django, *Views* determine **what** content is displayed on a given page while *URLConfs* determine **where** that content is going.

When a user requests a specific page, like the homepage, the URLConf uses a regular expression to map that request to the appropriate view function which then returns the correct data.

In other words, our *view* will output the text “Hello, World” while our *url* will ensure that when the user visits the homepage they are redirected to the correct view.

This interaction is frequently **very confusing** to newcomers so let’s map out the order of a given HTTP request/response cycle. When you type in a URL, such as `https://djangoforbeginners.com` the first thing that happens within our Django project is a *URLpattern* is found that matches the homepage. The URLpattern specifies a *view* which then determines the content for the page (usually from the database) and a *template* for styling. The end result is sent back to the user as an HTTP response.

Django request/response cycle

```
URL -> View -> Model (typically) -> Template
```

Let’s start by updating the `views.py` file in our `pages` app to look as follows:

Code

```
# pages/views.py
from django.http import HttpResponse


def homePageView(request):
    return HttpResponse('Hello, World!')
```

Basically we’re saying whenever the view function `homePageView` is called, return the text “Hello, World!” More specifically, we’ve imported the built-in HttpResponse method so we can return a response object to the user. We’ve created a function called `homePageView` that accepts the `request` object and returns a response with the string `Hello, World!`.

Now we need to configure our urls. Within the `pages` app, create a new `urls.py` file.

Command Line

```
(helloworld) $ touch pages/urls.py
```

Then update it with the following code:

Code

```python
# pages/urls.py
from django.urls import path

from .views import homePageView

urlpatterns = [
    path('', homePageView, name='home')
]
```

On the top line we import `path` from Django to power our `URLpattern` and on the next line we import our views. By using the period `.views` we reference the current directory, which is our `pages` app containing both `views.py` and `urls.py`. Our URLpattern has three parts:

- a Python regular expression for the empty string `''`
- specify the view which is called `homePageView`
- add an optional URL name of `'home'`

In other words, if the user requests the homepage, represented by the empty string `''` then use the view called `homePageView`.

We're *almost* done. The last step is to configure our project-level `urls.py` file since it's common to have multiple apps within a single Django project, so they each need their own route.

> "Project-level" means the topmost, parent directory of an application. In this case where both the `helloworld_project` and `pages` app folders exist. Once we are *inside* a specific app we are "app-level."

Update the existing `helloworld_project/urls.py` file as follows.

Code

```python
# helloworld_project/urls.py
from django.contrib import admin
from django.urls import path, include

urlpatterns = [
    path('admin/', admin.site.urls),
    path('', include('pages.urls')),
]
```

We've imported `include` on the second line next to `path` and then created a new URLpattern for our `pages` app. Now whenever a user visits the homepage at `/` they will first be routed to the `pages` app and then to the `homePageView` view.

It's often confusing to beginners that we don't need to import the `pages` app here, yet we refer to it in our URLpattern as `pages.urls`. The reason we do it this way is that the method `django.urls.include()` expects us to pass in a module, or app, as the first argument. So without using `include` we *would* need to import our `pages` app, but since we do use `include` we don't have to at the project level!

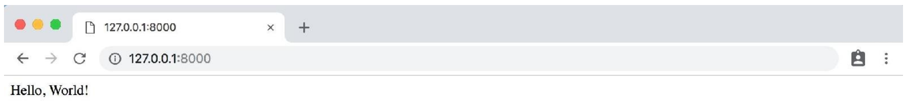
Hello, world!

We have all the code we need now! To confirm everything works as expected, restart our Django server:

Command Line

```
(helloworld) $ python manage.py runserver
```

If you refresh the browser for http://127.0.0.1:8000/ it now displays the text "Hello, world!"



Hello, World!

Hello world homepage

Git

In the previous chapter we also installed *git* which is a version control system. Let's use it here. The first step is to initialize (or add) *git* to our repository.

Command Line

```
(helloworld) $ git init
```

If you then type `git status` you'll see a list of changes since the last git commit. Since this is our first commit, this list is all of our changes so far.

Command Line

```
(helloworld) $ git status
On branch master

No commits yet

Untracked files:
  (use "git add <file>..." to include in what will be committed)

        Pipfile
        Pipfile.lock
        db.sqlite3
        helloworld_project/
        manage.py
        pages/

nothing added to commit but untracked files present (use "git add" to track)
```

We next want to add *all* changes by using the command `add -A` and then `commit` the changes along with a message describing what has changed.

Command Line

```
(helloworld) $ git add -A
(helloworld) $ git commit -m 'initial commit'
```

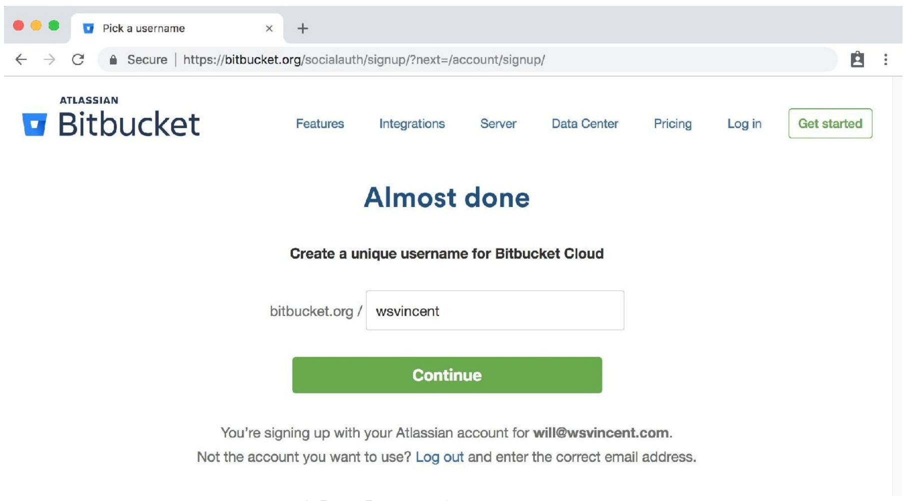
Please note Windows users may receive an error git commit error: pathspec ‘commit’ did not match any file(s) known to git which appears to be related to using single quotes `''` as opposed to double quotes `""`. If you see this error, just use double quotes for all commit messages going forward.

Bitbucket

It’s a good habit to create a remote repository of your code for each project. This way you have a backup in case anything happens to your computer and more importantly, it allows for collaboration with other software developers. The two most popular choices are Bitbucket and Github.

In this book we will use Bitbucket because it allows private repositories **for free**. Github charges a fee. Public repositories are available for anyone on the internet to use; private repositories are not. When you’re learning web development, it’s best to stick to private repositories so you don’t inadvertently post critical information such as passwords online.

To get started on Bitbucket, sign up for a free account. After confirming your account via email you’ll be sent a page to create a unique username for your Bitbucket Cloud.

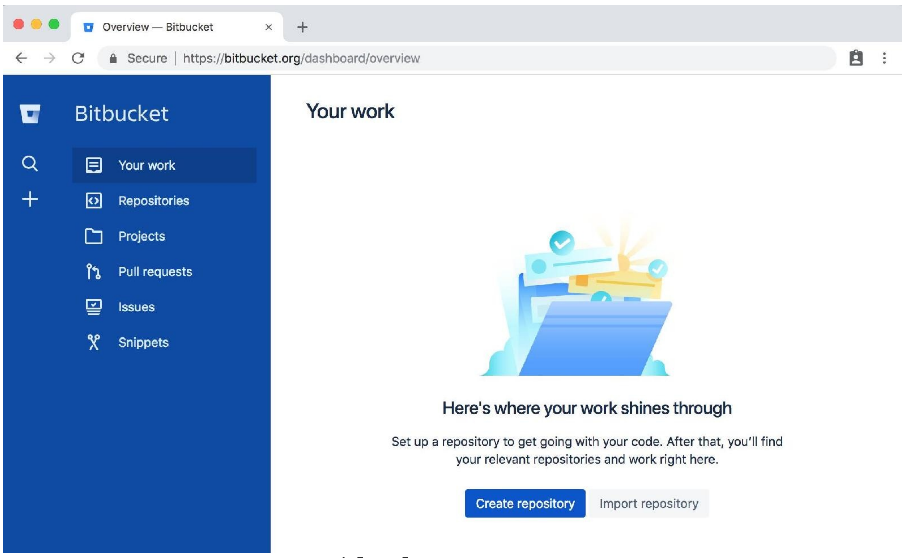

Pick a username
Secure | https://bitbucket.org/socialauth/signup/?next=/account/signup/

Almost done
Create a unique username for Bitbucket Cloud
bitbucket.org / wsvincent

You’re signing up with your Atlassian account for **will@wsvincent.com**.
Not the account you want to use? Log out and enter the correct email address.

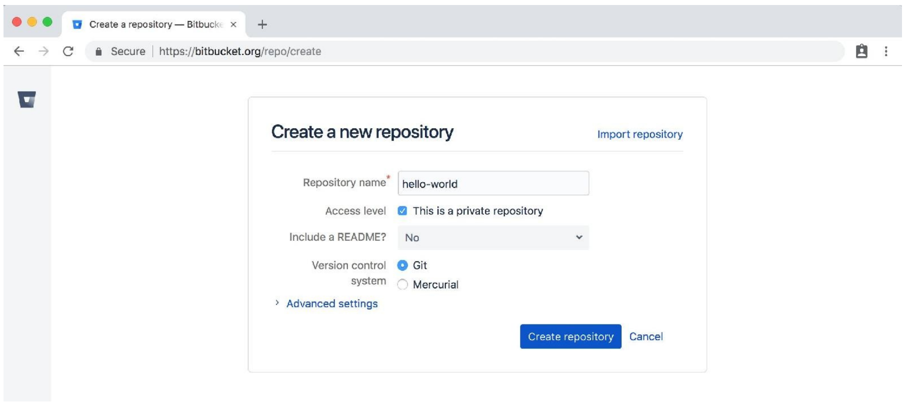
Bitbucket unique username

Next we can start our first code repository. Click on the button for “Create repository” since we want to add our existing local code to Bitbucket.


Overview — Bitbucket
Secure | https://bitbucket.org/dashboard/overview
Bitbucket
Your work
Repositories
Projects
Pull requests
Issues
Snippets
Your work
Here's where your work shines through
Set up a repository to get going with your code. After that, you'll find your relevant repositories and work right here.
Create repository
Import repository

Bitbucket create repo

Then on the "Create a new repository" page enter in the name of your repository: "hello-world". Also–and this is important–click on the dropdown menu next to "Include a README" and select "No" rather than the default "Yes, with a tutorial (for beginners)" button. Then click the blue "Create repository" button:

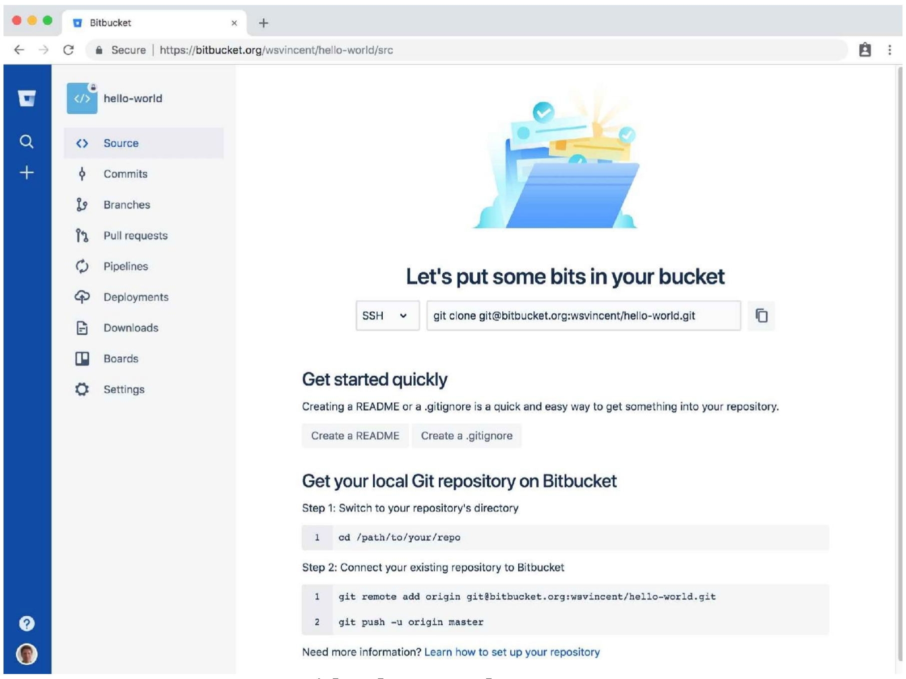

Create a repository — Bitbucket
Secure | https://bitbucket.org/repo/create
Import repository
Advanced settings
Create repository
Cancel

Create a new repository

Repository name*	hello-world
Access level	☑ This is a private repository
Include a README?	No
Version control system	● Git ○ Mercurial

Bitbucket new repo

Since we already have local code we want to add to Bitbucket, look at the instructions on the page for "Get your local Git repository on Bitbucket."



Let's put some bits in your bucket

```
git clone git@bitbucket.org:wsvincent/hello-world.git
```

Get started quickly

Creating a README or a .gitignore is a quick and easy way to get something into your repository.

Get your local Git repository on Bitbucket

Step 1: Switch to your repository's directory

```
cd /path/to/your/repo
```

Step 2: Connect your existing repository to Bitbucket

```
git remote add origin git@bitbucket.org:wsvincent/hello-world.git
git push -u origin master
```

Need more information? Learn how to set up your repository

Bitbucket repo homepage

We’re already in the directory for our repo so skip Step 1. In Step 2, we’ll use two commands to add our project to Bitbucket. Note that your command will differ from mine since you have a different username. The general format is the below where `<USER>` is your Bitbucket username. Mine happens to be `wsvincent`.

Command Line

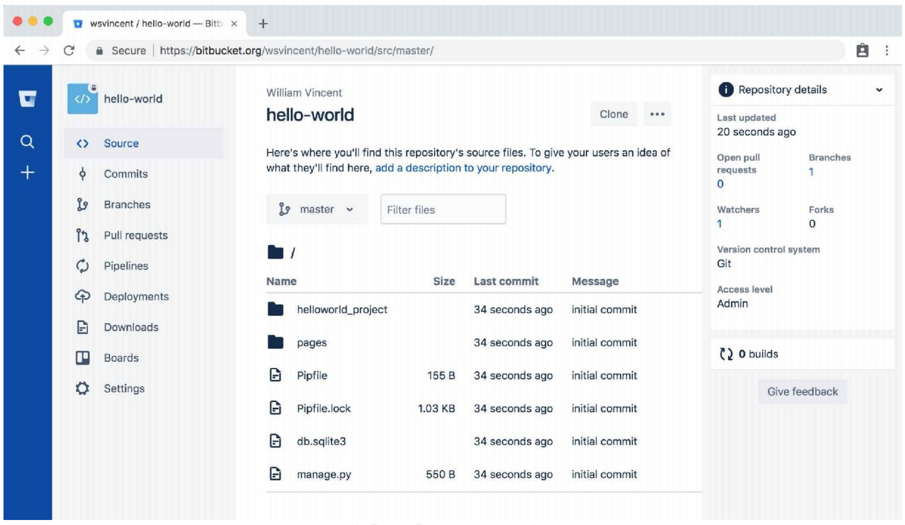
```
(helloworld) $ git remote add origin git@bitbucket.org:<USER>/hello-world.git
```

After running this command to configure git with this Bitbucket repository, we must “push” our code into it.

Command Line

```
(helloworld) $ git push -u origin master
```

Now if you go back to your Bitbucket page and refresh it, you’ll see the code is now online!



William Vincent

hello-world

Here's where you'll find this repository's source files. To give your users an idea of what they'll find here, add a description to your repository.

/

Name	Size	Last commit	Message
helloworld_project		34 seconds ago	initial commit
pages		34 seconds ago	initial commit
Pipfile	155 B	34 seconds ago	initial commit
Pipfile.lock	1.03 KB	34 seconds ago	initial commit
db.sqlite3		34 seconds ago	initial commit
manage.py	550 B	34 seconds ago	initial commit

Repository details

Last updated	20 seconds ago
Open pull requests	0
Branches	1
Watchers	1
Forks	0
Version control system	Git
Access level	Admin

0 builds

Bitbucket overview

Since we're done, go ahead and exit our virtual environment with the `exit` command.

Command Line

```
(helloworld) $ exit
```

You should no longer see parentheses on your command line, indicating the virtual environment is no longer active.

Conclusion

Congratulations! We've covered a lot of fundamental concepts in this chapter. We built our first Django application and learned about Django's project/app structure. We started to learn about views, urls, and the internal web server. And we worked with git to track our changes and pushed our code into a private repo on Bitbucket.

Continue on to **Chapter 3: Pages app** where we'll build and deploy a more complex Django application using templates and class-based views.

Chapter 3: Pages app

In this chapter we'll build, test, and deploy a *Pages* app that has a homepage and an about page. We'll also learn about Django's class-based views and templates which are the building blocks for the more complex web applications built later on in the book.

Initial Set Up

As in **Chapter 2: Hello World app**, our initial set up involves the following steps:

- create a new directory for our code
- install Django in a new virtual environment
- create a new Django project
- create a new `pages` app
- update `settings.py`

On the command line make sure you're not working in an existing virtual environment. You can tell if there's anything in parentheses before your command line prompt. If you are simply type `exit` to leave it.

We will again create a new directory `pages` for our project on the Desktop but you can put your code anywhere you like on your computer. It just needs to be in its own directory.

Within a new command line console start by typing the following:

Command Line

```
$ cd ~/Desktop
$ mkdir pages
$ cd pages
$ pipenv install django==2.1
$ pipenv shell
(pages) $ django-admin startproject pages_project .
(pages) $ python manage.py startapp pages
```

I'm using `(pages)` here to represent the virtual environment but in reality mine has the form of `(pages-unOYeQ9e)`. Your virtual environment name will be unique, too, something like `(pages-XXX)`.

Open your text editor and navigate to the file `settings.py`. Add the `pages` app at the bottom of our project under `INSTALLED_APPS`:

Code

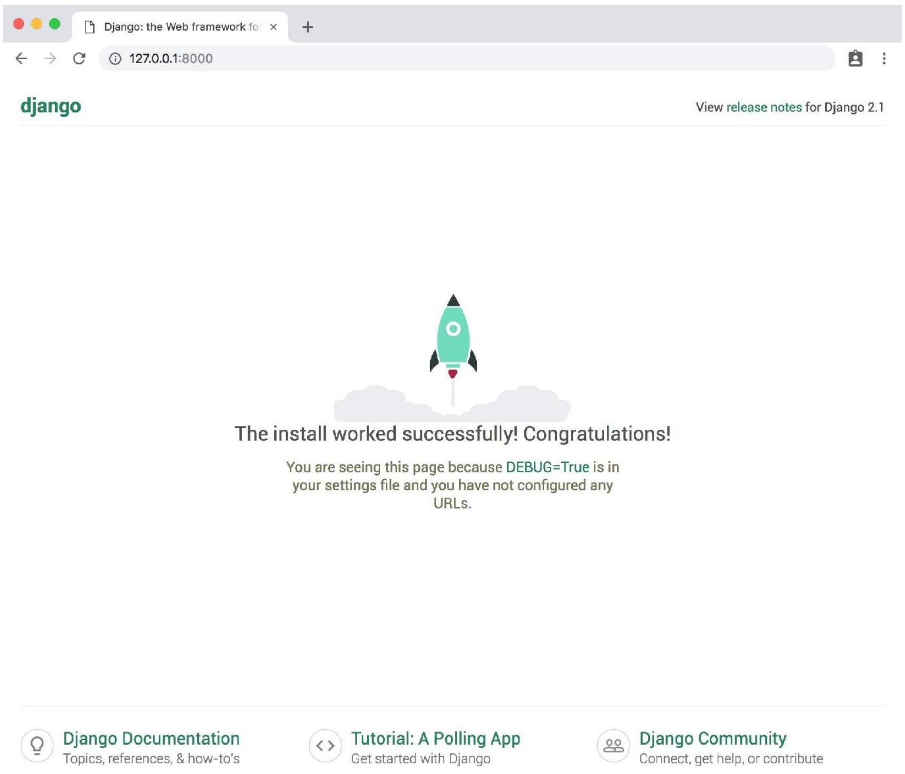
```
# pages_project/settings.py
INSTALLED_APPS = [
    'django.contrib.admin',
    'django.contrib.auth',
    'django.contrib.contenttypes',
    'django.contrib.sessions',
    'django.contrib.messages',
    'django.contrib.staticfiles',
    'pages.apps.PagesConfig', # new
]
```

Start the local web server with `runserver`.

Command Line

```
(pages) $ python manage.py runserver
```

And then navigate to http://127.0.0.1:8000/.


Django: the Web framework fo
127.0.0.1:8000
django
View release notes for Django 2.1
Django Documentation
Topics, references, & how-to's
Tutorial: A Polling App
Get started with Django
Django Community
Connect, get help, or contribute

The install worked successfully! Congratulations!

You are seeing this page because DEBUG=True is in your settings file and you have not configured any URLs.

Django welcome page

Templates

Every web framework needs a convenient way to generate HTML files. In Django, the approach is to use templates so that individual HTML files can be served by a view to a web page specified by the URL.

It’s worth repeating this pattern since you’ll see it over and over again in Django development: Templates, Views, and URLs. The order in which you create them doesn’t much matter since all three are required and work closely together. The URLs control the initial route, the entry point into a page, such as `/about`, the views contain the logic or the "what", and the template has the HTML. For web pages that rely on a database model, it is the view that does much of the work to decide what data is available to the template.

So: Templates, Views, URLs. This pattern will hold true for **every Django web page you make**. However it will take some repetition before you internalize it.

Ok, moving on. The question of where to place the templates directory can be confusing for beginners. By default, Django looks within each app for templates. In our `pages` app it will expect a `home.html` template to be located in the following location:

Layout

```
└── pages
    ├── templates
        ├── pages
            ├── home.html
```

This means we would need to create a new `templates` directory, a new directory with the name of the app, `pages`, and finally our template itself which is `home.html`.

A common question is: Why this repetitive structure? The short answer is that the Django template loader wants to be really sure it find the correct template and this is how it's programmed to look for them.

Fortunately there's another often-used approach to structuring the templates in a Django project. And that is to instead create a single, project-level `templates` directory that is available to *all apps*. This is the approach we'll use. By making a small tweak to our `settings.py` file we can tell Django to *also* look in this project-level folder for templates.

First quit our server with `Control+c`. Then create a project-level folder called `templates` and an HTML file called `home.html`.

Command Line

```
(pages) $ mkdir templates
(pages) $ touch templates/home.html
```

Next we need to update `settings.py` to tell Django to look at the project-level for templates. This is a one-line change to the setting `'DIRS'` under `TEMPLATES`.

Code

```
# pages_project/settings.py
TEMPLATES = [
    {
        ...
        'DIRS': [os.path.join(BASE_DIR, 'templates')], # new
        ...
    },
]
```

Then we can add a simple headline to our `home.html` file.

Code

```
<!-- templates/home.html -->
<h1>Homepage</h1>
```

Ok, our template is complete! The next step is to configure our URL and view.

Class-Based Views

Early versions of Django only shipped with function-based views, but developers soon found themselves repeating the same patterns over and over again. Write a view that lists all objects in a model. Write a view that displays only one detailed item from a model. And so on.

Function-based generic views were introduced to abstract these patterns and streamline development of common patterns. However there was no easy way to extend or customize these views. As a result, Django introduced class-based generic views that make it easy to use and also extend views covering common use cases.

Classes are a fundamental part of Python but a thorough discussion of them is beyond the scope of this book. If you need an introduction or refresher, I suggest reviewing the official Python docs which have an excellent tutorial on classes and their usage.

In our view we'll use the built-in TemplateView to display our template. Update the `pages/views.py` file.

Code

```
# pages/views.py
from django.views.generic import TemplateView


class HomePageView(TemplateView):
    template_name = 'home.html'
```

Note that we've capitalized our view since it's now a Python class. Classes, unlike functions, should always be capitalized. The `TemplateView` already contains all the logic needed to display our template, we just need to specify the template's name.

URLs

The last step is to update our URLConfs. Recall from Chapter 2 that we need to make updates in two locations. First we update the project-level `urls.py` file to point at our `pages` app and then within `pages` we match the views to routes.

Let's start with the project-level `urls.py` file.

Code

```
# pages_project/urls.py
from django.contrib import admin
from django.urls import path, include # new

urlpatterns = [
    path('admin/', admin.site.urls),
    path('', include('pages.urls')), # new
]
```

The code here should be review at this point. We add `include` on the second line to point the existing URL to the `pages` app. Next create an app-level `urls.py` file.

Command Line

```
(pages) $ touch pages/urls.py
```

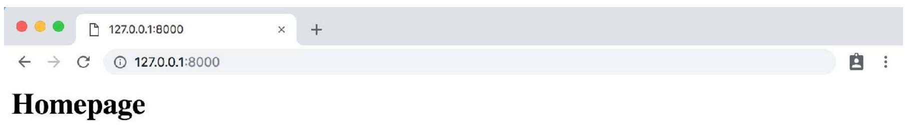
And add the following code.

Code

```
# pages/urls.py
from django.urls import path

from .views import HomePageView

urlpatterns = [
    path('', HomePageView.as_view(), name='home'),
]
```

This pattern is almost identical to what we did in Chapter 2 with one major difference. When using Class-Based Views, you always add `as_view()` at the end of the view name.

And we're done! If you start up the web server with `python manage.py runserver` and navigate to http://127.0.0.1:8000/ you can see our new homepage.



Homepage

Add an About Page

The process for adding an about page is **very** similar to what we just did. We'll create a new template file, a new view, and a new url route.

Quit the server with `Control+c` and create a new template called `about.html`.

Command Line

```
(pages) $ touch templates/about.html
```

Then populate it with a short HTML headline.

Code

```
<!-- templates/about.html -->
<h1>About page</h1>
```

Create a new view for the page.

Code

```
# pages/views.py
from django.views.generic import TemplateView


class HomePageView(TemplateView):
    template_name = 'home.html'


class AboutPageView(TemplateView):
    template_name = 'about.html'
```

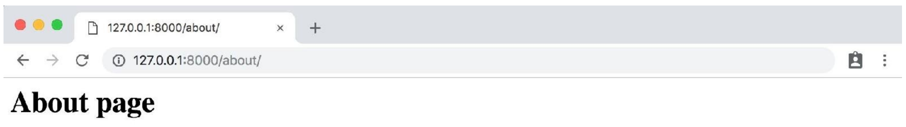
And then connect it to a URL at `about/`.

Code

```
# pages/urls.py
from django.urls import path

from .views import HomePageView, AboutPageView # new

urlpatterns = [
    path('about/', AboutPageView.as_view(), name='about'), # new
    path('', HomePageView.as_view(), name='home'),
]
```

Start up the web server with `python manage.py runserver`.

Navigate to http://127.0.0.1:8000/about and you can see our new "About page".



About page

About page

Extending Templates

The real power of templates is their ability to be extended. If you think about most web sites, there is content that is repeated on every page (header, footer, etc). Wouldn't it be nice if we, as developers, could have *one canonical place* for our header code that would be inherited by all other templates?

Well we can! Let's create a `base.html` file containing a header with links to our two pages. We could name this file anything but using `base.html` is a common convention. First `Control+c` and then type the following.

Command Line

```
(pages) $ touch templates/base.html
```

Django has a minimal templating language for adding links and basic logic in our templates. You can see the full list of built-in template tags here in the official docs. Template tags take the form of `{% something %}` where the "something" is the template tag itself. You can even create your own custom template tags, though we won't do that in this book.

To add URL links in our project we can use the built-in url template tag which takes the URL pattern name as an argument. Remember how we added optional URL names to our url routers? This is why. The `url` tag uses these names to automatically create links for us.

The URL route for our homepage is called `home` therefore to configure a link to it we would use the following: `{% url 'home' %}`.

Code

```
<!-- templates/base.html -->
<header>
  <a href="{% url 'home' %}">Home</a> | <a href="{% url 'about' %}">About</a>
</header>

{% block content %}
{% endblock content %}
```

At the bottom we've added a `block` tag called `content`. Blocks can be overwritten by child templates via inheritance. While it's optional to name our closing `endblock`–you can just write `{% endblock %}` if you prefer–doing so helps with readability, especially in larger template files.

Let's update our `home.html` and `about.html` to extend the `base.html` template. That means we can reuse the same code from one template in another template. The Django templating language comes with an extends method that we can use for this.

Code

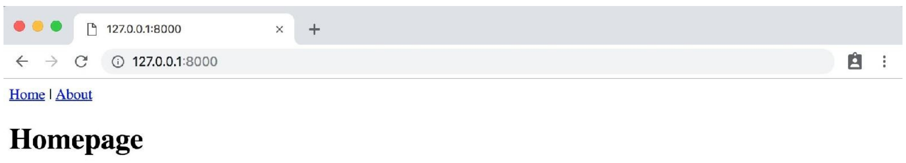
```
<!-- templates/home.html -->
{% extends 'base.html' %}

{% block content %}
<h1>Homepage</h1>
{% endblock content %}
```

Code

```
<!-- templates/about.html -->
{% extends 'base.html' %}

{% block content %}
<h1>About page</h1>
{% endblock content %}
```

Now if you start up the server with `python manage.py runserver` and open up our webpages again at http://127.0.0.1:8000/ and http://127.0.0.1:8000/about you'll see the header is magically included in *both* locations.

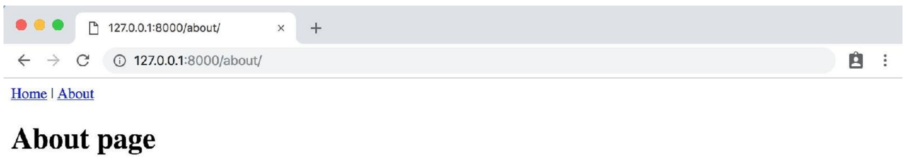
Nice, right?


127.0.0.1:8000

Home | About

Homepage

Homepage with header


127.0.0.1:8000/about/

Home | About

About page

About page with header

There's *a lot* more we can do with templates and in practice you'll typically create a `base.html` file and then add additional templates on top of it in a robust Django project. We'll do this later on in the book.

Tests

Finally we come to tests. Even in an application this basic, it's important to add tests and get in the habit of always adding them to our Django projects. In the words of [Jacob Kaplan-Moss](), one of Django's original creators, "Code without tests is broken as designed."

Writing tests is important because it automates the process of confirming that the code works as expected. In an app like this one, we can manually look and see that the home page and about page exist and contain the intended content.

But as a Django project grows in size there can be hundreds if not thousands of individual web pages and the idea of manually going through each page is not possible. Further, whenever we make changes to the code–adding new features, updating existing ones, deleting unused areas of the site–we want to be sure that we have not inadvertently broken some other piece of the site. Automated tests let us write one time how we expect a specific piece of our project to behave and then let the computer do the checking for us.

Fortunately Django comes with robust, built-in testing tools for writing and running tests.

If you look within our `pages` app, Django already provided a `tests.py` file we can use. Open it and add the following code:

Code

```
# pages/tests.py
from django.test import SimpleTestCase


class SimpleTests(SimpleTestCase):
    def test_home_page_status_code(self):
        response = self.client.get('/')
        self.assertEqual(response.status_code, 200)

    def test_about_page_status_code(self):
        response = self.client.get('/about/')
        self.assertEqual(response.status_code, 200)
```

We're using SimpleTestCase here since we aren't using a database. If we were using a database, we'd instead use TestCase. Then we perform a check if the status code for each page is 200, which is the standard response for a successful HTTP request. That's a fancy way of saying it ensures that a given webpage actually exists, but says nothing about the content of said page.

To run the tests quit the server `Control+c` and type `python manage.py test` on the command line:

Command Line

```
(pages) $ python manage.py test
Creating test database for alias 'default'...
System check identified no issues (0 silenced).
..
----------------------------------------------------------------------
Ran 2 tests in 0.014s

OK
Destroying test database for alias 'default'...
```

Success! We'll do much more with testing in the future, especially once we start working with databases. For now, it's important to see how easy it is to add tests each and every time we add new functionality to our Django project.

Git and Bitbucket

It’s time to track our changes with *git* and push them up to Bitbucket. We’ll start by initializing our directory.

Command Line

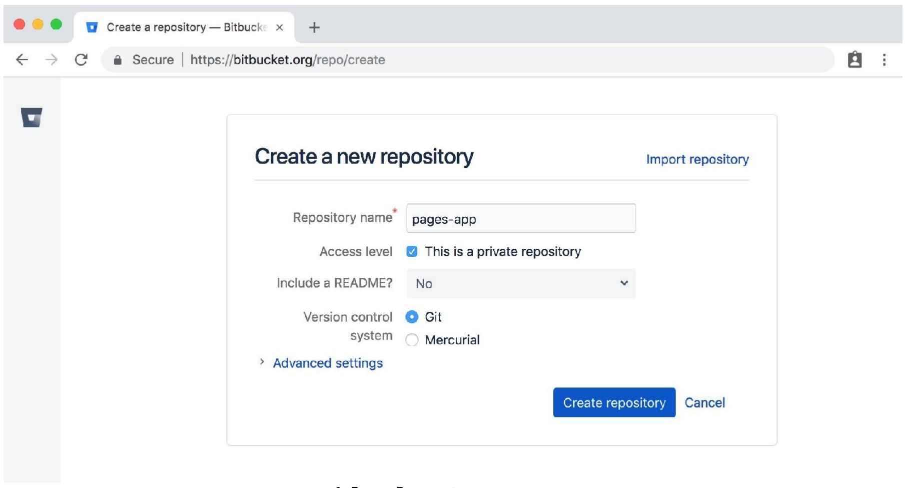
```
(pages) $ git init
```

Use `git status` to see all our code changes then `git add -A` to add them all. Finally we’ll add our first commit message.

Command Line

```
(pages) $ git status
(pages) $ git add -A
(pages) $ git commit -m 'initial commit'
```

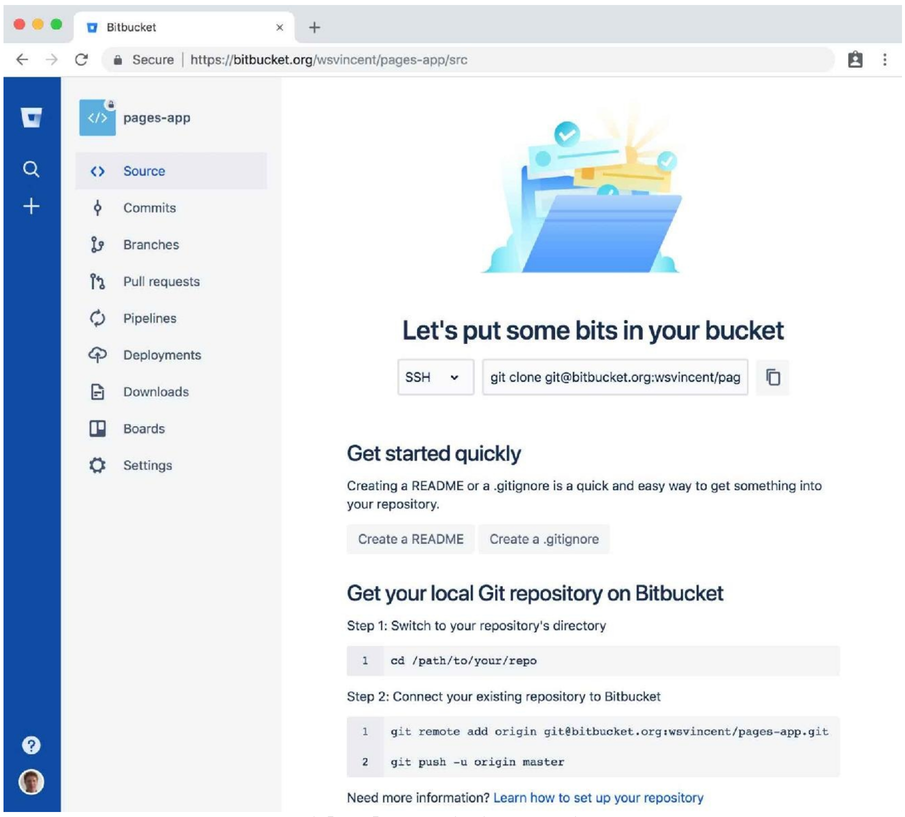
Over on Bitbucket [create a new repo]() which we’ll call `pages-app`.



Repository name*: pages-app
Access level: ✓ This is a private repository
Include a README?: No
Version control system: ● Git ○ Mercurial

Bitbucket Create Page

On the next page, look for the commands under “Step 2: Connect your existing repository to Bitbucket.” Copy the two commands to your command line to link the repo and then push the repository to Bitbucket.


Bitbucket
Secure | https://bitbucket.org/wsvincent/pages-app/src
pages-app
Source
Commits
Branches
Pull requests
Pipelines
Deployments
Downloads
Boards
Settings
Let's put some bits in your bucket
SSH
git clone git@bitbucket.org:wsvincent/pag
Create a README
Create a .gitignore
Need more information? Learn how to set up your repository

Get started quickly

Creating a README or a .gitignore is a quick and easy way to get something into your repository.

Get your local Git repository on Bitbucket

Step 1: Switch to your repository's directory

```
cd /path/to/your/repo
```

Step 2: Connect your existing repository to Bitbucket

```
git remote add origin git@bitbucket.org:wsvincent/pages-app.git
git push -u origin master
```

Bitbucket Existing Project

It should look like this, replacing `wsvincent` with your Bitbucket username:

Command Line

```
(pages) $ git remote add origin git@bitbucket.org:wsvincent/pages-app.git
(pages) $ git push -u origin master
```

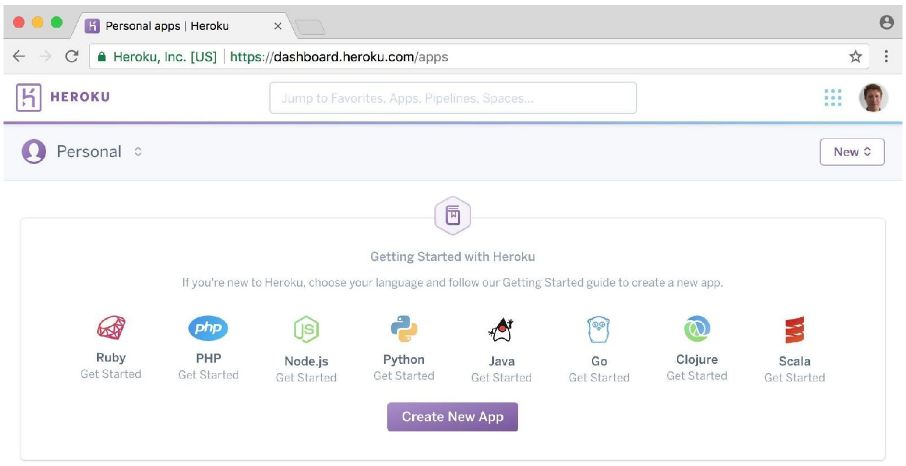
Local vs Production

Up to this point we've been using Django's own internal web server to power our *Pages* application locally on our computer. But you can't share a localhost address with someone else. To make our site available on the Internet where everyone can see it, we need to deploy our code to an external server that anyone can use to see our site. This is called putting our code into *production*. Local code lives only on our computer; production code lives on an external server.

There are many server providers available but we will use Heroku because it is free for small projects, widely-used, and has a relatively straightforward deployment process.

Heroku

You can sign up for a free Heroku account on their website. After you confirm your email Heroku will redirect you to the dashboard section of the site.


Personal apps | Heroku
Heroku, Inc. [US] | https://dashboard.heroku.com/apps
HEROKU
Jump to Favorites, Apps, Pipelines, Spaces...
Personal
New
Getting Started with Heroku
If you're new to Heroku, choose your language and follow our Getting Started guide to create a new app.
Ruby Get Started
PHP Get Started
Node.js Get Started
Python Get Started
Java Get Started
Go Get Started
Clojure Get Started
Scala Get Started
Create New App

Heroku dashboard

Now we need to install Heroku's *Command Line Interface (CLI)* so we can deploy from the command line. We want to install Heroku globally so it is available across our entire computer, so open up a new command line tab: `Command+t` on a Mac, `Control+t` on Windows. If we installed Heroku within our virtual environment, it would only be available there.

Within this new tab, on a Mac use Homebrew to install Heroku:

Command Line

```
$ brew install heroku
```

On Windows, see the Heroku CLI page to correctly install either the 32-bit or 64-bit version.

If you are using Linux there are specific install instructions available on the Heroku website.

Once installation is complete you can close our new command line tab and return to the initial tab with the `pages` virtual environment active.

Type the command `heroku login` and use the email and password for Heroku you just set.

Command Line

```
(pages) $ heroku login
Enter your Heroku credentials:
Email: will@wsvincent.com
Password: *********************************
Logged in as will@wsvincent.com
```

Additional Files

We need to make the following four changes to our *Pages* project so it's ready to deploy online with Heroku:

- update `Pipfile.lock`
- make a new `Procfile` file
- install `gunicorn` as our web server
- make aone-line change to `settings.py` file

Within your existing `Pipfile` specify the version of Python we're using, which is `3.7`. Add these two lines at the bottom of the file.

Pipfile

```
[requires]
python_version = "3.7"
```

Then run `pipenv lock` to generate the appropriate `Pipfile.lock`.

Command Line

```
(pages) $ pipenv lock
```

Heroku actually looks in our `Pipfile.lock` for information on our virtual environment, which is why we add the language setting here.

Next create a `Procfile` which is specific to Heroku.

Command Line

```
(pages) $ touch Procfile
```

Open the `Procfile` with your text editor and add the following:

Procfile

```
web: gunicorn pages_project.wsgi --log-file -
```

This says to use gunicorn, which is a web server suitable for production, instead of Django's own server which is only suitable for local development.

The configuration for the server is contained in a `wsgi.py` file that Django automatically creates for every new project. It resides at the top-most, project level of our code. Since our project's name is `pages_project` here, the file is located at `pages_project/wsgi.py` file.

Command Line

```
(pages) $ pipenv install gunicorn==19.9.0
```

The final step is a one-line change to `settings.py`. Scroll down to the section called `ALLOWED_HOSTS` and add a `'*'` so it looks as follows:

Code

```
# pages_project/settings.py
ALLOWED_HOSTS = ['*']
```

The ALLOWED_HOSTS setting represents which host/domain names our Django site can serve. This is a security measure to prevent HTTP Host header attacks, which are possible even under many seemingly-safe web server configurations. However we've used the wildcard Asterisk `*` which means all domains are acceptable to keep things simple. In a production-level Django site you would explicitly list which domains were allowed.

Use `git status` to check our changes, add the new files, and then commit them:

Command Line

```
(pages) $ git status
(pages) $ git add -A
(pages) $ git commit -m "New updates for Heroku deployment"
```

Finally push to Bitbucket so we have an online backup of our code changes.

Command Line

```
(pages) $ git push -u origin master
```

Deploy

The last step is to actually deploy with Heroku. If you've ever configured a server yourself in the past, you'll be amazed at how much simpler the process is with a platform-as-a-service provider like Heroku.

Our process will be as follows:

- create a new app on Heroku and push our code to it
- add a git remote "hook" for Heroku
- configure the app to ignore static files, which we'll cover in later chapters
- start the Heroku server so the app is live
- visit the app on Heroku's provided URL

We can do the first step, creating a new Heroku app, from the command line with `heroku create`. Heroku will create a random name for our app, in my case `fathomless-hamlet-26076`. Your name will be different.

Command Line

```
(pages) $ heroku create
Creating app... done, ⬢ fathomless-hamlet-26076
```

```
https://fathomless-hamlet-26076.herokuapp.com/ |
https://git.heroku.com/fathomless-hamlet-26076.git
```

Now we need to add a “hook” for Heroku within git. This means that git will store both our settings for pushing code to Bitbucket and to Heroku. My Heroku app is called `cryptic-oasis-40349` so my command is as follows.

Command Line

```
(pages) $ heroku git:remote -a fathomless-hamlet-26076
```

You should replace `fathomless-hamlet-26076` with the app name Heroku provides.

We only need to do one set of Heroku configurations at this point, which is to tell Heroku to ignore static files like CSS and JavaScript which Django by default tries to optimize for us. We’ll cover this in later chapters so for now just run the following command.

Command Line

```
(pages) $ heroku config:set DISABLE_COLLECTSTATIC=1
```

Now we can push our code to Heroku. Because we set our “hook” previously, it will go to Heroku.

Command Line

```
(pages) $ git push heroku master
```

If we just typed `git push origin master` then the code is pushed to Bitbucket, not Heroku. Adding `heroku` to the command sends the code to Heroku. This is a little confusing the first few times.

Finally we need to make our Heroku app live. As websites grow in traffic they need additional Heroku services but for our basic example we can use the lowest level, `web=1`, which also happens to be free!

Type the following command.

Command Line

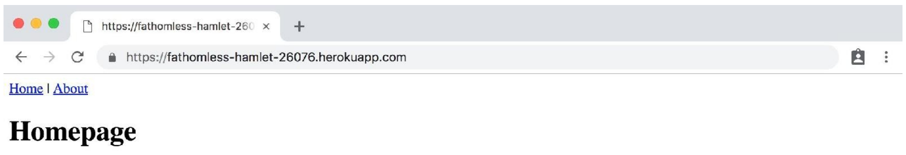
```
(pages) $ heroku ps:scale web=1
```

We’re done! The last step is to confirm our app is live and online. If you use the command `heroku open` your web browser will open a new tab with the URL of your app:

Command Line

```
(pages) $ heroku open
```

Mine is at https://fathomless-hamlet-26076.herokuapp.com/. You can see both the homepage is up:

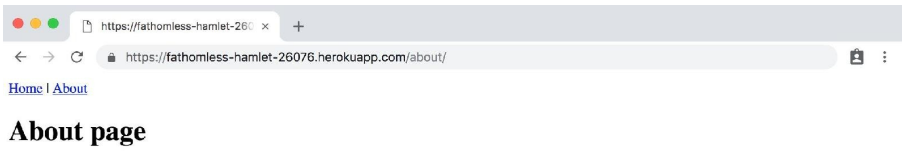

https://fathomless-hamlet-260
https://fathomless-hamlet-26076.herokuapp.com

Home | About

Homepage

Homepage on Heroku

As is the about page:


https://fathomless-hamlet-260
https://fathomless-hamlet-26076.herokuapp.com/about/

Home | About

About page

About page on Heroku

You do not have to log out or exit from your Heroku app. It will continue running at this free tier on its own.

Conclusion

Congratulations on building and deploying your second Django project! This time we used templates, class-based views, explored URLConfs more fully, added basic tests, and used Heroku. Next up we'll move on to our first database-backed project and see where Django really shines.

Chapter 4: Message Board app

In this chapter we will use a database for the first time to build a basic *Message Board* application where users can post and read short messages. We'll explore Django's powerful built-in admin interface which provides a visual way to make changes to our data. And after adding tests we will push our code to Bitbucket and deploy the app on Heroku.

Django provides built-in support for several types of database backends. With just a few lines in our `settings.py` file it can support PostgreSQL, MySQL, Oracle, or SQLite. But the simplest–**by far**–to use is SQLite because it runs off a single file and requires no complex installation. By contrast, the other options require a process to be running in the background and can be quite complex to properly configure. Django uses SQLite by default for this reason and it's a perfect choice for small projects.

Initial Set Up

Since we've already set up several Django projects at this point in the book, we can quickly run through our commands to begin a new one. We need to do the following:

- create a new directory for our code on the Desktop called `mb`
- install Django in a new virtual environment
- create a new project called `mb_project`
- create a new app call `posts`
- update `settings.py`

In a new command line console, enter the following commands. Note that I'm using `(mb)` here to represent the virtual environment name even though it's actually `(mb-XXX)` where `XXX` represents random characters.

Command Line

```
$ cd ~/Desktop
$ mkdir mb
$ cd mb
$ pipenv install django==2.1
$ pipenv shell
(mb) $ django-admin startproject mb_project .
(mb) $ python manage.py startapp posts
```

Tell Django about the new app `posts` by adding it to the bottom of the `INSTALLED_APPS` section of our `settings.py` file. Open it with your text editor of choice.

Code

```
# mb_project/settings.py
INSTALLED_APPS = [
    'django.contrib.admin',
    'django.contrib.auth',
    'django.contrib.contenttypes',
    'django.contrib.sessions',
    'django.contrib.messages',
    'django.contrib.staticfiles',
    'posts.apps.PostsConfig', # new
]
```

Then execute the `migrate` command to create an initial database based on Django's default settings.

Command Line

```
(mb) $ python manage.py migrate
```

If you look inside our directory with the `ls` command, you'll see there's now a `db.sqlite3` file representing our SQLite database.

Command Line

```
(mb) $ ls
Pipfile      db.sqlite3   mb_project
Pipfile.lock manage.py    posts
```

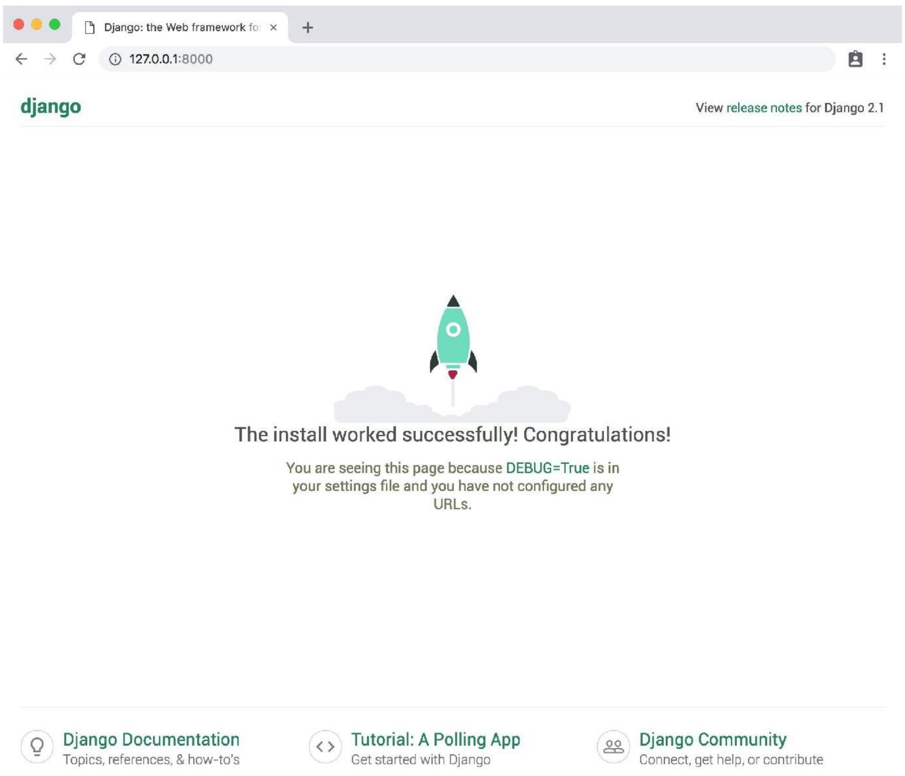
Technically a `db.sqlite3` file is created the first time you run *either* `migrate` or `runserver`. Using `runserver` configures a database using Django's default settings, however `migrate` will sync the database with the current state of any database models contained in the project and listed in `INSTALLED_APPS`. In other words, to make sure the database reflects the current state of your project you'll need to run `migrate` (and also `makemigrations`) each time you update a model. More on this shortly.

To confirm everything works correctly, spin up our local server.

Command Line

```
(mb) $ python manage.py runserver
```

And navigate to http://127.0.0.1:8000/ to see the familiar Django installed correctly page.


Django: the Web framework fo
127.0.0.1:8000
django
View release notes for Django 2.1
The install worked successfully! Congratulations!
You are seeing this page because DEBUG=True is in your settings file and you have not configured any URLs.
Django Documentation
Topics, references, & how-to's
Tutorial: A Polling App
Get started with Django
Django Community
Connect, get help, or contribute

Django welcome page

Create a database model

Our first task is to create a database model where we can store and display posts from our users. Django will turn this model into a database table for us. In real-world Django projects, it's often the case that there will be many complex, interconnected database models but in our simple message board app we only need one.

I won't cover database design in this book but I have written a short guide which you can find here if this is all new to you.

Open the `posts/models.py` file and look at the default code which Django provides:

Code

```
# posts/models.py
from django.db import models

# Create your models here
```

Django imports a module `models` to help us build new database models, which will "model" the characteristics of the data in our database. We want to create a model to store the textual content of a message board post, which we can do so as follows:

Code

```
# posts/models.py
from django.db import models


class Post(models.Model):
    text = models.TextField()
```

Note that we’ve created a new database model called `Post` which has the database field `text`. We’ve also specified the *type of content* it will hold, `TextField()`. Django provides many model fields supporting common types of content such as characters, dates, integers, emails, and so on.

Activating models

Now that our new model is created we need to activate it. Going forward, whenever we create or modify an existing model we’ll need to update Django in a two-step process.

1. First we create a migration file with the `makemigrations` command which generate the SQL commands for preinstalled apps in our `INSTALLED_APPS` setting. Migration files **do not execute those commands** on our database file, rather they are a reference of all new changes to our models. This approach means that we have a record of the changes to our models over time.
2. Second we build the actual database with `migrate` which **does execute** the instructions in our migrations file.

Make sure the local server is stopped `Control+c` and then run the following two commands:

Command Line

```
(mb) $ python manage.py makemigrations posts
(mb) $ python manage.py migrate posts
```

Note that you don’t *have* to include a name after either `makemigrations` or `migrate`. If you simply run the commands then they will apply to all available changes. But it’s a good habit to be specific. If we had two separate apps in our project, and updated the models in both, and then ran `makemigrations` it would generate a migrations file containing data on both changes. This makes debugging harder in the future. You want each migration file to be as small and isolated as possible. That way if you need to look at past migrations, there is only one change per migration rather than one that applies to multiple apps.

Django Admin

Django provides us with a robust admin interface for interacting with our database. This is a truly killer feature that few web frameworks offer. It has its routes in Django's origin as a project at a newspaper. The developers wanted a CMS (Content Management System) so that journalists could write and edit their stories without needing to touch "code." Over time the built-in admin app has evolved into a fantastic, out-of-the-box tool for managing all aspects of a Django project.

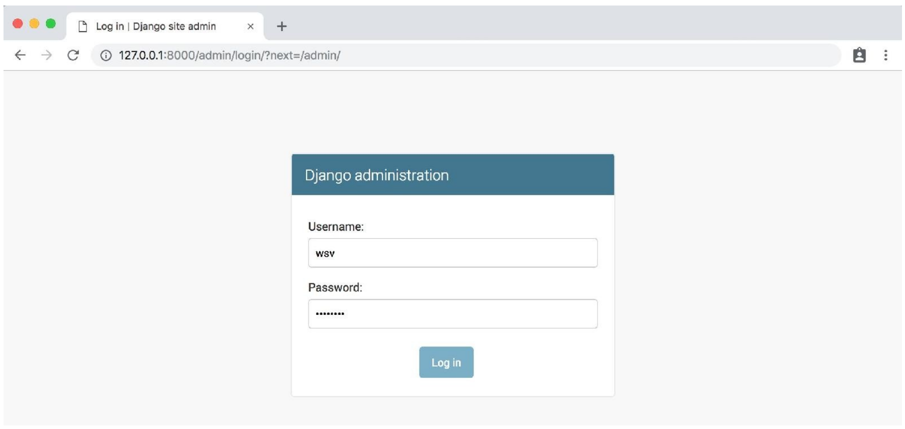
To use the Django admin, we first need to create a `superuser` who can log in. In your command line console, type `python manage.py createsuperuser` and respond to the prompts for a username, email, and password:

Command Line

```
(mb) $ python manage.py createsuperuser
Username (leave blank to use 'wsv'): wsv
Email:
Password:
Password (again):
Superuser created successfully.
```

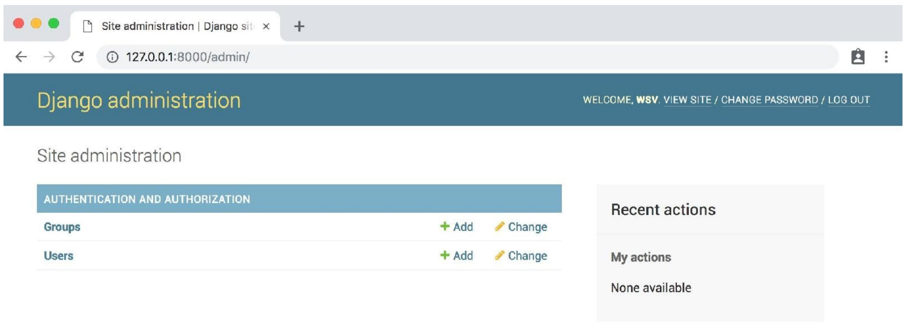
Note: When you type your password, it will not appear visible in the command line console for security reasons.

Restart the Django server with `python manage.py runserver` and in your web browser go to http://127.0.0.1:8000/admin/. You should see the admin's log in screen:


Log in | Django site admin
127.0.0.1:8000/admin/login/?next=/admin/
Django administration
Username:
wsv
Password:
••••••••
Log in

Admin login page

Log in by entering the username and password you just created. You will see the Django admin homepage next:



Admin homepage

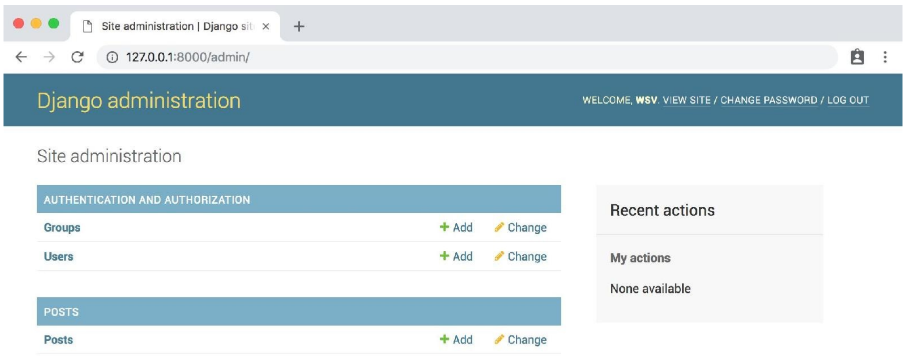
But where's our `posts` app? It's not displayed on the main admin page!

We need to explicitly tell Django what to display in the admin. Fortunately we can change fix this easily by opening the `posts/admin.py` file and editing it to look like this:

Code

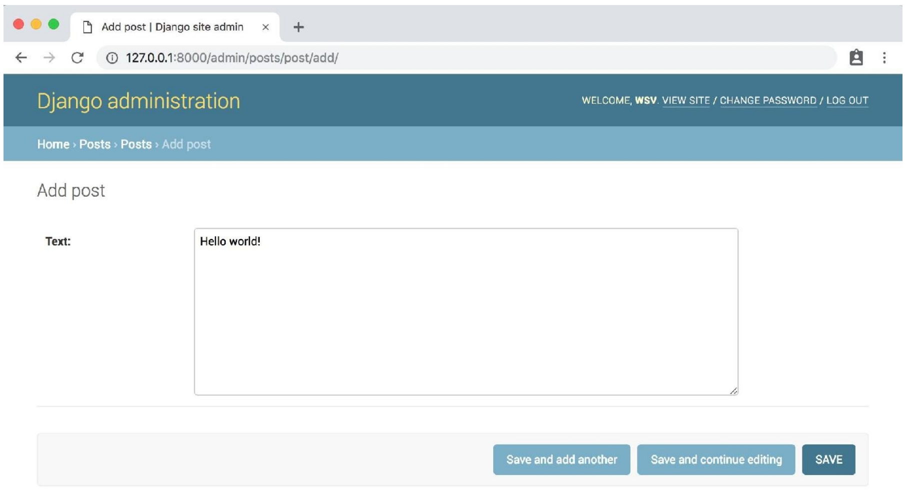
```
# posts/admin.py
from django.contrib import admin

from .models import Post

admin.site.register(Post)
```

Django now knows that it should display our `posts` app and its database model `Post` on the admin page. If you refresh your browser you'll see that it now appears:



Admin homepage updated

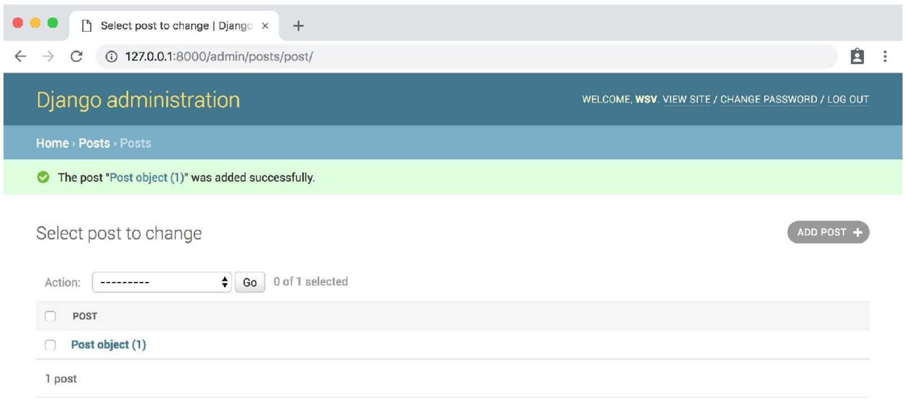
Now let's create our first message board post for our database. Click on the `+ Add` button opposite `Posts`. Enter your own text in the `Text` form field.


Add post | Django site admin
127.0.0.1:8000/admin/posts/post/add/
Django administration
WELCOME, WSV. VIEW SITE / CHANGE PASSWORD / LOG OUT
Home › Posts › Posts › Add post
Add post
Text:
Save and add another
Save and continue editing
SAVE

Hello world!

Admin new entry

Then click the "Save" button, which will redirect you to the main Post page. However if you look closely, there's a problem: our new entry is called "Post object", which isn't very helpful.


Select post to change | Django
127.0.0.1:8000/admin/posts/post/
Django administration
WELCOME, WSV. VIEW SITE / CHANGE PASSWORD / LOG OUT
Home › Posts › Posts
Select post to change
ADD POST
Action:

Go
0 of 1 selected
POST

The post "Post object (1)" was added successfully.

Post object (1)

1 post

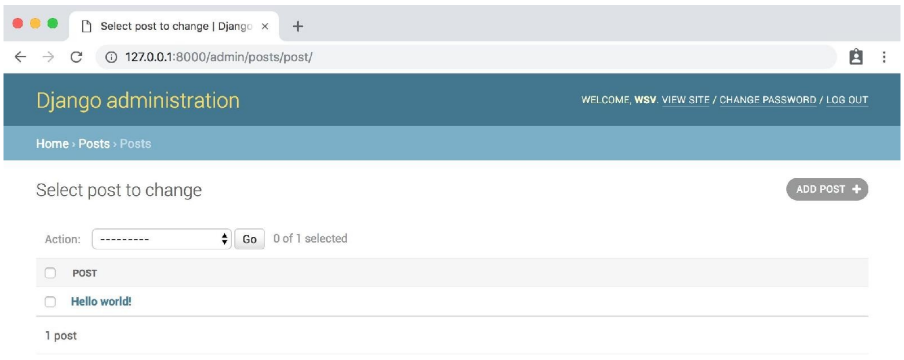
Admin new entry

Let's change that. Within the `posts/models.py` file, add a new function `__str__` as follows:

Code

```
# posts/models.py
from django.db import models


class Post(models.Model):
    text = models.TextField()

    def __str__(self):
        return self.text[:50]
```

This will display the first 50 characters of the `text` field. If you refresh your Admin page in the browser, you'll see it's changed to a much more descriptive and helpful representation of our database entry.


Select post to change | Django
127.0.0.1:8000/admin/posts/post/
Django administration
WELCOME, WSV. VIEW SITE / CHANGE PASSWORD / LOG OUT
Home › Posts › Posts
Select post to change
ADD POST
Action: --------- Go 0 of 1 selected
POST
Hello world!
1 post

Admin new entry

Much better! It’s a best practice to add `str()` methods to all of your models to improve their readability.

Views/Templates/URLs

In order to display our database content on our homepage, we have to wire up our views, templates, and URLConfs. This pattern should start to feel familiar now.

Let’s begin with the view. Earlier in the book we used the built-in generic TemplateView to display a template file on our homepage. Now we want to list the contents of our database model. Fortunately this is also a common task in web development and Django comes equipped with the generic class-based ListView.

In the `posts/views.py` file enter the Python code below:

Code

```
# posts/views.py
from django.views.generic import ListView
from .models import Post


class HomePageView(ListView):
    model = Post
    template_name = 'home.html'
```

On the first line we’re importing `ListView` and in the second line we need to explicitly define which model we’re using. In the view, we subclass `ListView`, specify our model name and specify our template reference. Internally `ListView` returns an object called `object_list` that we want to display in our template.

Our view is complete which means we still need to configure our URLs and make our template. Let’s start with the template. Create a project-level directory called `templates` and a `home.html` template file.

Command Line

```
(mb) $ mkdir templates
(mb) $ touch templates/home.html
```

Then update the `DIRS` field in our `settings.py` file so that Django knows to look in this templates folder.

Code

```
# settings.py
TEMPLATES = [
    {
        ...
        'DIRS': [os.path.join(BASE_DIR, 'templates')], # new
        ...
    },
]
```

In our templates file `home.html` we can use the Django Templating Language's `for` loop to list all the objects in `object_list`.

Why `object_list`? This is the name of the variable that `ListView` returns to us.

Code

```
<!-- templates/home.html -->
<h1>Message board homepage</h1>
<ul>
  {% for post in object_list %}
    <li>{{ post }}</li>
  {% endfor %}
</ul>
```

However `object_list` isn't very friendly is it? In fact, it's one of the common points of confusion for developers new to generic class-based views. So let's instead provide an explicit name which we can do via context_object_name.

Adding an explicit name in this way can make it easier for other members of a team, for example a designer, to understand and reason about what is available in the template context.

Back in our `posts/views.py` file add the following:

Code

```
# posts/views.py
from django.views.generic import ListView
from .models import Post


class HomePageView(ListView):
    model = Post
    template_name = 'home.html'
    context_object_name = 'all_posts_list' # new
```

And don’t forget to update our template, too.

Code

```
<!-- templates/home.html -->
<h1>Message board homepage</h1>
<ul>
  {% for post in all_posts_list %}
    <li>{{ post }}</li>
  {% endfor %}
</ul>
```

The last step is to set up our URLConfs. Let’s start with the project-level `urls.py` file where we simply include our `posts` and add `include` on the second line.

Code

```
# mb_project/urls.py
from django.contrib import admin
from django.urls import path, include

urlpatterns = [
    path('admin/', admin.site.urls),
    path('', include('posts.urls')),
]
```

Then create an app-level `urls.py` file.

Command Line

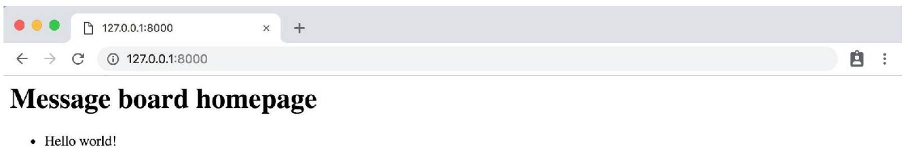
```
(mb) $ touch posts/urls.py
```

And update it like so:

Code

```
# posts/urls.py
from django.urls import path

from .views import HomePageView

urlpatterns = [
    path('', HomePageView.as_view(), name='home'),
]
```

Restart the server with `python manage.py runserver` and navigate to our homepage http://127.0.0.1:8000/ which now lists out our message board posts.



Message board homepage

- Hello world!

Homepage with posts

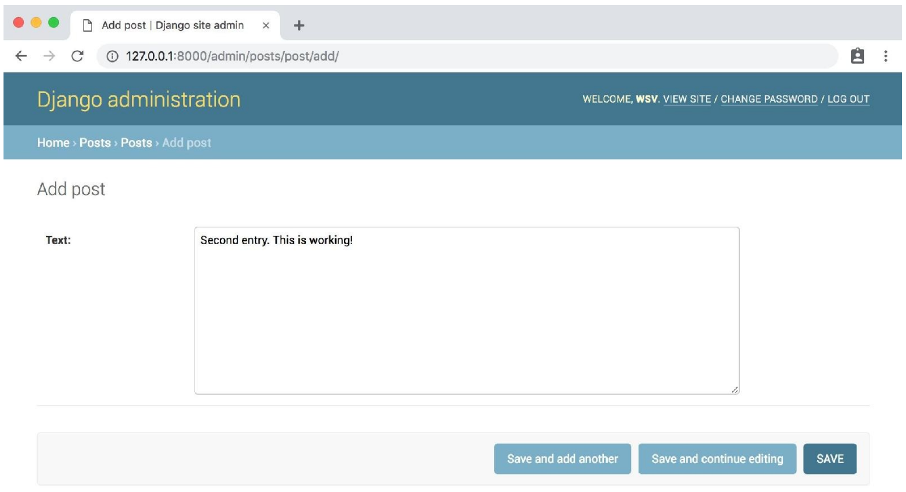
We’re basically done at this point, but let’s create a few more message board posts in the Django admin to confirm that they will display correctly on the homepage.

Adding new posts

To add new posts to our message board, go back into the Admin:

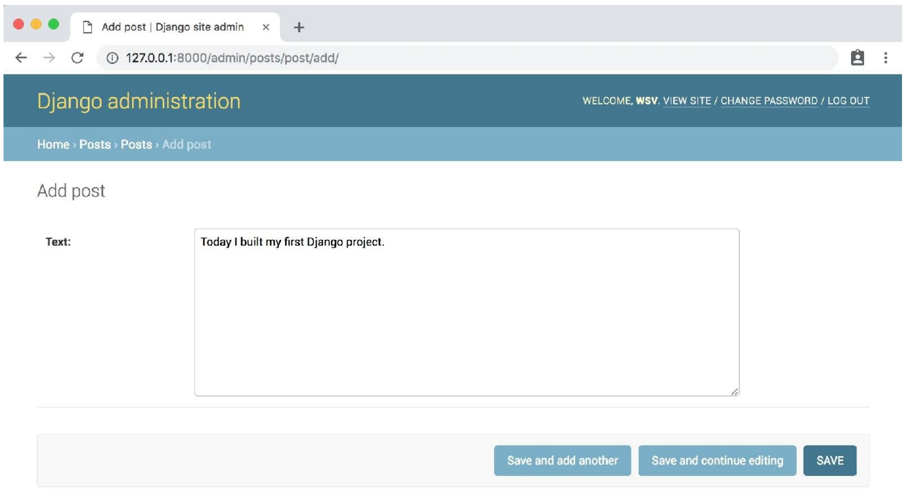
http://127.0.0.1:8000/admin/

And create two more posts. Here’s what mine look like:


Add post | Django site admin
127.0.0.1:8000/admin/posts/post/add/
Django administration
WELCOME, WSV. VIEW SITE / CHANGE PASSWORD / LOG OUT
Home › Posts › Posts › Add post
Add post
Save and add another
Save and continue editing
SAVE

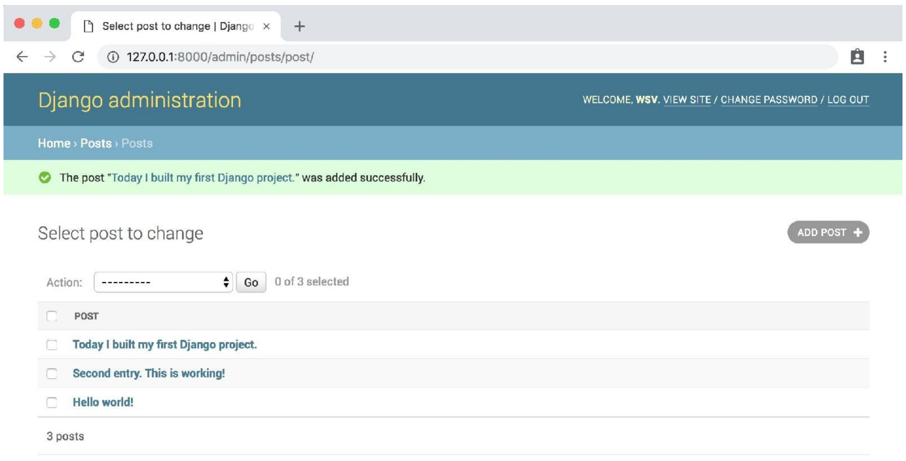
Text: Second entry. This is working!

Admin entry


Add post | Django site admin
127.0.0.1:8000/admin/posts/post/add/
Django administration
WELCOME, WSV. VIEW SITE / CHANGE PASSWORD / LOG OUT
Home › Posts › Posts › Add post
Add post
Save and add another
Save and continue editing
SAVE

Text: Today I built my first Django project.

Admin entry


Django administration

WELCOME, WSV. VIEW SITE / CHANGE PASSWORD / LOG OUT

Home › Posts › Posts

The post "Today I built my first Django project." was added successfully.

Select post to change

ADD POST

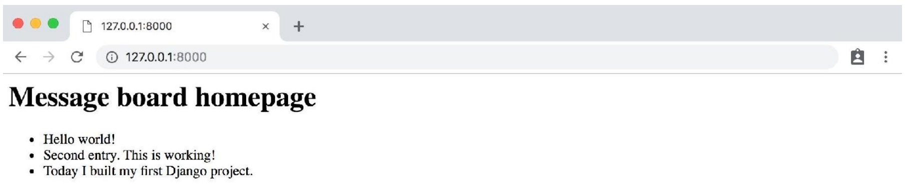
Action: --------- Go 0 of 3 selected

POST
Today I built my first Django project.
Second entry. This is working!
Hello world!

3 posts

Updated admin entries section

If you return to the homepage you'll see it automatically displays our formatted posts. Woohoo!


Message board homepage

- Hello world!
- Second entry. This is working!
- Today I built my first Django project.

Homepage with three entries

Everything works so it's a good time to initialize our directory, add the new code, and include our first `git` commit.

Command Line

```
(mb) $ git init
(mb) $ git add -A
(mb) $ git commit -m 'initial commit'
```

Tests

Previously we were only testing static pages so we used SimpleTestCase. But now that our homepage works with a database, we need to use TestCase which will let us create a "test" database we can check against. In other words, we don't need to run tests on our *actual* database but instead can make a separate test database, fill it with sample data, and then test against it.

Let's start by adding a sample post to the `text` database field and then check that it is stored correctly in the database. It's important that all our test methods start with `test_` so Django knows to test them! The code will look like this:

Code

```
# posts/tests.py
from django.test import TestCase
from .models import Post


class PostModelTest(TestCase):

    def setUp(self):
        Post.objects.create(text='just a test')

    def test_text_content(self):
        post=Post.objects.get(id=1)
        expected_object_name = f'{post.text}'
        self.assertEqual(expected_object_name, 'just a test')
```

At the top we import the `TestCase` module which lets us create a sample database, then import our `Post` model. We create a new class `PostModelTest` and add a method `setUp` to create a new database that has just one entry: a post with a text field containing the string 'just a test'.

Then we run our first test, `test_text_content`, to check that the database field actually contains `just a test`. We create a variable called `post` that represents the first `id` on our Post model. Remember that Django automatically sets this id for us. If we created another entry it would have an id of 2, the next one would be 3, and so on.

The following line uses f strings which are a very cool addition to Python 3.6. They let us put variables directly in our strings as long as the variables are surrounded by brackets `{}`. Here we're setting `expected_object_name` to be the string of the value in `post.text`, which should be `just a test`.

On the final line we use `assertEqual` to check that our newly created entry does in fact match what we input at the top. Go ahead and run the test on the command line with `python manage.py test`.

Command Line

```
(mb) $ python manage.py test
Creating test database for alias 'default'...
System check identified no issues (0 silenced).
.
----------------------------------------------------------------------
Ran 1 test in 0.001s

OK
Destroying test database for alias 'default'...
```

It passed!

Don't worry if the previous explanation felt like information overload. That's natural the first time you start writing tests, but you'll soon find that most tests that you write are actually quite repetitive.

Time for our second test. The first test was on the model but now we want test our one and only page: the homepage. Specifically, we want to test that it exists (throws an HTTP 200 response), uses the `home` view, and uses the `home.html` template.

We'll need to add one more import at the top for `reverse` and a brand new class `HomePageViewTest` for our test.

Code

```
# posts/tests.py
from django.test import TestCase
from django.urls import reverse

from .models import Post

class PostModelTest(TestCase):

    def setUp(self):
        Post.objects.create(text='just a test')

    def test_text_content(self):
        post=Post.objects.get(id=1)
        expected_object_name = f'{post.text}'
        self.assertEqual(expected_object_name, 'just a test')

class HomePageViewTest(TestCase):

    def setUp(self):
        Post.objects.create(text='this is another test')

    def test_view_url_exists_at_proper_location(self):
        resp = self.client.get('/')
        self.assertEqual(resp.status_code, 200)

    def test_view_url_by_name(self):
        resp = self.client.get(reverse('home'))
        self.assertEqual(resp.status_code, 200)

    def test_view_uses_correct_template(self):
        resp = self.client.get(reverse('home'))
        self.assertEqual(resp.status_code, 200)
        self.assertTemplateUsed(resp, 'home.html')
```

If you run our tests again you should see that they pass.

Command Line

```
(mb) $ python manage.py test
Creating test database for alias 'default'...
System check identified no issues (0 silenced).
.
----------------------------------------------------------------------
Ran 4 tests in 0.036s

OK
Destroying test database for alias 'default'...
```

Why does it say four tests? Remember that our `setUp` methods are not actually tests, they merely let us run subsequent tests. Our four actual tests are `test_text_content`, `test_view_url_exists_at_proper_location`, `test_view_url_by_name`, and `test_view_uses_correct_template`.

Any function that has the word `test*` at the beginning and exists in a `tests.py` file will be run when we execute the command `python manage.py test`.

We’re done adding code for our testing so it’s time to commit the changes to git.

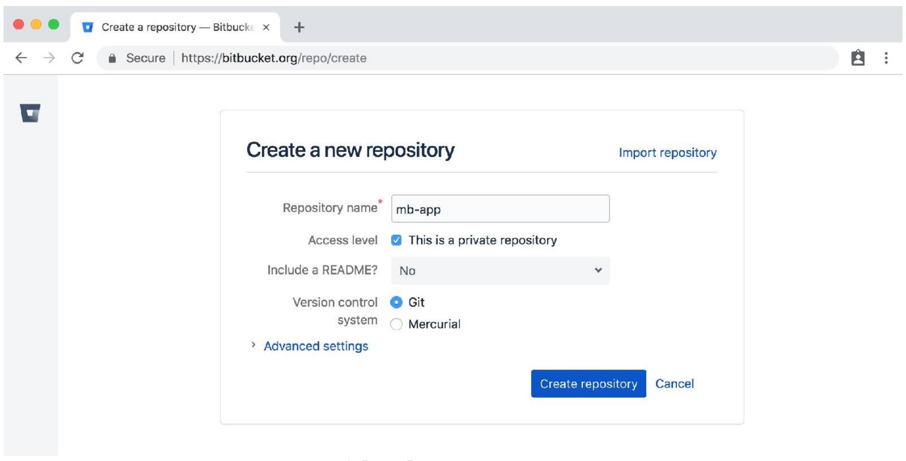
Command Line

```
(mb) $ git add -A
(mb) $ git commit -m 'added tests'
```

Bitbucket

We also need to store our code on Bitbucket. This is a good habit to get into in case anything happens to your local computer and it also allows you to share and collaborate with other developers.

You should already have a Bitbucket account from previous chapters so go ahead and create a new repo which we’ll call `mb-app`.


Create a repository — Bitbuck
Secure | https://bitbucket.org/repo/create
Import repository
Advanced settings
Create repository
Cancel

Create a new repository

Repository name*: mb-app
Access level: ☑ This is a private repository
Include a README?: No
Version control system: ● Git ○ Mercurial

Bitbucket create app

On the next page click on the bottom link for “I have an existing project”. Copy the two commands to connect and then push the repository to Bitbucket.

It should look like this, replacing `wsvincent` (my username) with your Bitbucket username:

Command Line

```
(mb) $ git remote add origin git@bitbucket.org:wsvincent/mb-app.git
(mb) $ git push -u origin master
```

Heroku configuration

You should also already have a Heroku account set up and installed from **Chapter 3**. We need to make the following changes to our *Message Board* project to deploy it online:

- update `Pipfile.lock`
- new `Procfile`
- install `gunicorn`
- update `settings.py`

Within your `Pipfile` specify the version of Python we're using, which is `3.7`. Add these two lines at the bottom of the file.

Pipfile

```
[requires]
python_version = "3.7"
```

Run `pipenv lock` to generate the appropriate `Pipfile.lock`.

Command Line

```
(mb) $ pipenv lock
```

Then create a `Procfile` which tells Heroku *how* to run the remote server where our code will live.

Command Line

```
(mb) $ touch Procfile
```

For now we're telling Heroku to use `gunicorn` as our production server and look in our `mb_project.wsgi` file for further instructions.

Procfile

```
web: gunicorn mb_project.wsgi --log-file -
```

Next install gunicorn which we'll use in production while still using Django's internal server for local development use.

Command Line

```
(mb) $ pipenv install gunicorn==19.9.0
```

Finally update `ALLOWED_HOSTS` in our `settings.py` file.

Code

```
# mb_project/settings.py
ALLOWED_HOSTS = ['*']
```

We're all done! Add and commit our new changes to git and then push them up to Bitbucket.

Command Line

```
(mb) $ git status
(mb) $ git add -A
(mb) $ git commit -m 'New updates for Heroku deployment'
(mb) $ git push -u origin master
```

Heroku deployment

Make sure you're logged into your correct Heroku account.

Command Line

```
(mb) $ heroku login
```

Then run the `create` command and Heroku will randomly generate an app name for you. You can customize this later if desired.

Command Line

```
(mb) $ heroku create
Creating app... done, ⬢ sleepy-brook-64719
https://sleepy-brook-64719.herokuapp.com/ |
https://git.heroku.com/sleepy-brook-64719.git
```

Set `git` to use the name of your new app when you push code to Heroku. My Heroku-generated name is `sleepy-brook-64719` so the command looks like this.

Command Line

```
(mb) $ heroku git:remote -a sleepy-brook-64719
```

Tell Heroku to ignore static files which we'll cover in-depth when deploying our *Blog* app later in the book.

Command Line

```
(mb) $ heroku config:set DISABLE_COLLECTSTATIC=1
```

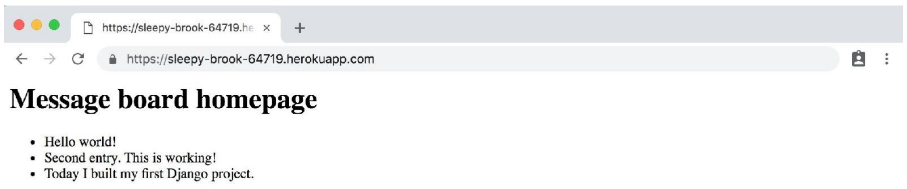
Push the code to Heroku and add free scaling so it's actually running online, otherwise the code is just sitting there.

Command Line

```
(mb) $ git push heroku master
(mb) $ heroku ps:scale web=1
```

If you open the new project with `heroku open` it will automatically launch a new browser window with the URL of your app. Mine is live at:

https://sleepy-brook-64719.herokuapp.com/.


https://sleepy-brook-64719.herokuapp.com

Message board homepage

- Hello world!
- Second entry. This is working!
- Today I built my first Django project.

Live site

Conclusion

We’ve now built, tested, and deployed our first database-driven app. While it’s deliberately quite basic, now we know how to create a database model, update it with the admin panel, and then display the contents on a web page. But something is missing, no?

In the real-world, users need forms to interact with our site. After all, not everyone should have access to the admin panel. In the next chapter we’ll build a blog application that uses forms so that users can create, edit, and delete posts. We’ll also add styling via CSS.

Chapter 5: Blog app

In this chapter we'll build a *Blog* application that allows users to create, edit, and delete posts. The homepage will list all blog posts and there will be a dedicated detail page for each individual post. We'll also introduce CSS for styling and learn how Django works with static files.

Initial Set Up

As covered in previous chapters, our steps for setting up a new Django project are as follows:

- create a new directory for our code on the Desktop called `blog`
- install Django in a new virtual environment
- create a new Django project called `blog_project`
- create a new app `blog`
- perform a migration to set up the database
- update `settings.py`

Execute the following commands in a new command line console. Note that the actual name of the virtual environment will be `(blog-XXX)` where `XXX` represents random characters. I'm using `(blog)` here to keep things simpler since my name will differ from yours.

And don't forget to include the period `.` at the end of the command for creating our new `blog_project`.

Command Line

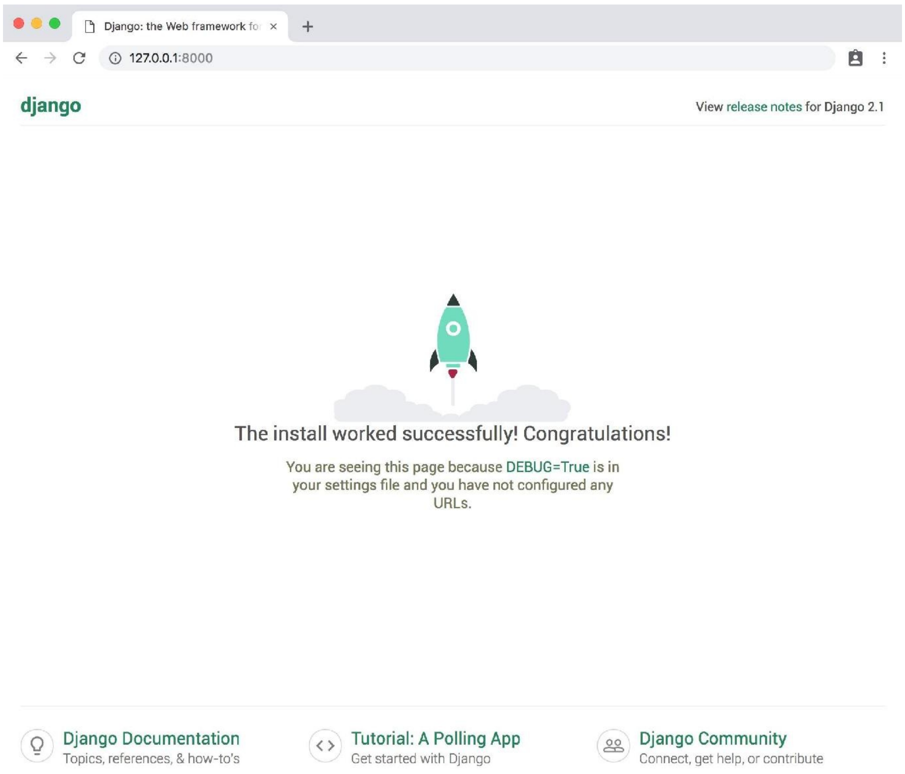
```
$ cd ~/Desktop
$ mkdir blog
$ cd blog
$ pipenv install django==2.1
$ pipenv shell
(blog) $ django-admin startproject blog_project .
(blog) $ python manage.py startapp blog
(blog) $ python manage.py migrate
(blog) $ python manage.py runserver
```

To ensure Django knows about our new app, open your text editor and add the new app to `INSTALLED_APPS` in our `settings.py` file:

Code

```
# blog_project/settings.py
INSTALLED_APPS = [
    'django.contrib.admin',
    'django.contrib.auth',
    'django.contrib.contenttypes',
    'django.contrib.sessions',
    'django.contrib.messages',
    'django.contrib.staticfiles',
    'blog.apps.BlogConfig', # new
]
```

If you navigate to http://127.0.0.1:8000/ in your browser you should see the following page.


Django: the Web framework fo
127.0.0.1:8000
django
View release notes for Django 2.1
The install worked successfully! Congratulations!
You are seeing this page because DEBUG=True is in your settings file and you have not configured any URLs.
Django Documentation
Topics, references, & how-to's
Tutorial: A Polling App
Get started with Django
Django Community
Connect, get help, or contribute

Django welcome page

Ok, initial installation complete! Next we'll create our database model for blog posts.

Database Models

What are the characteristics of a typical blog application? In our case let's keep things simple and assume each post has a title, author, and body. We can turn this into a database model by opening the `blog/models.py` file and entering the code below:

Code

```
# blog/models.py
from django.db import models


class Post(models.Model):
    title = models.CharField(max_length=200)
    author = models.ForeignKey(
        'auth.User',
        on_delete=models.CASCADE,
    )
    body = models.TextField()

    def __str__(self):
        return self.title
```

At the top we’re importing the class `models` and then creating a subclass of `models.Model` called `Post`. Using this subclass functionality we automatically have access to everything within django.db.models.Models and can add additional fields and methods as desired.

For `title` we’re limiting the length to 200 characters and for `body` we’re using a TextField which will automatically expand as needed to fit the user’s text. There are many field types available in Django; you can see the full list here.

For the `author` field we’re using a ForeignKey which allows for a *many-to-one* relationship. This means that a given user can be the author of many different blog posts but not the other way around. The reference is to the built-in `User` model that Django provides for authentication. For all many-to-one relationships such as a ForeignKey we must also specify an on_delete option.

Now that our new database model is created we need to create a new migration record for it and migrate the change into our database. Stop the server with `Control+c`. This two-step process can be completed with the commands below:

Command Line

```
(blog) $ python manage.py makemigrations blog
(blog) $ python manage.py migrate blog
```

Our database is configured! What’s next?

Admin

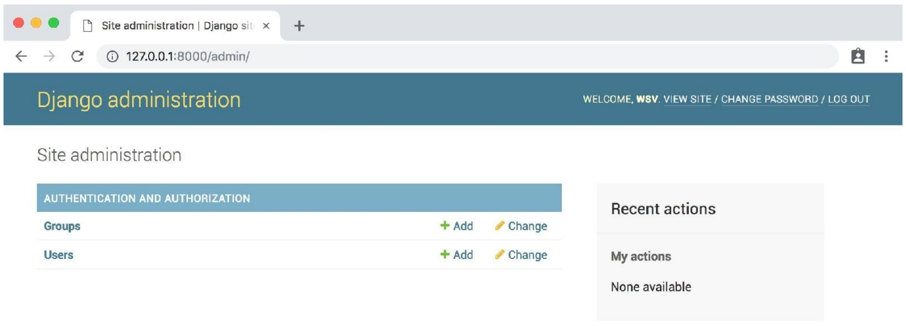
We need a way to access our data. Enter the Django admin! First create a superuser account by typing the command below and following the prompts to set up an email and password. Note that when typing your password, it will not appear on the screen for security reasons.

Command Line

```
(blog) $ python manage.py createsuperuser
Username (leave blank to use 'wsv'): wsv
Email:
Password:
Password (again):
Superuser created successfully.
```

Now start running the Django server again with the command `python manage.py runserver` and open up the Django admin at http://127.0.0.1:8000/admin/. Log in with your new superuser account.

Oops! Where's our new `Post` model?



Site administration | Django sit ×
127.0.0.1:8000/admin/

Django administration
WELCOME, WSV. VIEW SITE / CHANGE PASSWORD / LOG OUT

Site administration

AUTHENTICATION AND AUTHORIZATION
Groups + Add ✎ Change
Users + Add ✎ Change

Recent actions
My actions
None available

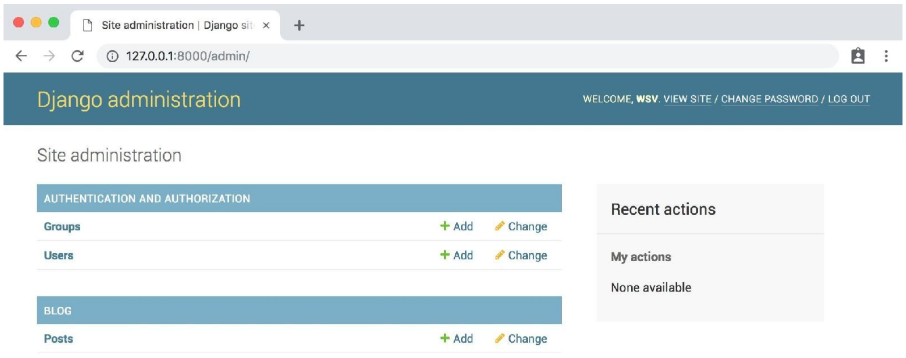
Admin homepage

We forgot to update `blog/admin.py` so let's do that now.

Code

```
# blog/admin.py
from django.contrib import admin
from .models import Post

admin.site.register(Post)
```

If you refresh the page you'll see the update.



Site administration | Django sit ×
127.0.0.1:8000/admin/

Django administration
WELCOME, WSV. VIEW SITE / CHANGE PASSWORD / LOG OUT

Site administration

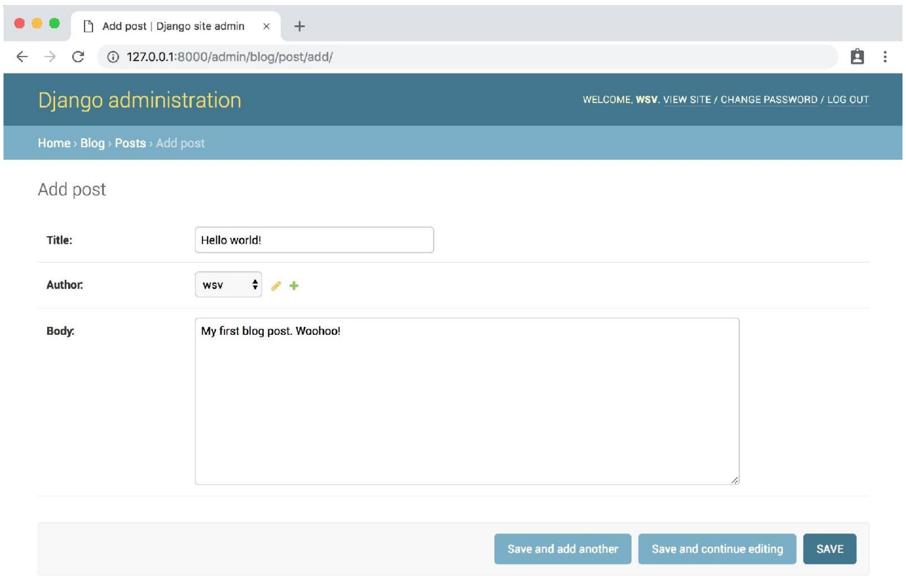
AUTHENTICATION AND AUTHORIZATION
Groups + Add ✎ Change
Users + Add ✎ Change

BLOG
Posts + Add ✎ Change

Recent actions
My actions
None available

Admin homepage

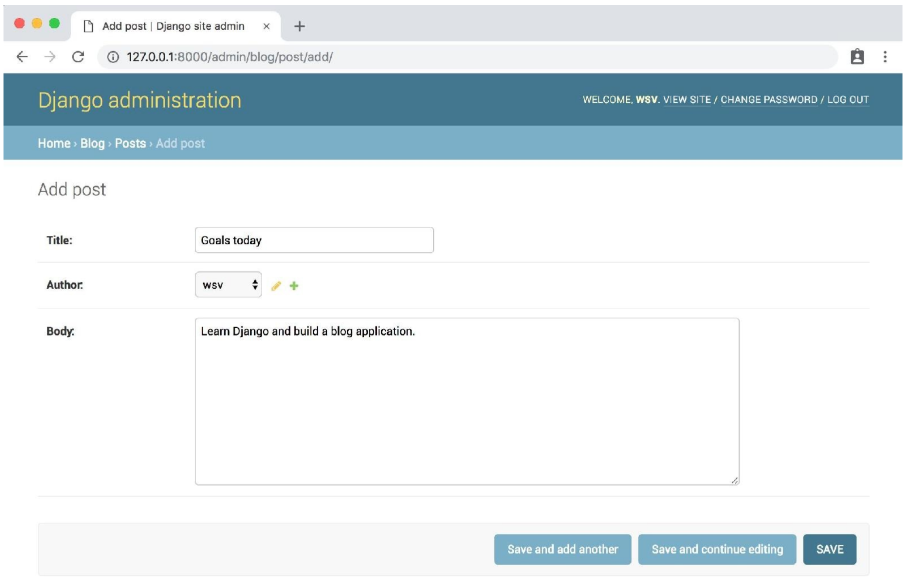
Let's add two blog posts so we have some sample data to work with. Click on the `+ Add` button next to `Posts` to create a new entry. Make sure to add an "author" to each post too since by default all model fields are required. If you try to enter a post without an author you will see an error. If we wanted to change this, we could add field options to our model to make a given field optional or fill it with a default value.


Add post | Django site admin
127.0.0.1:8000/admin/blog/post/add/
Django administration
WELCOME, WSV. VIEW SITE / CHANGE PASSWORD / LOG OUT
Home › Blog › Posts › Add post
Save and add another
Save and continue editing
SAVE

Add post

Title:	Hello world!
Author:	wsv
Body:	My first blog post. Woohoo!

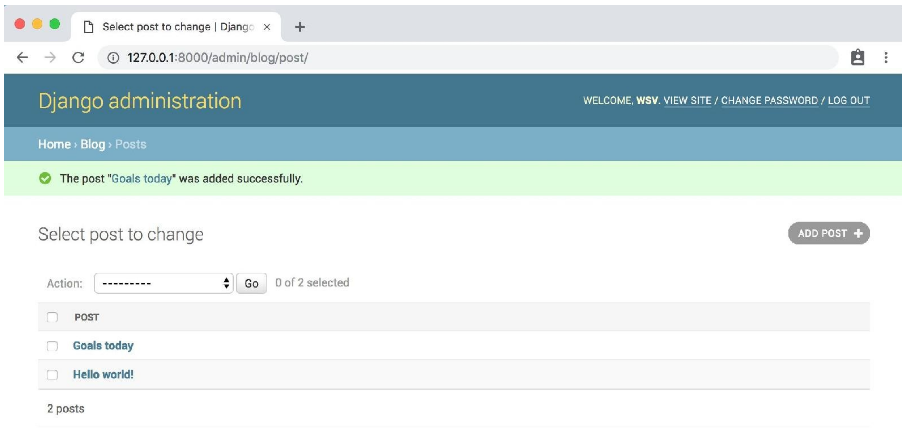
Admin first post


Add post | Django site admin
127.0.0.1:8000/admin/blog/post/add/
Django administration
WELCOME, WSV. VIEW SITE / CHANGE PASSWORD / LOG OUT
Home › Blog › Posts › Add post
Save and add another
Save and continue editing
SAVE

Add post

Title:	Goals today
Author:	wsv
Body:	Learn Django and build a blog application.

Admin second post


Select post to change | Django
127.0.0.1:8000/admin/blog/post/
Django administration
WELCOME, WSV. VIEW SITE / CHANGE PASSWORD / LOG OUT
Home › Blog › Posts
ADD POST
Action: ---------
Go

The post "Goals today" was added successfully.

Select post to change

0 of 2 selected

POST
Goals today
Hello world!

2 posts

Admin homepage with two posts

Now that our database model is complete we need to create the necessary views, URLs, and templates so we can display the information on our web application.

URLs

We want to display our blog posts on the homepage so, as in previous chapters, we'll first configure our project-level URLConfs and then our app-level URLConfs to achieve this. Note that "project-level" means in the same parent folder as the `blog_project` and `blog` app folders.

On the command line quit the existing server with `Control+c` and create a new `urls.py` file within our `blog`:

Command Line

```
(blog) $ touch blog/urls.py
```

Now update it with the code below.

Code

```
# blog/urls.py
from django.urls import path

from .views import BlogListView

urlpatterns = [
    path('', BlogListView.as_view(), name='home'),
]
```

We're importing our soon-to-be-created views at the top. The empty string `''` tells Python to match all values and we make it a named URL, `home`, which we can refer to in our views later on. While it's optional to add a named URL it's a best practice you should adopt as it helps keep things organized as your number of URLs grows.

We also should update our project-level `urls.py` file so that it knows to forward all requests directly to the `blog` app.

Code

```
# blog_project/urls.py
from django.contrib import admin
from django.urls import path, include # new

urlpatterns = [
    path('admin/', admin.site.urls),
    path('', include('blog.urls')), # new
]
```

We've added `include` on the second line and a URLpattern using an empty string regular expression `''` indicating that URL requests should be redirected as is to blog's URLs for further instructions.

Views

We're going to use class-based views but if you want to see a function-based way to build a blog application, I highly recommend the Django Girls Tutorial. It is excellent.

In our views file, add the code below to display the contents of our Post model using ListView.

Code

```
# blog/views.py
from django.views.generic import ListView

from .models import Post


class BlogListView(ListView):
    model = Post
    template_name = 'home.html'
```

On the top two lines we import ListView and our database model Post. Then we subclass ListView and add links to our model and template. This saves us a lot of code versus implementing it all from scratch.

Templates

With our URLConfs and views now complete, we're only missing the third piece of the puzzle: templates. As we already saw in **Chapter 4**, we can inherit from other templates to keep our code clean. Thus we'll start off with a base.html file and a home.html file that inherits from it. Then later when we add templates for creating and editing blog posts, they too can inherit from base.html.

Start by creating our project-level templates directory with the two template files.

Command Line

```
(blog) $ mkdir templates
(blog) $ touch templates/base.html
(blog) $ touch templates/home.html
```

Then update settings.py so Django knows to look there for our templates.

Code

```
# blog_project/settings.py
TEMPLATES = [
    {
        ...
        'DIRS': [os.path.join(BASE_DIR, 'templates')], # new
        ...
    },
]
```

Then update the base.html template as follows.

Code

```
<!-- templates/base.html -->
<html>
  <head>
    <title>Django blog</title>
  </head>
  <body>
    <header>
      <h1><a href="{% url 'home' %}">Django blog</a></h1>
    </header>
    <div>
      {% block content %}
      {% endblock content %}
    </div>
  </body>
</html>
```

Note that code between `{% block content %}` and `{% endblock content %}` can be filled by other templates. Speaking of which, here is the code for `home.html`.

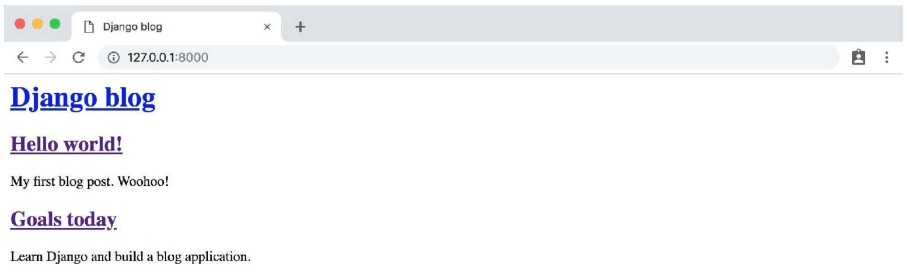
Code

```
<!-- templates/home.html -->
{% extends 'base.html' %}

{% block content %}
  {% for post in object_list %}
    <div class="post-entry">
      <h2><a href="">{{ post.title }}</a></h2>
      <p>{{ post.body }}</p>
    </div>
  {% endfor %}
{% endblock content %}
```

At the top we note that this template extends `base.html` and then wraps our desired code with `content` blocks. We use the Django Templating Language to set up a simple *for loop* for each blog post. Note that `object_list` comes from `ListView` and contains all the objects in our view.

If you start the Django server again: `python manage.py runserver`.

And refresh http://127.0.0.1:8000/ we can see it’s working.


Django blog

Hello world!

My first blog post. Woohoo!

Goals today

Learn Django and build a blog application.

Blog homepage with two posts

But it looks terrible. Let's fix that!

Static files

We need to add some CSS which is referred to as a static file because, unlike our dynamic database content, it doesn't change. Fortunately it's straightforward to add static files like CSS, JavaScript, and images to our Django project.

In a production-ready Django project you would typically store this on a Content Delivery Network (CDN) for better performance, but for our purposes storing the files locally is fine.

First quit our local server with `Control+c`. Then create a project-level folder called `static`.

Command Line

```
(blog) $ mkdir static
```

Just as we did with our `templates` folder we need to update `settings.py` to tell Django where to look for these static files. We can update `settings.py` with a one-line change for `STATICFILES_DIRS`. Add it at the bottom of the file below the entry for `STATIC_URL`.

Code

```
# blog_project/settings.py
STATICFILES_DIRS = [os.path.join(BASE_DIR, 'static')]
```

Now create a `css` folder within `static` and add a new `base.css` file in it.

Command Line

```
(blog) $ mkdir static/css
(blog) $ touch static/css/base.css
```

What should we put in our file? How about changing the title to be red?

Code

```
/* static/css/base.css */
header h1 a {
  color: red;
}
```

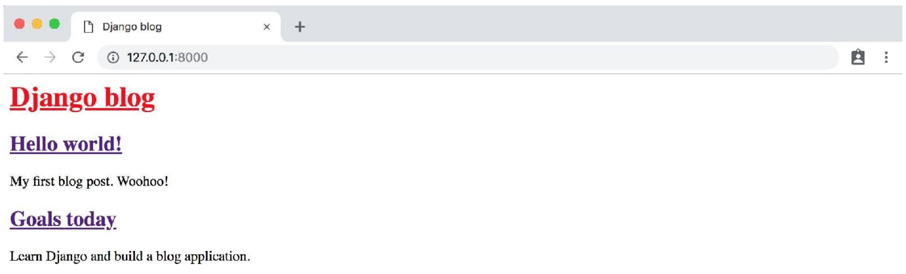
Last step now. We need to add the static files to our templates by adding `{% load static %}` to the top of `base.html`. Because our other templates inherit from `base.html` we only have to add this once. Include a new line at the bottom of the `<head></head>` code that explicitly references our new `base.css` file.

Code

```
<!-- templates/base.html -->
{% load static %}
<html>
  <head>
    <title>Django blog</title>
    <link href="{% static 'css/base.css' %}" rel="stylesheet">
  </head>
  ...
```

Phew! That was a bit of a pain but it's a one-time pain. Now we can add static files to our `static` folder and they'll automatically appear in all our templates.

Start up the server again with `python manage.py runserver` and look at our updated homepage at http://127.0.0.1:8000/.



Django blog

Hello world!

My first blog post. Woohoo!

Goals today

Learn Django and build a blog application.

Blog homepage with red title

We can do a little better though. How about if we add a custom font and some more CSS? Since this book is not a tutorial on CSS simply insert the following between `<head></head>` tags to add Source Sans Pro, a free font from Google.

Code

```
<!-- templates/base.html -->
{% load static %}
<html>
<head>
  <title>Django blog</title>
  <link href="https://fonts.googleapis.com/css?family=Source+Sans+Pro:400"
  rel="stylesheet">
  <link href="{% static 'css/base.css' %}" rel="stylesheet">
```

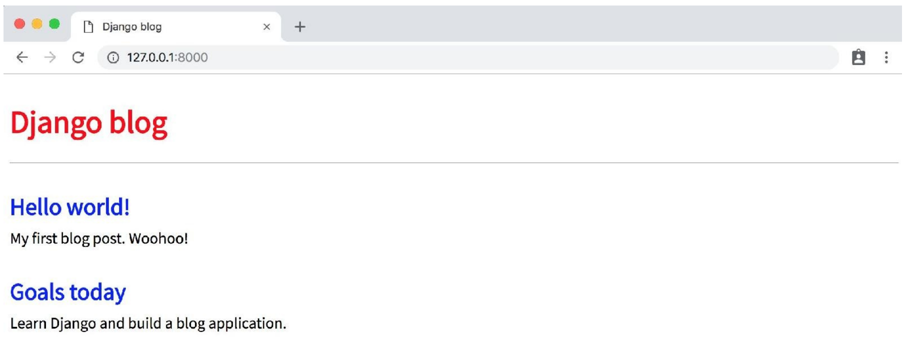
```
</head>
  ...
```

Then update our css file by copy and pasting the following code:

Code

```css
/* static/css/base.css */
body {
  font-family: 'Source Sans Pro', sans-serif;
  font-size: 18px;
}

header {
  border-bottom: 1px solid #999;
  margin-bottom: 2rem;
  display: flex;
}

header h1 a {
  color: red;
  text-decoration: none;
}

.nav-left {
  margin-right: auto;
}

.nav-right {
  display: flex;
  padding-top: 2rem;
}

.post-entry {
  margin-bottom: 2rem;
}

.post-entry h2 {
  margin: 0.5rem 0;
}

.post-entry h2 a,
.post-entry h2 a:visited {
  color: blue;
  text-decoration: none;
}

.post-entry p {
  margin: 0;
  font-weight: 400;
}

.post-entry h2 a:hover {
  color: red;
}
```

Refresh the homepage at http://127.0.0.1:8000/ and you should see the following.



Django blog

Hello world!

My first blog post. Woohoo!

Goals today

Learn Django and build a blog application.

Blog homepage with CSS

Individual blog pages

Now we can add the functionality for individual blog pages. How do we do that? We need to create a new view, url, and template. I hope you're noticing a pattern in development with Django now!

Start with the view. We can use the generic class-based DetailView to simplify things. At the top of the file add `DetailView` to the list of imports and then create our new view called `BlogDetailView`.

Code

```
# blog/views.py
from django.views.generic import ListView, DetailView # new

from .models import Post


class BlogListView(ListView):
    model = Post
    template_name = 'home.html'


class BlogDetailView(DetailView): # new
    model = Post
    template_name = 'post_detail.html'
```

In this new view we define the model we're using, `Post`, and the template we want it associated with, `post_detail.html`. By default `DetailView` will provide a context object we can use in our template called either `object` or the lowercased name of our model, which would be `post`. Also, `DetailView` expects either a primary key or a slug passed to it as the identifier. More on this shortly.

Now exit the local server `Control+c` and create our new template for a post detail as follows:

Command Line

```
(blog) $ touch templates/post_detail.html
```

Then type in the following code:

Code

```
<!-- templates/post_detail.html -->
{% extends 'base.html' %}

{% block content %}
  <div class="post-entry">
    <h2>{{ post.title }}</h2>
    <p>{{ post.body }}</p>
  </div>

{% endblock content %}
```

At the top we specify that this template inherits from `base.html`. Then display the `title` and `body` from our context object, which `DetailView` makes accessible as `post`.

Personally I found the naming of context objects in generic views extremely confusing when first learning Django. Because our context object from DetailView is either our model name `post` or `object` we could also update our template as follows and it would work exactly the same.

Code

```
<!-- templates/post_detail.html -->
{% extends 'base.html' %}

{% block content %}
  <div class="post-entry">
    <h2>{{ object.title }}</h2>
    <p>{{ object.body }}</p>
  </div>

{% endblock content %}
```

If you find using `post` or `object` confusing, it’s possible to explicitly name the context object in our view using context_object_name.

The “magic” naming of the context object is a price you pay for the ease and simplicity of using generic views. They’re great if you know what they’re doing but take a little research in the official documentation to customize.

Ok, what’s next? How about adding a new URLConf for our view, which we can do as follows.

Code

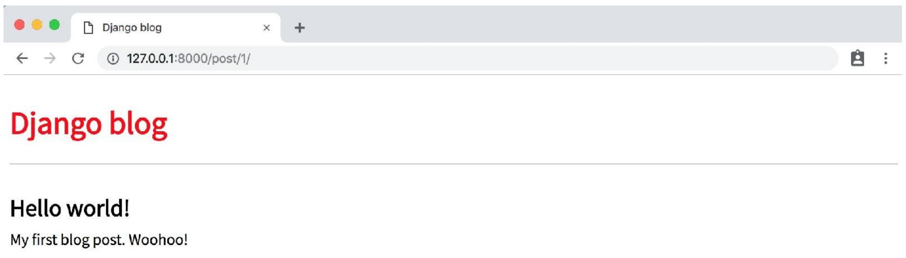
```
# blog/urls.py
from django.urls import path

from .views import BlogListView, BlogDetailView # new

urlpatterns = [
    path('post/<int:pk>/', BlogDetailView.as_view(), name='post_detail'), # new
    path('', BlogListView.as_view(), name='home'),
]
```

All blog post entries will start with `post/`. Next is the primary key for our post entry which will be represented as an integer `<int:pk>`. What's the primary key you're probably asking? Django automatically adds an auto-incrementing primary key to our database models. So while we only declared the fields `title`, `author`, and `body` on our `Post` model, under-the-hood Django also added another field called `id`, which is our primary key. We can access it as either `id` or `pk`.

The `pk` for our first "Hello, World" post is 1. For the second post, it is 2. And so on. Therefore when we go to the individual entry page for our first post, we can expect that its urlpattern will be `post/1`.

> Understanding how primary keys work with DetailView is a **very common** place of confusion for beginners. It's worth re-reading the previous two paragraphs a few times if it doesn't click. With practice it will become second nature.

If you now start up the server with `python manage.py runserver` and go directly to http://127.0.0.1:8000/post/1/ you'll see a dedicated page for our first blog post.



Django blog

Hello world!

My first blog post. Woohoo!

Blog post one detail

Woohoo! You can also go to http://127.0.0.1:8000/post/2/ to see the second entry.

To make our life easier, we should update the link on the homepage so we can directly access individual blog posts from there. Currently in `home.html` our link is empty: `<a href="">`. Update it to `<a href="{% url 'post_detail' post.pk %}">`.

Code

```
<!-- templates/home.html -->
{% extends 'base.html' %}

{% block content %}
  {% for post in object_list %}
  <div class="post-entry">
    <h2><a href="{% url 'post_detail' post.pk %}">{{ post.title }}</a></h2>
    <p>{{ post.body }}</p>
  </div>
  {% endfor %}
{% endblock content %}
```

We start off by telling our Django template we want to reference a URLConf by using the code `{% url ... %}`. Which URL? The one named `post_detail`, which is the name we gave `BlogDetailView` in our URLConf just a moment ago. If we look at `post_detail` in our URLConf, we see that it expects to be passed an argument `pk` representing the primary key for the blog post. Fortunately, Django has already created and included this `pk` field on our `post` object. We pass it into the URLConf by adding it in the template as `post.pk`.

To confirm everything works, refresh the main page at http://127.0.0.1:8000/ and click on the title of each blog post to confirm the new links work.

Tests

We need to test our model and views now. We want to ensure that the `Post` model works as expected, including its `str` representation. And we want to test both `ListView` and `DetailView`.

Here's what sample tests look like in the `blog/tests.py` file.
Code

```
# blog/tests.py
from django.contrib.auth import get_user_model
from django.test import TestCase
from django.urls import reverse

from .models import Post


class BlogTests(TestCase):

    def setUp(self):
        self.user = get_user_model().objects.create_user(
            username='testuser',
            email='test@email.com',
            password='secret'
        )

        self.post = Post.objects.create(
            title='A good title',
            body='Nice body content',
            author=self.user,
        )

    def test_string_representation(self):
        post = Post(title='A sample title')
        self.assertEqual(str(post), post.title)

    def test_post_content(self):
        self.assertEqual(f'{self.post.title}', 'A good title')
        self.assertEqual(f'{self.post.author}', 'testuser')
        self.assertEqual(f'{self.post.body}', 'Nice body content')

    def test_post_list_view(self):
        response = self.client.get(reverse('home'))
        self.assertEqual(response.status_code, 200)
        self.assertContains(response, 'Nice body content')
        self.assertTemplateUsed(response, 'home.html')

    def test_post_detail_view(self):
        response = self.client.get('/post/1/')
        no_response = self.client.get('/post/100000/')
        self.assertEqual(response.status_code, 200)
        self.assertEqual(no_response.status_code, 404)
        self.assertContains(response, 'A good title')
        self.assertTemplateUsed(response, 'post_detail.html')
```

There's a lot that's new in these tests so we'll walk through them slowly. At the top we import both get_user_model to reference our active `User` and `TestCase` which we've seen before.

In our `setUp` method we add a sample blog post to test and then confirm that both its string representation and content are correct. Then we use `test_post_list_view` to confirm that our homepage returns a 200 HTTP status code, contains our body text, and uses the correct `home.html` template. Finally `test_post_detail_view` tests that our detail page works as expected and that an incorrect page returns a 404. It's always good to both test that something **does** exist and that something incorrect **doesn't** exist in your tests.

Go ahead and run these tests now. They should all pass.

Command Line

```
(blog) $ python manage.py test
```

Git

Now is also a good time for our first *git* commit. First initialize our directory.

Command Line

```
(blog) $ git init
```

Then review all the content we've added by checking the `status`. Add all new files. And make our first `commit`.

Command Line

```
(blog) $ git status
(blog) $ git add -A
(blog) $ git commit -m 'initial commit'
```

Conclusion

We've now built a basic blog application from scratch! Using the Django admin we can create, edit, or delete the content. And we used DetailView for the first time to create a detailed individual view of each blog post entry.

In the next section **Chapter 6: Blog app with forms**, we’ll add forms so we don’t have to use the Django admin at all for these changes.

Chapter 6: Forms

In this chapter we’ll continue working on our blog application from **Chapter 5** by adding forms so a user can create, edit, or delete any of their blog entries.

Forms

Forms are very common and very complicated to implement correctly. Any time you are accepting user input there are security concerns (XSS Attacks), proper error handling is required, and there are UI considerations around how to alert the user to problems with the form. Not to mention the need for redirects on success.

Fortunately for us Django’s built-in Forms abstract away much of the difficulty and provide a rich set of tools to handle common use cases working with forms.

To start, update our base template to display a link to a page for entering new blog posts. It will take the form `<a href="{% url 'post_new' %}"></a>` where `post_new` is the name for our URL.

Your updated file should look as follows:

Code

```
<!-- templates/base.html -->
{% load static %}
<html>
  <head>
    <title>Django blog</title>
    <link href="https://fonts.googleapis.com/css?family=Source+Sans+Pro:400"
    rel="stylesheet">
    <link href="{% static 'css/base.css' %}" rel="stylesheet">
  </head>
  <body>
    <div>
      <header>
        <div class="nav-left">
          <h1><a href="{% url 'home' %}">Django blog</a></h1>
        </div>
        <div class="nav-right">
          <a href="{% url 'post_new' %}">+ New Blog Post</a>
        </div>
      </header>
      {% block content %}
      {% endblock content %}
    </div>
  </body>
</html>
```

Let’s add a new URLConf for `post_new` now. Import our not-yet-created view called `BlogCreateView` at the top. And then make the URL which will start with `post/new/` and be named `post_new`.

Code

```
# blog/urls.py
from django.urls import path

from .views import BlogListView, BlogDetailView, BlogCreateView # new

urlpatterns = [
    path('post/new/', BlogCreateView.as_view(), name='post_new'), # new
    path('post/<int:pk>/', BlogDetailView.as_view(), name='post_detail'),
    path('', BlogListView.as_view(), name='home'),
]
```

Simple, right? It’s the same url, views, template pattern we’ve seen before.

Now let’s create our view by importing a new generic class called `CreateView` at the top and then subclass it to create a new view called `BlogCreateView`.

Code

```
# blog/views.py
from django.views.generic import ListView, DetailView
from django.views.generic.edit import CreateView # new

from .models import Post


class BlogListView(ListView):
    model = Post
    template_name = 'home.html'


class BlogDetailView(DetailView):
    model = Post
    template_name = 'post_detail.html'


class BlogCreateView(CreateView): # new
    model = Post
    template_name = 'post_new.html'
    fields = ['title', 'author', 'body']
```

Within `BlogCreateView` we specify our database model `Post`, the name of our template `post_new.html`. For `fields` we explicitly set the database fields we want to expose which are `title`, `author`, and `body`.

The last step is to create our template, which we will call `post_new.html`.

Command Line

```
(blog) $ touch templates/post_new.html
```

And then add the following code:

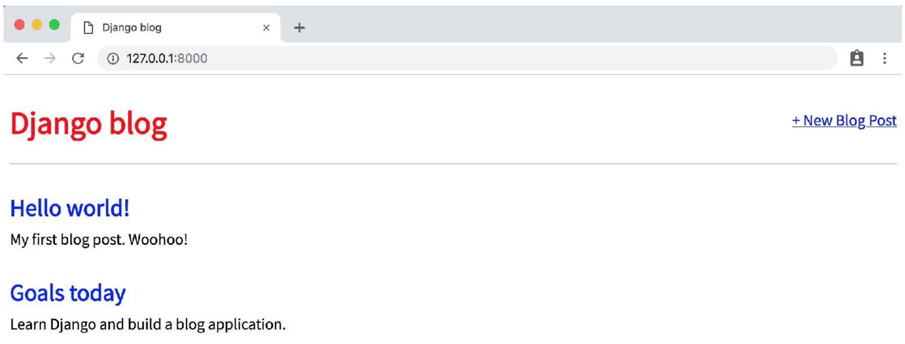
Code

```
<!-- templates/post_new.html -->
{% extends 'base.html' %}

{% block content %}
    <h1>New post</h1>
    <form action="" method="post">{% csrf_token %}
      {{ form.as_p }}
      <input type="submit" value="Save" />
    </form>
{% endblock content %}
```

Let's breakdown what we've done:

- On the top line we inherit from our base template.
- Use HTML `<form>` tags with the POST method since we're *sending* data. If we were receiving data from a form, for example in a search box, we would use GET.
- Add a {% csrf_token %} which Django provides to protect our form from cross-site scripting attacks. **You should use it for all your Django forms.**
- Then to output our form data we use `{{ form.as_p }}` which renders it within paragraph <p> tags.
- Finally specify an input type of submit and assign it the value "Save".

To view our work, start the server with `python manage.py runserver` and go to the homepage at http://127.0.0.1:8000/.



Django blog

Hello world!

My first blog post. Woohoo!

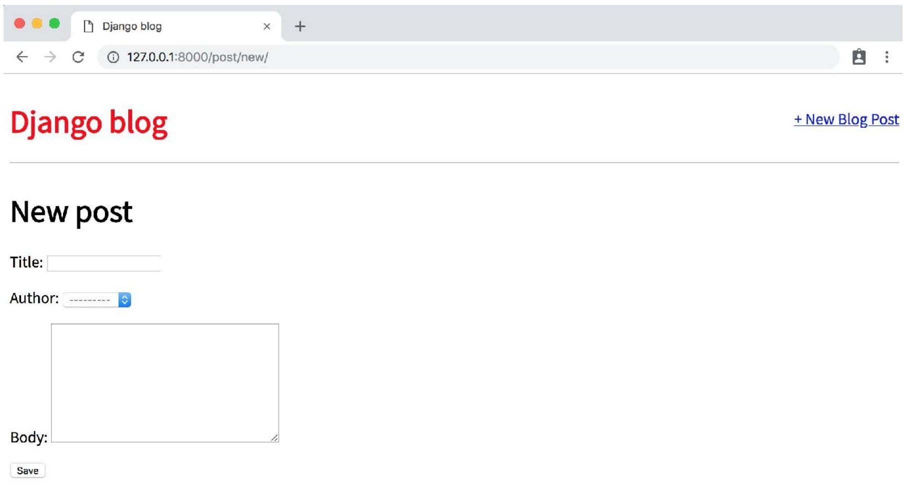
Goals today

Learn Django and build a blog application.

Homepage with new button

Click on our link for "+ New Blog Post" which will redirect you to:

http://127.0.0.1:8000/post/new/.


127.0.0.1:8000/post/new/

Django blog

+ New Blog Post

New post

Title:

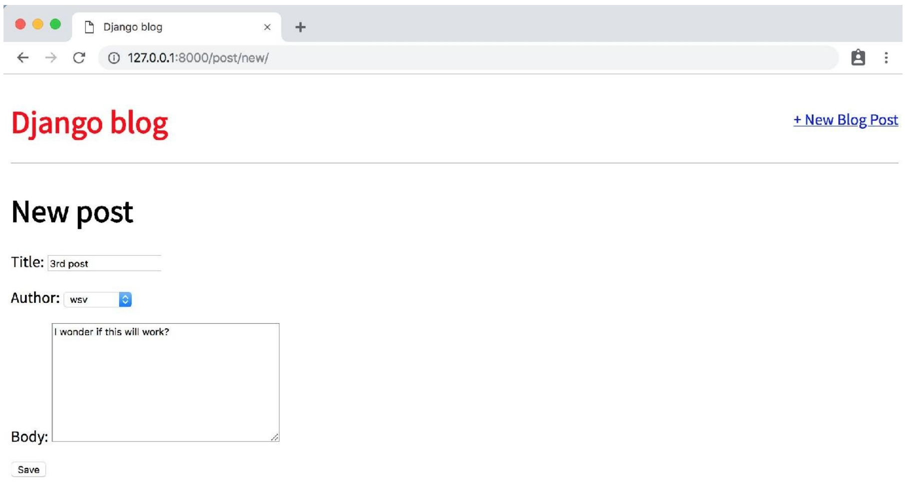
Author: ---------

Body:

Save

Blog new page

Go ahead and try to create a new blog post and submit it.


127.0.0.1:8000/post/new/

Django blog

+ New Blog Post

New post

Title: 3rd post

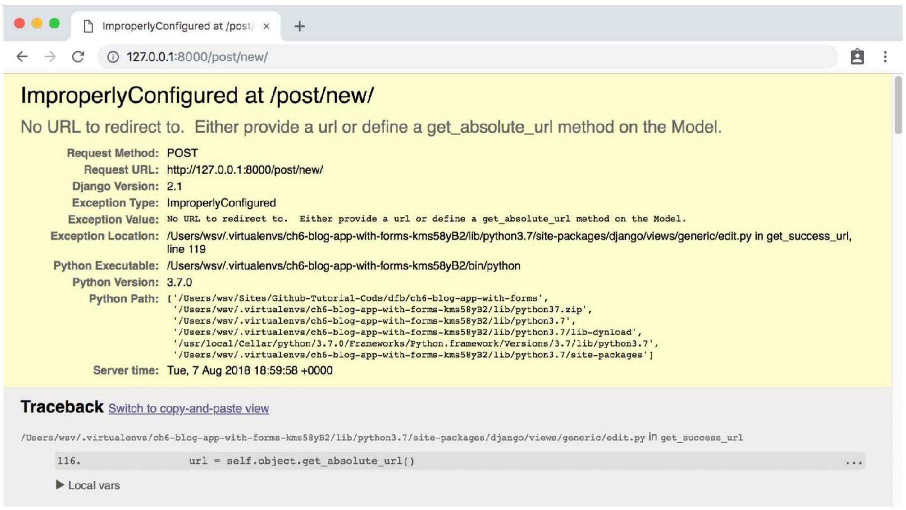
Author: wsv

Body: I wonder if this will work?

Save

Blog new page

Oops! What happened?


```
ImproperlyConfigured at /post/new/
No URL to redirect to.  Either provide a url or define a get_absolute_url method on the Model.

   Request Method: POST
      Request URL: http://127.0.0.1:8000/post/new/
   Django Version: 2.1
   Exception Type: ImproperlyConfigured
  Exception Value: No URL to redirect to.  Either provide a url or define a get_absolute_url method on the Model.
Exception Location: /Users/wsv/.virtualenvs/ch6-blog-app-with-forms-kms58yB2/lib/python3.7/site-packages/django/views/generic/edit.py in get_success_url,
                   line 119
Python Executable: /Users/wsv/.virtualenvs/ch6-blog-app-with-forms-kms58yB2/bin/python
   Python Version: 3.7.0
      Python Path: ['/Users/wsv/Sites/Github-Tutorial-Code/dfb/ch6-blog-app-with-forms',
                    '/Users/wsv/.virtualenvs/ch6-blog-app-with-forms-kms58yB2/lib/python37.zip',
                    '/Users/wsv/.virtualenvs/ch6-blog-app-with-forms-kms58yB2/lib/python3.7',
                    '/Users/wsv/.virtualenvs/ch6-blog-app-with-forms-kms58yB2/lib/python3.7/lib-dynload',
                    '/usr/local/Cellar/python/3.7.0/Frameworks/Python.framework/Versions/3.7/lib/python3.7',
                    '/Users/wsv/.virtualenvs/ch6-blog-app-with-forms-kms58yB2/lib/python3.7/site-packages']
      Server time: Tue, 7 Aug 2018 18:59:58 +0000

Traceback Switch to copy-and-paste view

/Users/wsv/.virtualenvs/ch6-blog-app-with-forms-kms58yB2/lib/python3.7/site-packages/django/views/generic/edit.py in get_success_url

    116.            url = self.object.get_absolute_url()                ...

    ▶ Local vars
```

Blog new page

Django's error message is quite helpful. It's complaining that we did not specify where to send the user after successfully submitting the form. Let's send a user to the detail page after success; that way they can see their completed post.

We can follow Django's suggestion and add a get_absolute_url to our model. This is a best practice that you should always do. It sets a canonical URL for an object so even if the structure of your URLs changes in the future, the reference to the specific object is the same. In short, you should add a `get_absolute_url()` and `__str__()` method to each model you write.

Open the `models.py` file. Add an import on the second line for reverse and a new `get_absolute_url` method.

Code

```
# blog/models.py
from django.db import models
from django.urls import reverse # new


class Post(models.Model):
    title = models.CharField(max_length=200)
    author = models.ForeignKey(
        'auth.User',
        on_delete=models.CASCADE,
    )
    body = models.TextField()

    def __str__(self):
        return self.title

    def get_absolute_url(self): # new
        return reverse('post_detail', args=[str(self.id)])
```

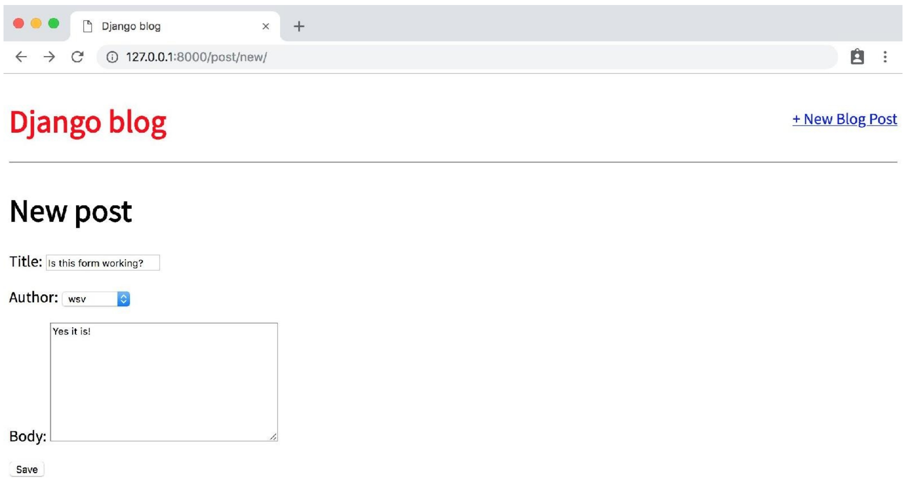
Reverse is a very handy utility function Django provides us to reference an object by its URL template name, in this case `post_detail`. If you recall our URL pattern is the following:

Code

```
path('post/<int:pk>/', BlogDetailView.as_view(), name='post_detail'),
```

That means in order for this route to work we must *also* pass in an argument with the `pk` or primary key of the object. Confusingly `pk` and `id` are interchangeable in Django though the Django docs recommend using `self.id` with `get_absolute_url`. So we're telling Django that the ultimate location of a Post entry is its `post_detail` view which is `posts/<int:pk>/` so the route for the first entry we've made will be at `posts/1`.

Try to create a new blog post again at http://127.0.0.1:8000/post/new/.


Django blog

127.0.0.1:8000/post/new/

Django blog

+ New Blog Post

New post

Title: Is this form working?

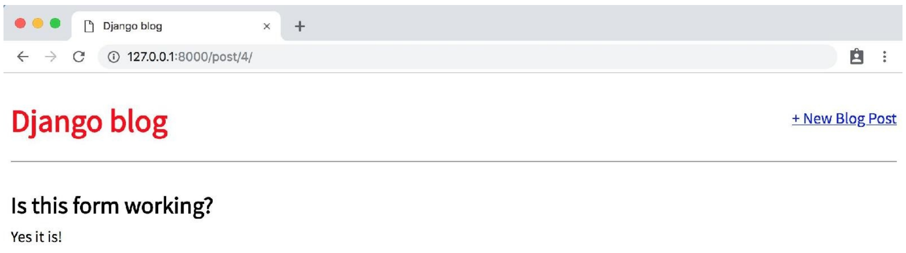
Author: wsv

Body: Yes it is!

Save

Blog new page with fourth post

Upon clicking the “Save” button you are new redirected to the detailed view page where the post appears.


Django blog

127.0.0.1:8000/post/4/

Django blog

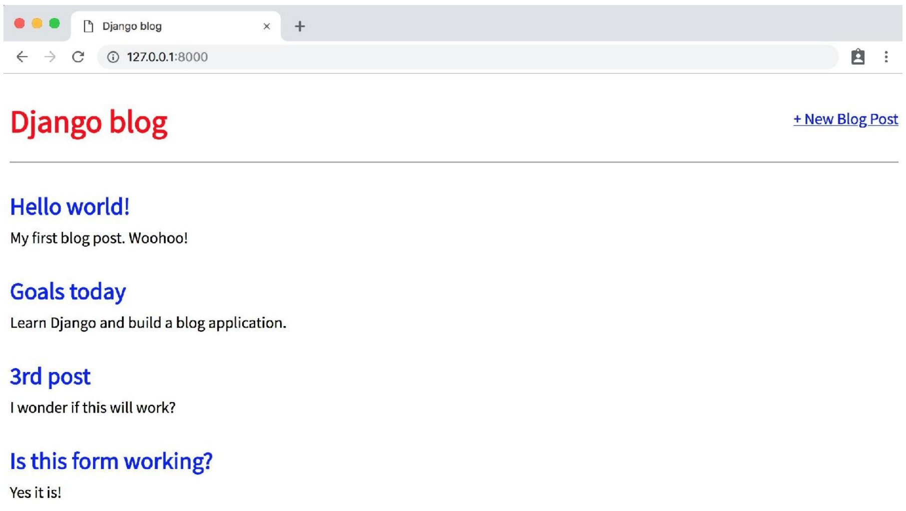
+ New Blog Post

Is this form working?

Yes it is!

Blog individual page

Go over to the homepage at http://127.0.0.1:8000/ and you’ll also notice that our earlier blog post is also there. It *was* successfully sent to the database, but Django didn’t know how to redirect us after that.


Django blog

127.0.0.1:8000

Django blog

+ New Blog Post

Hello world!

My first blog post. Woohoo!

Goals today

Learn Django and build a blog application.

3rd post

I wonder if this will work?

Is this form working?

Yes it is!

Blog homepage with four posts

While we could go into the Django admin to delete unwanted posts, it’s better if we add forms so a user can update and delete existing posts directly from the site.

Update Form

The process for creating an update form so users can edit blog posts should feel familiar. We’ll again use a built-in Django class-based generic view, UpdateView, and create the requisite template, url, and view.

To start, let’s add a new link to `post_detail.html` so that the option to edit a blog post appears on an individual blog page.

Code

```
<!-- templates/post_detail.html -->
{% extends 'base.html' %}

{% block content %}
  <div class="post-entry">
    <h2>{{ post.title }}</h2>
    <p>{{ post.body }}</p>
  </div>

  <a href="{% url 'post_edit' post.pk %}">+ Edit Blog Post</a>
{% endblock content %}
```

We’ve added a link using `<a href>...</a>` and the Django template engine’s `{% url ... %}` tag. Within it we’ve specified the target name of our url, which will be called `post_edit` and also passed the parameter needed, which is the primary key of the post `post.pk`.

Next we create the template for our edit page called `post_edit.html`.

Command Line

```
(blog) $ touch templates/post_edit.html
```

And add the following code:

Code

```
<!-- templates/post_edit.html -->
{% extends 'base.html' %}

{% block content %}
    <h1>Edit post</h1>
    <form action="" method="post">{% csrf_token %}
      {{ form.as_p }}
    <input type="submit" value="Update" />
</form>
{% endblock content %}
```

We again use HTML `<form></form>` tags, Django’s `csrf_token` for security, `form.as_p` to display our form fields with paragraph tags, and finally give it the value “Update” on the submit button.

Now to our view. We need to import `UpdateView` on the second-from-the-top line and then subclass it in our new view `BlogUpdateView`.
Code

```
# blog/views.py
from django.views.generic import ListView, DetailView
from django.views.generic.edit import CreateView, UpdateView # new

from .models import Post


class BlogListView(ListView):
    model = Post
    template_name = 'home.html'


class BlogDetailView(DetailView):
    model = Post
    template_name = 'post_detail.html'


class BlogCreateView(CreateView):
    model = Post
    template_name = 'post_new.html'
    fields = ['title', 'author', 'body']


class BlogUpdateView(UpdateView): # new
    model = Post
    template_name = 'post_edit.html'
    fields = ['title', 'body']
```

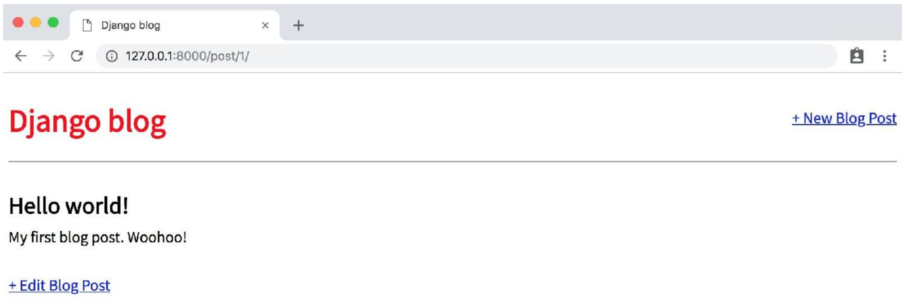
Notice that in `BlogUpdateView` we are explicitly listing the fields we want to use `['title', 'body']` rather than using `'__all__'`. This is because we assume that the author of the post is not changing; we only want the title and text to be editable.

The final step is to update our `urls.py` file as follows. Add the `BlogUpdateView` up top and then the new route at the top of the existing `URLpatterns`.
Code

```
# blog/urls.py
from django.urls import path

from .views import (
    BlogListView,
    BlogDetailView,
    BlogCreateView,
    BlogUpdateView, # new
)

urlpatterns = [
    path('post/<int:pk>/edit/',
        BlogUpdateView.as_view(), name='post_edit'), # new
    path('post/new/', BlogCreateView.as_view(), name='post_new'),
    path('post/<int:pk>/', BlogDetailView.as_view(), name='post_detail'),
    path('', BlogListView.as_view(), name='home'),
]
```

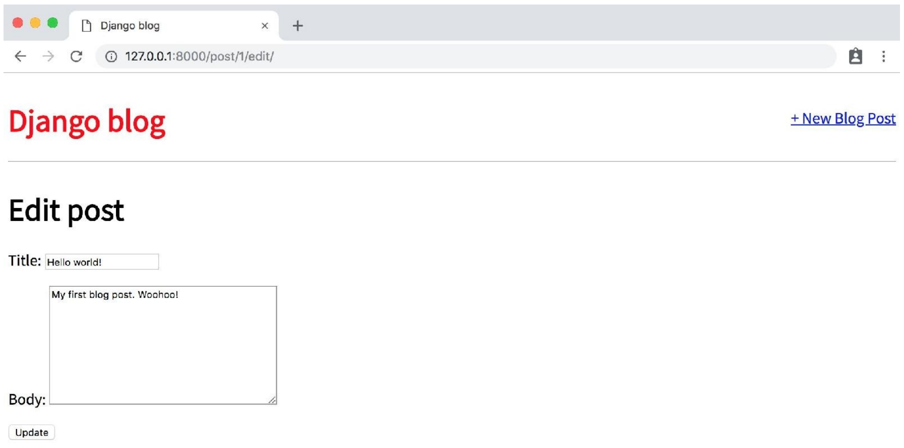
At the top we add our view `BlogUpdateView` to the list of imported views, then created a new url pattern for `/post/pk/edit` and given it the name `post_edit`.

Now if you click on a blog entry you'll see our new Edit button.



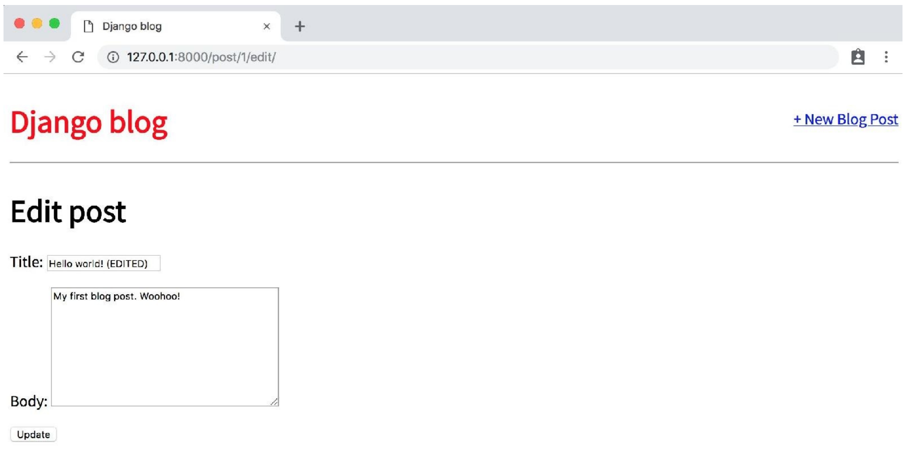
Blog page with edit button

If you click on "+ Edit Blog Post" you'll be redirected to http://127.0.0.1:8000/post/1/edit/ if it's your first blog post.



Blog edit page

Note that the form is pre-filled with our database's existing data for the post. Let's make a change…



Edit post

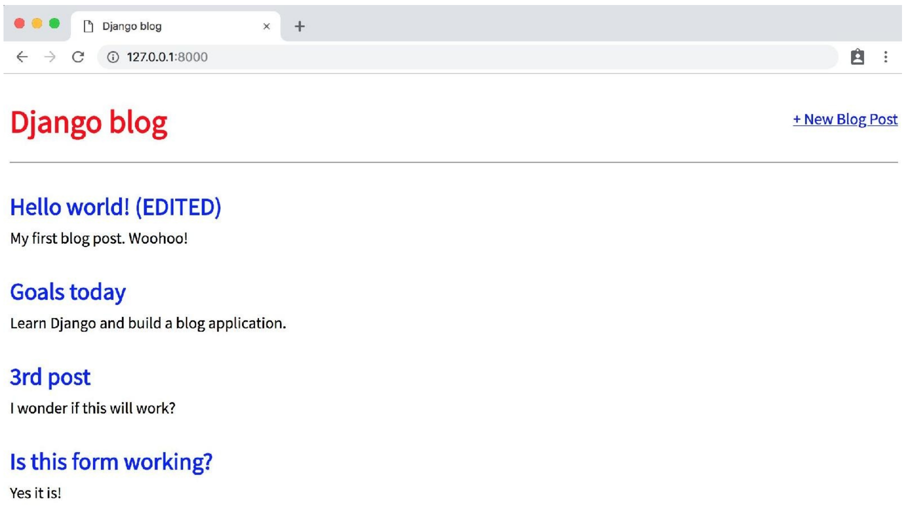
Title: Hello world! (EDITED)

Body: My first blog post. Woohoo!

Update

Blog edit page

And after clicking the “Update” button we are redirected to the detail view of the post where you can see the change. This is because of our `get_absolute_url` setting. Navigate to the homepage and you can see the change next to all the other entries.



Hello world! (EDITED)

My first blog post. Woohoo!

Goals today

Learn Django and build a blog application.

3rd post

I wonder if this will work?

Is this form working?

Yes it is!

Blog homepage with edited post

Delete View

The process for creating a form to delete blog posts is very similar to that for updating a post. We’ll use yet another generic class-based view, DeleteView, to help and need to create a view, url, and template for the functionality.

Let’s start by adding a link to delete blog posts on our individual blog page, `post_detail.html`.

Code

```
<!-- templates/post_detail.html -->
{% extends 'base.html' %}

{% block content %}
```

```
  <div class="post-entry">
    <h2>{{ post.title }}</h2>
    <p>{{ post.body }}</p>
  </div>

  <p><a href="{% url 'post_edit' post.pk %}">+ Edit Blog Post</a></p>
  <p><a href="{% url 'post_delete' post.pk %}">+ Delete Blog Post</a></p>
{% endblock content %}
```

Then create a new file for our delete page template. First quit the local server `Control+c` and then type the following command:

Command Line

```
(blog) $ touch templates/post_delete.html
```

And fill it with this code:

Code

```
<!-- templates/post_delete.html -->
{% extends 'base.html' %}

{% block content %}
    <h1>Delete post</h1>
    <form action="" method="post">{% csrf_token %}
      <p>Are you sure you want to delete "{{ post.title }}"?</p>
      <input type="submit" value="Confirm" />
    </form>
{% endblock content %}
```

Note we are using `post.title` here to display the title of our blog post. We could also just use `object.title` as it too is provided by `DetailView`.

Now update our `views.py` file, by importing `DeleteView` and `reverse_lazy` at the top, then create a new view that subclasses `DeleteView`.

Code

```
# blog/views.py
from django.views.generic import ListView, DetailView
from django.views.generic.edit import CreateView, UpdateView, DeleteView # new
from django.urls import reverse_lazy # new

from .models import Post


class BlogListView(ListView):
    model = Post
    template_name = 'home.html'


class BlogDetailView(DetailView):
    model = Post
    template_name = 'post_detail.html'


class BlogCreateView(CreateView):
    model = Post
    template_name = 'post_new.html'
    fields = ['title', 'author', 'body']
```

```
class BlogUpdateView(UpdateView):
    model = Post
    template_name = 'post_edit.html'
    fields = ['title', 'body']


class BlogDeleteView(DeleteView): # new
    model = Post
    template_name = 'post_delete.html'
    success_url = reverse_lazy('home')
```

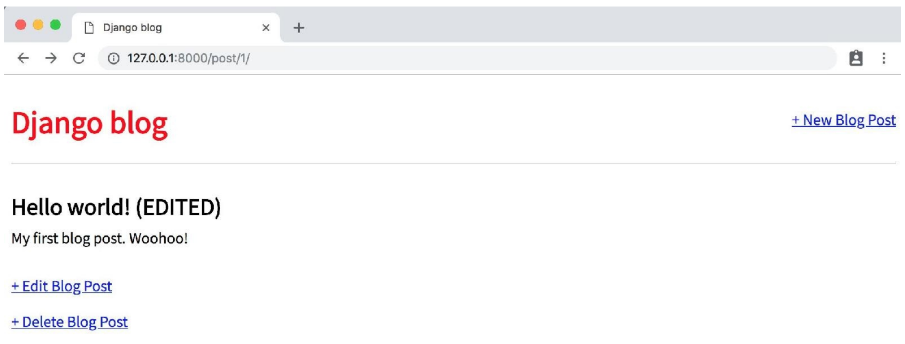
We use reverse_lazy as opposed to just reverse so that it won't execute the URL redirect until our view has finished deleting the blog post.

Finally create a URL by importing our view `BlogDeleteView` and adding a new pattern:

Code

```
# blog/urls.py
from django.urls import path

from .views import (
    BlogListView,
    BlogUpdateView,
    BlogDetailView,
    BlogCreateView,
    BlogDeleteView, # new
)

urlpatterns = [
    path('post/<int:pk>/delete/', # new
        BlogDeleteView.as_view(), name='post_delete'),
    path('post/new/', BlogCreateView.as_view(), name='post_new'),
    path('post/<int:pk>/', BlogDetailView.as_view(), name='post_detail'),
    path('post/<int:pk>/edit/',
        BlogUpdateView.as_view(), name='post_edit'),
    path('', BlogListView.as_view(), name='home'),
]
```

If you start the server again `python manage.py runserver` and refresh the individual post page you'll see our "Delete Blog Post" link.

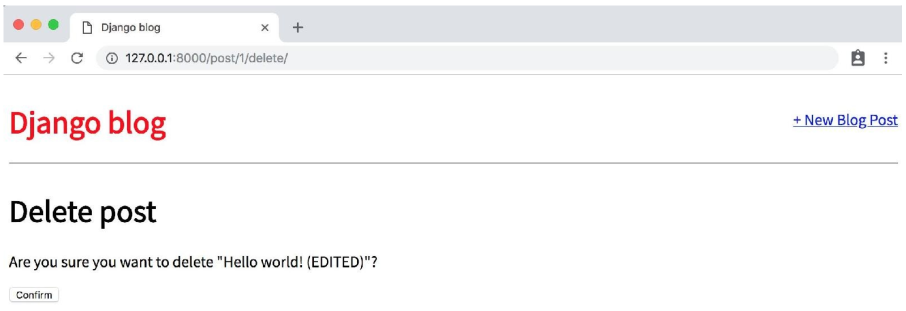


Hello world! (EDITED)

My first blog post. Woohoo!

Blog delete post

Clicking on the link takes us to the delete page for the blog post, which displays the name of the blog post.


Django blog

+ New Blog Post

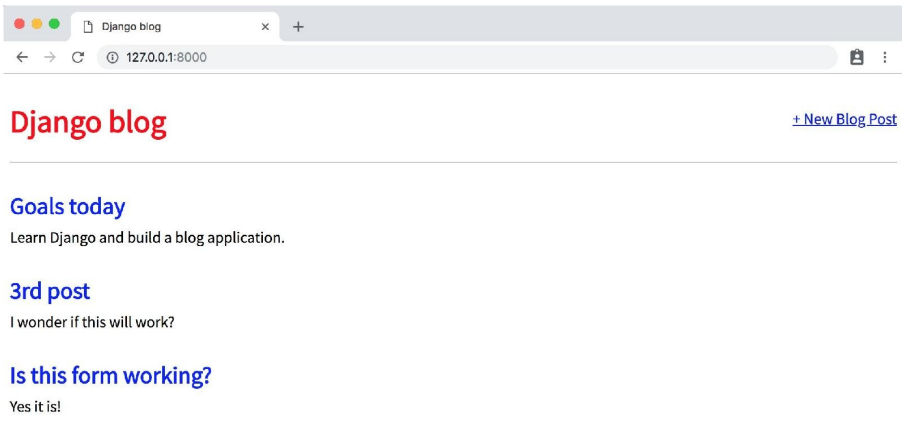
Delete post

Are you sure you want to delete "Hello world! (EDITED)"?

Confirm

Blog delete post page

If you click on the “Confirm” button, it redirects you to the homepage where the blog post has been deleted!


Django blog

+ New Blog Post

Goals today

Learn Django and build a blog application.

3rd post

I wonder if this will work?

Is this form working?

Yes it is!

Homepage with post deleted

So it works!

Tests

Time for tests to make sure everything works now–and in the future–as expected. We’ve added a `get_absolute_url` method to our model and new views for create, update, and edit posts. That means we need four new tests:

- `def test_get_absolute_url`
- `def test_post_create_view`
- `def test_post_update_view`
- `def test_post_delete_view`

Update your existing `tests.py` file as follows.

Code

```
# blog/tests.py
from django.contrib.auth import get_user_model
from django.test import TestCase
from django.urls import reverse

from .models import Post
```

```python
class BlogTests(TestCase):

    def setUp(self):
        self.user = get_user_model().objects.create_user(
            username='testuser',
            email='test@email.com',
            password='secret'
        )

        self.post = Post.objects.create(
            title='A good title',
            body='Nice body content',
            author=self.user,
        )

    def test_string_representation(self):
        post = Post(title='A sample title')
        self.assertEqual(str(post), post.title)

    def test_get_absolute_url(self):
        self.assertEqual(self.post.get_absolute_url(), '/post/1/')

    def test_post_content(self):
        self.assertEqual(f'{self.post.title}', 'A good title')
        self.assertEqual(f'{self.post.author}', 'testuser')
        self.assertEqual(f'{self.post.body}', 'Nice body content')

    def test_post_list_view(self):
        response = self.client.get(reverse('home'))
        self.assertEqual(response.status_code, 200)
        self.assertContains(response, 'Nice body content')
        self.assertTemplateUsed(response, 'home.html')

    def test_post_detail_view(self):
        response = self.client.get('/post/1/')
        no_response = self.client.get('/post/100000/')
        self.assertEqual(response.status_code, 200)
        self.assertEqual(no_response.status_code, 404)
        self.assertContains(response, 'A good title')
        self.assertTemplateUsed(response, 'post_detail.html')

    def test_post_create_view(self): # new
        response = self.client.post(reverse('post_new'), {
            'title': 'New title',
            'body': 'New text',
            'author': self.user,
        })
        self.assertEqual(response.status_code, 200)
        self.assertContains(response, 'New title')
        self.assertContains(response, 'New text')

    def test_post_update_view(self): # new
        response = self.client.post(reverse('post_edit', args='1'), {
            'title': 'Updated title',
            'body': 'Updated text',
        })
        self.assertEqual(response.status_code, 302)

    def test_post_delete_view(self): # new
        response = self.client.get(
            reverse('post_delete', args='1'))
        self.assertEqual(response.status_code, 200)
```

We expect the URL of our test to be at `post/1/` since there’s only one post and the `1` is its primary key Django adds automatically for us. To test create view we make a new response and then ensure that the response goes through (status code 200) and contains our new title and body text. For update view we access the first post–which has a `pk` of `1` which is passed in as the only argument–and we confirm that it results in a 302 redirect. Finally we test our delete view by confirming that if we delete a post the status code is 200 for success.

There’s always more tests that can be added but this at least has coverage on all our new functionality.

Conclusion

In a small amount of code we’ve built a blog application that allows for creating, reading, updating, and deleting blog posts. This core functionality is known by the acronym CRUD: Create-Read-Update-Delete. While there are multiple ways to achieve this same functionality–we could have used function-based views or written our own class-based views–we’ve demonstrated how little code it takes in Django to make this happen.

In the next chapter we’ll add user accounts and log in, log out, and sign up functionality.

Chapter 7: User Accounts

So far we've built a working blog application that uses forms, but we're missing a major piece of most web applications: user authentication.

Implementing proper user authentication is famously hard; there are many security gotchas along the way so you really don't want to implement this yourself. Fortunately Django comes with a powerful, built-in user authentication system that we can use.

Whenever you create a new project, by default Django installs the `auth` app, which provides us with a User object containing:

- username
- password
- email
- first_name
- last_name

We will use this `User` object to implement log in, log out, and sign up in our blog application.

Log in

Django provides us with a default view for a log in page via LoginView. All we need to add are a project-level urlpattern for the auth system, a log in template, and a small update to our `settings.py` file.

First update the project-level `urls.py` file. We'll place our log in and log out pages at the `accounts/` URL. This is a one-line addition on the next-to-last line.

Code

```
# blog_project/urls.py
from django.contrib import admin
from django.urls import path, include

urlpatterns = [
    path('admin/', admin.site.urls),
    path('accounts/', include('django.contrib.auth.urls')), # new
    path('', include('blog.urls')),
]
```

As the LoginView documentation notes, by default Django will look within a templates folder called `registration` for a file called `login.html` for a log in form. So we need to create a new directory called `registration` and the requisite file within it. From the command line type `Control+c` to quit our local server. Then enter the following:

Command Line

```
(blog) $ mkdir templates/registration
(blog) $ touch templates/registration/login.html
```

Now type the following template code for our newly-created file.

Code

```
<!-- templates/registration/login.html -->
{% extends 'base.html' %}

{% block content %}
<h2>Log In</h2>
<form method="post">
  {% csrf_token %}
  {{ form.as_p }}
  <button type="submit">Log In</button>
</form>
{% endblock content %}
```

We're using HTML `<form></form>` tags and specifying the POST method since we're sending data to the server (we'd use GET if we were requesting data, such as in a search engine form). We add `{% csrf_token %}` for security concerns, namely to prevent a XSS Attack. The form's contents are outputted between paragraph tags thanks to `{{ form.as_p }}` and then we add a "submit" button.

The final step is we need to specify *where* to redirect the user upon a successful log in. We can set this with the `LOGIN_REDIRECT_URL` setting. At the bottom of the `settings.py` file add the following:

Code

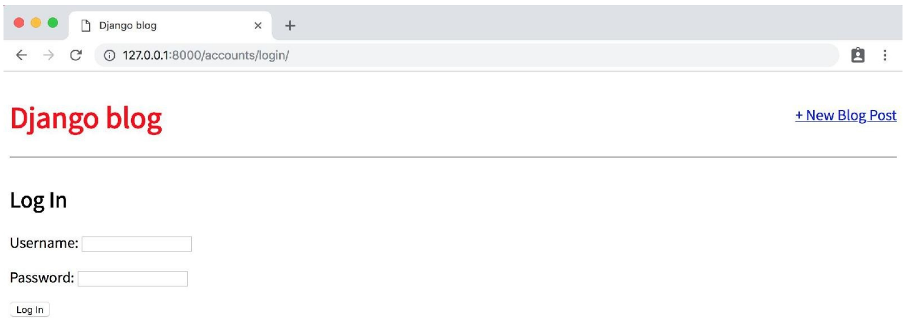
```
# blog_project/settings.py
LOGIN_REDIRECT_URL = 'home'
```

Now the user will be redirected to the `'home'` template which is our homepage.

We're actually done at this point! If you now start up the Django server again with `python manage.py runserver` and navigate to our log in page:

http://127.0.0.1:8000/accounts/login/

You'll see the following:


Django blog
127.0.0.1:8000/accounts/login/
Django blog
+ New Blog Post
Log In
Username:
Password:
Log In

Log in page

Upon entering the log in info for our superuser account, we are redirected to the homepage. Notice that we didn't add any *view* logic or create a database model because the Django auth system provided both for us automatically. Thanks Django!

Updated homepage

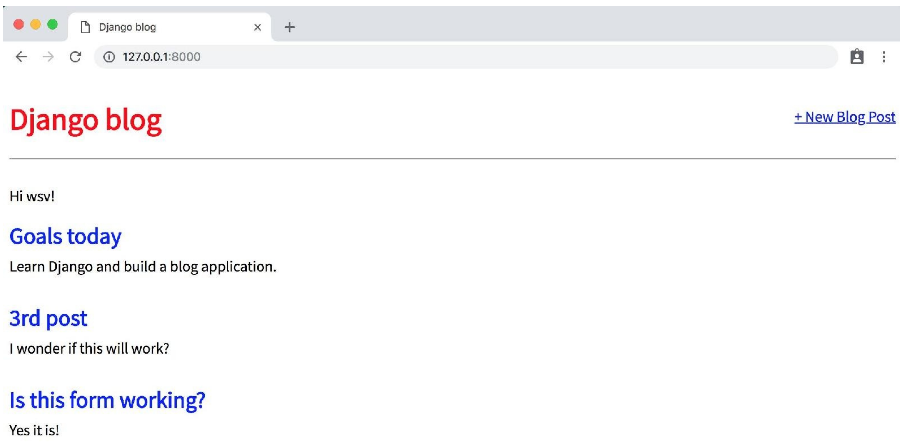
Let's update our `base.html` template so we display a message to users whether they are logged in or not. We can use the is_authenticated attribute for this.

For now, we can simply place this code in a prominent position. Later on we can style it more appropriately. Update the `base.html` file with new code starting beneath the closing `</header>` tag.

Code

```
<!-- templates/base.html -->
{% load static %}
<html>
  <head>
    <title>Django blog</title>
    <link href="https://fonts.googleapis.com/css?family=Source+Sans+Pro:400"
    rel="stylesheet">
    <link href="{% static 'css/base.css' %}" rel="stylesheet">
  </head>
  <body>
    <div>
      <header>
        <div class="nav-left">
          <h1><a href="{% url 'home' %}">Django blog</a></h1>
        </div>
        <div class="nav-right">
          <a href="{% url 'post_new' %}">+ New Blog Post</a>
        </div>
      </header>
      {% if user.is_authenticated %}
        <p>Hi {{ user.username }}!</p>
      {% else %}
        <p>You are not logged in.</p>
        <a href="{% url 'login' %}">Log In</a>
      {% endif %}
    {% block content %}
    {% endblock content %}
    </div>
  </body>
</html>
```

If the user is logged in we say hello to them by name, if not we provide a link to our newly created log in page.



Hi wsv!

Goals today

Learn Django and build a blog application.

3rd post

I wonder if this will work?

Is this form working?

Yes it is!

Homepage logged in

It worked! My superuser name is `wsv` so that's what I see on the page.

Log out link

We added template page logic for logged out users but…how do we log out now? We could go into the Admin panel and do it manually, but there's a better way. Let's add a log out link instead that redirects to the homepage. Thanks to the Django auth system, this is dead-simple to achieve.

In our `base.html` file add a one-line `{% url 'logout' %}` link for logging out just below our user greeting.

Command Line

```
<!-- templates/base.html-->
...
{% if user.is_authenticated %}
  <p>Hi {{ user.username }}!</p>
  <p><a href="{% url 'logout' %}">Log out</a></p>
{% else %}
...
```

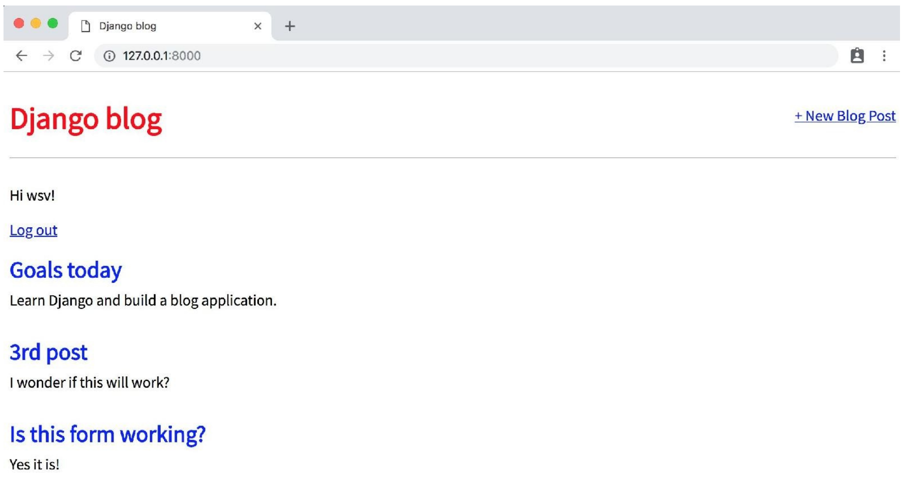
That's all we need to do as the necessary *view* is provided to us by the Django `auth` app. We do need to specify where to redirect a user upon log out though.

Update `settings.py` to provide a redirect link which is called, appropriately, `LOGOUT_REDIRECT_URL`. We can add it right next to our log in redirect so the bottom of the file should look as follows:

Code

```
# blog_project/settings.py
LOGIN_REDIRECT_URL = 'home'
LOGOUT_REDIRECT_URL = 'home' # new
```

If you refresh the homepage you'll see it now has a "log out" link for logged in users.



Django blog

+ New Blog Post

Hi wsv!

Log out

Goals today

Learn Django and build a blog application.

3rd post

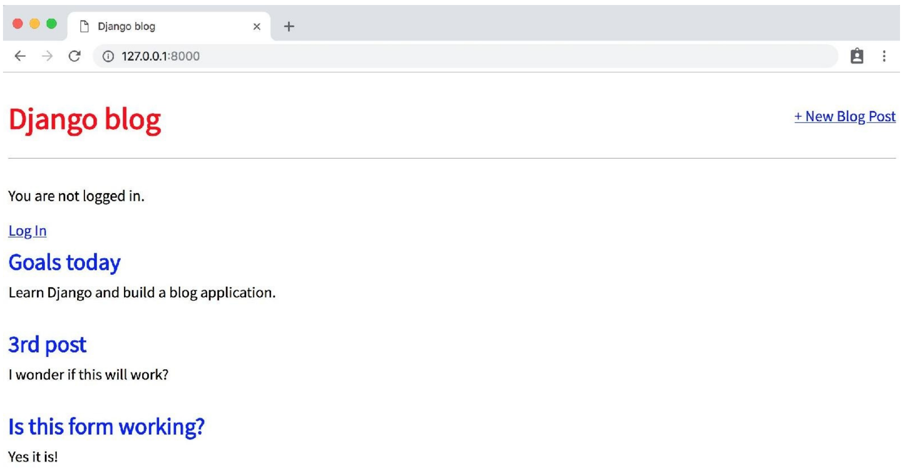
I wonder if this will work?

Is this form working?

Yes it is!

Homepage log out link

And clicking it takes you back to the homepage with a `login` link.



Django blog

+ New Blog Post

You are not logged in.

Log In

Goals today

Learn Django and build a blog application.

3rd post

I wonder if this will work?

Is this form working?

Yes it is!

Homepage logged out

Go ahead and try logging in and out several times with your user account.

Sign up

We need to write our own view for a sign up page to register new users, but Django provides us with a form class, UserCreationForm, to make things easier. By default it comes with three fields: `username`, `password1`, and `password2`.

There are many ways to organize your code and URL structure for a robust user authentication system. Here we will create a dedicated new app, `accounts`, for our sign up page.

Command Line

```
(blog) $ python manage.py startapp accounts
```

Add the new app to the `INSTALLED_APPS` setting in our `settings.py` file.

Code

```
# blog_project/settings.py
INSTALLED_APPS = [
    'django.contrib.admin',
    'django.contrib.auth',
    'django.contrib.contenttypes',
    'django.contrib.sessions',
    'django.contrib.messages',
    'django.contrib.staticfiles',
    'blog.apps.BlogConfig',
    'accounts.apps.AccountsConfig', # new
]
```

Next add a project-level `url` pointing to this new app directly **below** where we include the built-in `auth` app.

Code

```
# blog_project/urls.py
from django.contrib import admin
from django.urls import path, include

urlpatterns = [
    path('admin/', admin.site.urls),
    path('accounts/', include('django.contrib.auth.urls')),
    path('accounts/', include('accounts.urls')), # new
    path('', include('blog.urls')),
]
```

The order of our `urls` matters here because Django reads this file top-to-bottom. Therefore when we request them `/accounts/signup` url, Django will first look in `auth`, not find it, and **then** proceed to the `accounts` app.

Let's go ahead and create our `accounts/urls.py` file.

Command Line

```
(blog) $ touch accounts/urls.py
```

And add the following code:

Code

```
# acounts/urls.py
from django.urls import path

from .views import SignUpView

urlpatterns = [
    path('signup/', SignUpView.as_view(), name='signup'),
]
```

We're using a not-yet-created view called `SignupView` which we already know is class-based since it is capitalized and has the `as_view()` suffix. Its path is just `signup/` so the overall URL path will be `accounts/signup/`.

Now for the view which uses the built-in `UserCreationForm` and generic `CreateView`.

Code

```
# accounts/views.py
from django.contrib.auth.forms import UserCreationForm
from django.urls import reverse_lazy
from django.views import generic


class SignUpView(generic.CreateView):
    form_class = UserCreationForm
    success_url = reverse_lazy('login')
    template_name = 'signup.html'
```

We're subclassing the generic class-based view `CreateView` in our `SignUpView` class. We specify the use of the built-in `UserCreationForm` and the not-yet-created template at `signup.html`. And we use `reverse_lazy` to redirect the user to the log in page upon successful registration.

Why use `reverse_lazy` here instead of `reverse`? The reason is that for all generic class-based views the URLs are not loaded when the file is imported, so we have to use the lazy form of `reverse` to load them later when they're available.

Now let's add `signup.html` to our project-level `templates` folder:

Command Line

```
(blog) $ touch templates/signup.html
```

Add then populate it with the code below.

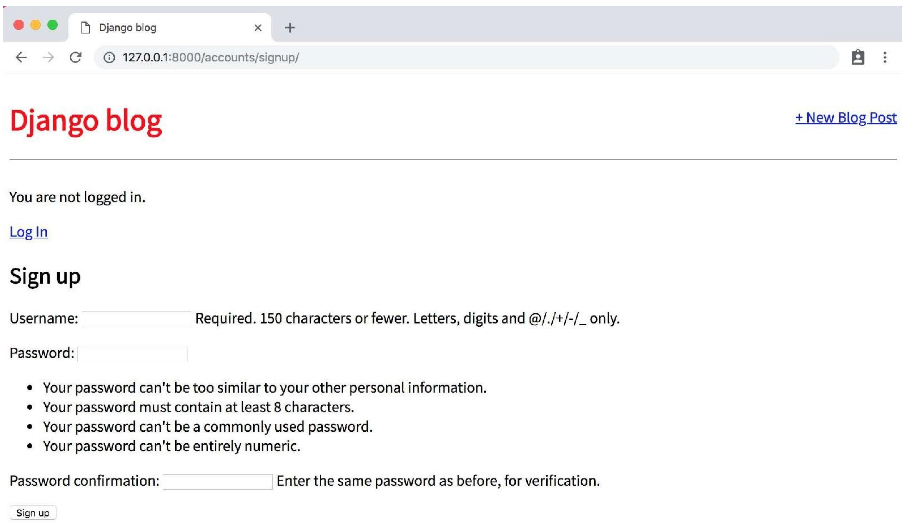
Code

```
<!-- templates/signup.html -->
{% extends 'base.html' %}

{% block content %}
<h2>Sign up</h2>
<form method="post">
  {% csrf_token %}
  {{ form.as_p }}
  <button type="submit">Sign up</button>
</form>
{% endblock content %}
```

This format is very similar to what we've done before. We extend our base template at the top, place our logic between `<form></form>` tags, use the `csrf_token` for security, display the form's content in paragraph tags with `form.as_p`, and include a submit button.

We're now done! To test it out start up the local server with `python manage.py runserver` and navigate to our newly created page:

http://127.0.0.1:8000/accounts/signup/



Django blog

You are not logged in.

Log In

Sign up

Username: Required. 150 characters or fewer. Letters, digits and @/./+/-/_ only.

Password:

- Your password can't be too similar to your other personal information.
- Your password must contain at least 8 characters.
- Your password can't be a commonly used password.
- Your password can't be entirely numeric.

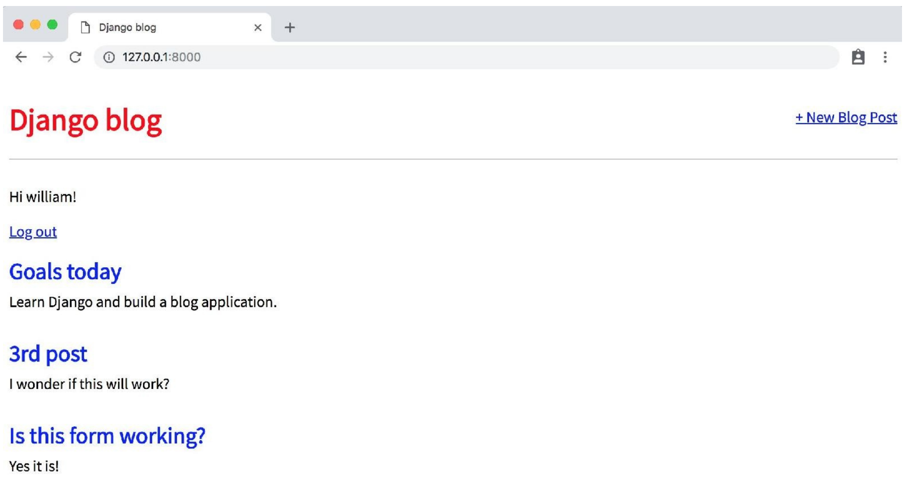
Password confirmation: Enter the same password as before, for verification.

Sign up

Django sign up page

Notice there is a lot of extra text that Django includes by default. We can customize this using something like the built-in messages framework but for now try out the form.

I've created a new user called "william" and upon submission was redirected to the log in page. Then after logging in successfully with my new user and password, I was redirected to the homepage with our personalized "Hi username" greeting.



Django blog

Hi william!

Log out

Goals today

Learn Django and build a blog application.

3rd post

I wonder if this will work?

Is this form working?

Yes it is!

Homepage for user william

Our ultimate flow is therefore: `Signup -> Login -> Homepage`. And of course we can tweak this however we want. The `SignupView` redirects to `login` because we set `success_url = reverse_lazy('login')`. The `Login` page redirects to the homepage because in our `blog_project/settings.py` file we set `LOGIN_REDIRECT_URL = 'home'`.

It can seem overwhelming at first to keep track of all the various parts of a Django project. That's normal. But I promise with time they'll start to make more sense.

Bitbucket

It's been a while since we made a `git` commit. Let's do that and then push a copy of our code onto Bitbucket.

First check all the new work that we've done with `git status`.

Command Line

```
(blog) $ git status
```

Then add the new content.

Command Line

```
(blog) $ git commit -m 'forms and user accounts'
```

Create a new repo on Bitbucket which you can call anything you like. I'll choose the name `blog-app`. Therefore *after creating the new repo on the Bitbucket site* I can type the following two commands. Make sure to replace my username `wsvincent` with your own from Bitbucket.

Command Line

```
(blog) $ git remote add origin git@bitbucket.org:wsvincent/blog-app.git
(blog) $ git push -u origin master
```

All done! Now we can deploy our new app on Heroku.

Heroku config

This is our third time deploying an app. As with our *Message Board* app, there are four changes we need to make so it can be deployed on Heroku.

- update `Pipfile.lock`
- new `Procfile`
- install `gunicorn`
- update `settings.py`

We'll specify a Python version in our `Pipfile` and then run `pipenv lock` to apply it to the `Pipfile.lock`. We'll add a `Procfile` which is a Heroku-specific configuration file, install `gunicorn` to run as our production web server in place of Django's local server, and finally update the `ALLOWED_HOSTS` so anyone can view our app.

Open the `Pipfile` with your text editor and at the bottom add the following two lines.

Pipfile

```
[requires]
python_version = "3.7"
```

We're using `3.7` here rather than the more specific `3.7.0` so that our app is automatically updated to the most recent version of Python 3.7x on Heroku.

Now run `pipenv lock` to update our `Pipfile.lock` since Heroku will use it to generate a new environment on Heroku servers for our app.

Command Line

```
(blog) $ pipenv lock
```

Create a new `Procfile` file.

Command Line

```
(blog) $ touch Procfile
```

Within your text editor add the following line to `Procfile`. This tells tells Heroku to use `gunicorn` rather than the local server which is not suitable for production.

Procfile

```
web: gunicorn blog_project.wsgi --log-file -
```

Now install gunicorn.

Command Line

```
(blog) $ pipenv install gunicorn==19.9.0
```

Finally update `ALLOWED_HOSTS` to accept all domains, which is represented by the asterisk `*`.

Code

```
# blog_project/settings.py
ALLOWED_HOSTS = ['*']
```

We can commit our new changes and push them up to Bitbucket.

Command Line

```
(blog) $ git status
(blog) $ git add -A
(blog) $ git commit -m 'Heroku config files and updates'
(blog) $ git push -u origin master
```

Heroku deployment

To deploy on Heroku first confirm that you’re logged in to your existing Heroku account.

Command Line

```
(blog) $ heroku login
```

Then run the `create` command which tells Heroku to make a new container for our app to live in. If you just run `heroku create` then Heroku will assign you a random name, however you can specify a custom name but it must be *unique on Heroku*. In other words, since I’m picking the name `dfb-blog` you can’t. You need some other combination of letters and numbers.

Command Line

```
(blog) $ heroku create dfb-blog
```

Now configure `git` so that when you push to Heroku, it goes to your new app name (replacing `dfb-blog` with your custom name).

Command Line

```
(blog) $ heroku git:remote -a dfb-blog
```

There’s one more step we need to take now that we have static files, which in our case is CSS. Django does not support serving static files in production however the WhiteNoise project does. So let’s install it.

Command Line

```
(blog) $ pipenv install whitenoise==3.3.1
```

Then we need to update our static settings so it will be used in production. In your text editor open `settings.py`. Add whitenoise to the `INSTALLED_APPS` **above** the built-in `staticfiles` app and also to `MIDDLEWARE` on the third line. Order matters for both `INSTALLED_APPS` and `MIDDLEWARE`.

At the bottom of the file add new lines for both `STATIC_ROOT` and `STATICFILES_STORAGE`. It should look like the following.

Code

```
# blog_project/settings.py
INSTALLED_APPS = [
    'blog.apps.BlogConfig',
    'accounts.apps.AccountsConfig',
    'django.contrib.admin',
    'django.contrib.auth',
    'django.contrib.contenttypes',
    'django.contrib.sessions',
    'django.contrib.messages',
    'whitenoise.runserver_nostatic', # new!
    'django.contrib.staticfiles',
]

MIDDLEWARE = [
    'django.middleware.security.SecurityMiddleware',
    'django.contrib.sessions.middleware.SessionMiddleware',
    'whitenoise.middleware.WhiteNoiseMiddleware', # new!
    'django.middleware.common.CommonMiddleware',
    'django.middleware.csrf.CsrfViewMiddleware',
    'django.contrib.auth.middleware.AuthenticationMiddleware',
    'django.contrib.messages.middleware.MessageMiddleware',
    'django.middleware.clickjacking.XFrameOptionsMiddleware',
]

...

STATIC_ROOT = os.path.join(BASE_DIR, 'staticfiles') # new!
STATIC_URL = '/static/'
STATICFILES_DIRS = [os.path.join(BASE_DIR, 'static')]
STATICFILES_STORAGE = 'whitenoise.storage.CompressedManifestStaticFilesStorage'
```

Make sure to add and commit your new changes. Then push it to Bitbucket.

Command Line

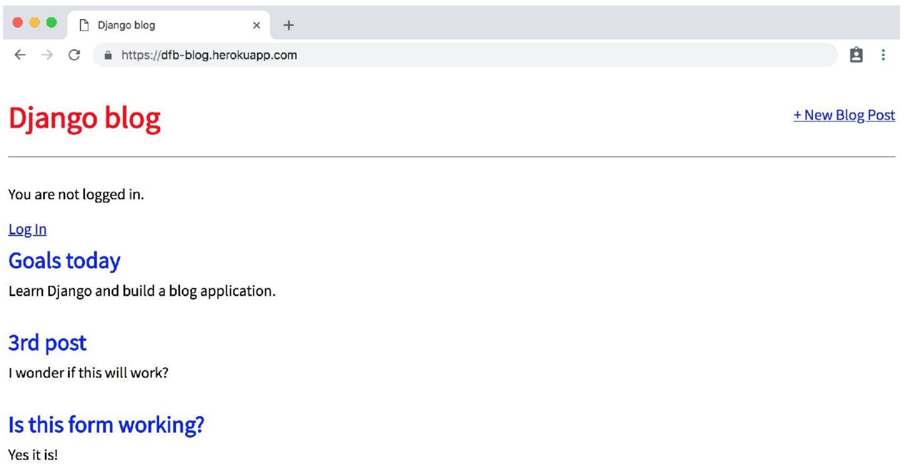
```
(blog) $ git add -A
(blog) $ git commit -m 'Heroku config'
(blog) $ git push origin master
```

Finally we can push our code to Heroku and add a web process so the dyno is running.

Command Line

```
(blog) $ git push heroku master
(blog) $ heroku ps:scale web=1
```

The URL of your new app will be in the command line output or you can run `heroku open` to find it. Mine is located at https://dfb-blog.herokuapp.com/.


Django blog

https://dfb-blog.herokuapp.com

Django blog

+ New Blog Post

You are not logged in.

Log In

Goals today

Learn Django and build a blog application.

3rd post

I wonder if this will work?

Is this form working?

Yes it is!

Heroku site

Conclusion

With a minimal amount of code, the Django framework has allowed us to create a log in, log out, and sign up user authentication flow. Under-the-hood it has taken care of the many security gotchas that can crop up if you try to create your own user authentication flow from scratch.

Chapter 8: Custom User Model

Django's built-in User model allows us to start working with users right away, as we just did with our *Blog app* in the previous chapters. However the official Django documentation *highly recommends* using a custom user model for new projects. The reason is that if you want to make any changes to the User model down the road–-for example adding an `age` field-–using a custom user model from the beginning makes this quite easy. But if you do not create a custom user model, updating the default User model in an existing Django project is very, very challenging.

So **always use a custom user model** for all new Django projects. But the approach demonstrated in the official documentation example is actually not what many Django experts recommend. It uses the quite complex `AbstractBaseUser` when if we just use `AbstractUser` instead things are far simpler and still customizable.

Thus we will use `AbstractUser` in this chapter where we start a new *Newspaper* app properly with a custom user model. The choice of a newspaper app pays homage to Django's roots as a web framework built for editors and journalists at the Lawrence Journal-World.

Set Up

The first step is to create a new Django project from the command line. We need to do several things:

- create and navigate into a new directory for our code
- create a new virtual environment `news`
- install Django
- make a new Django project `newspaper_project`
- make a new app `users`

We're calling our app for managing users `users` here but you'll also see it frequently called `accounts` in open source code. The actual name doesn't matter as long as you are consistent when referring to it throughout the project.

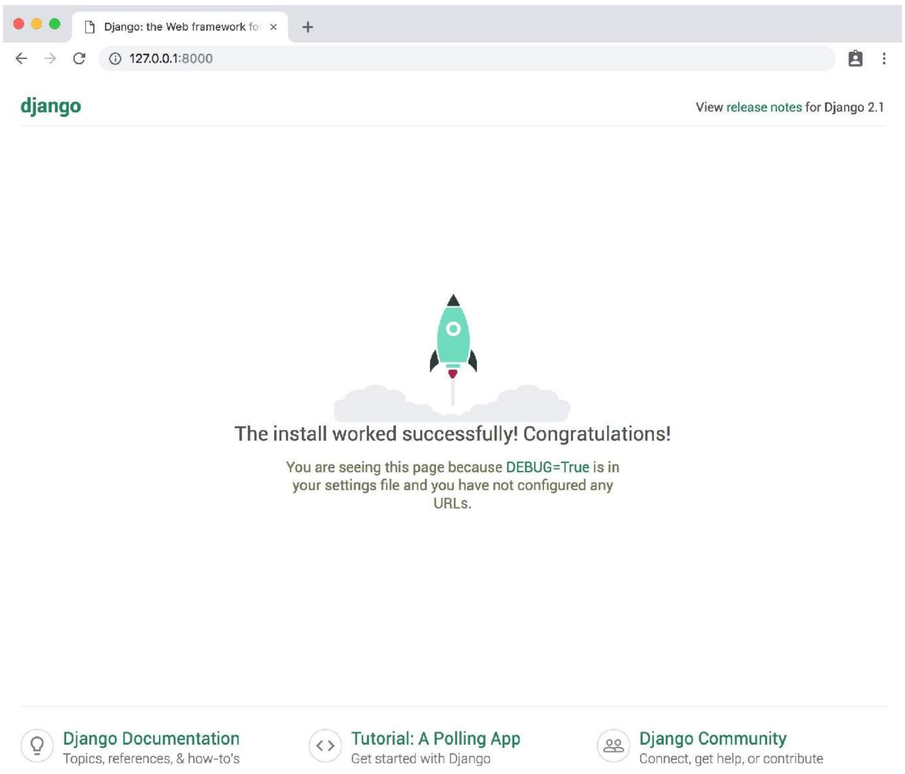
Here are the commands to run:

Command Line

```
$ cd ~/Desktop
$ mkdir news
$ cd news
$ pipenv install django==2.1
$ pipenv shell
(news) $ django-admin startproject newspaper_project .
(news) $ python manage.py startapp users
(news) $ python manage.py runserver
```

Note that we **did not** run `migrate` to configure our database. It's important to wait until **after** we've created our new custom user model before doing so given how tightly connected the user model is to the rest of Django.

If you navigate to http://127.0.0.1:8000 you'll see the familiar Django welcome screen.


Django: the Web framework fo
127.0.0.1:8000
django
View release notes for Django 2.1
Django Documentation
Topics, references, & how-to's
Tutorial: A Polling App
Get started with Django
Django Community
Connect, get help, or contribute

The install worked successfully! Congratulations!

You are seeing this page because DEBUG=True is in your settings file and you have not configured any URLs.

Welcome page

Custom User Model

Creating our custom user model requires four steps:

- update `settings.py`
- create a new `CustomUser` model
- update the admin
- create new forms for `UserCreationForm` and `UserChangeForm`

In `settings.py` we'll add the `users` app to our `INSTALLED_APPS`. Then at the bottom of the file use the `AUTH_USER_MODEL` config to tell Django to use our new custom user model in place of the built-in `User` model. We'll call our custom user model `CustomUser` so, since it exists within our `users` app we refer to it as `users.CustomUser`.

Code

```
# newspaper_project/settings.py
INSTALLED_APPS = [
    'django.contrib.admin',
    'django.contrib.auth',
    'django.contrib.contenttypes',
    'django.contrib.sessions',
    'django.contrib.messages',
    'django.contrib.staticfiles',
    'users.apps.UsersConfig', # new
]
...
AUTH_USER_MODEL = 'users.CustomUser' # new
```

Now update `users/models.py` with a new User model which we'll call `CustomUser` that extends the existing `AbstractUser`. We also include our first custom field, `age`, here.

Code

```
# users/models.py
from django.contrib.auth.models import AbstractUser
from django.db import models

class CustomUser(AbstractUser):
    age = models.PositiveIntegerField(null=True, blank=True)
```

If you read the official documentation on custom user models it recommends using `AbstractBaseUser` not `AbstractUser`. This needlessly complicates things in my opinion, especially for beginners.

AbstractBaseUser vs AbstractUser

`AbstractBaseUser` requires a very fine level of control and customization. We essentially rewrite Django. This *can be* helpful, but if we just want a custom user model that can be updated with additional fields, the better choice is `AbstractUser` which subclasses `AbstractBaseUser`. In other words, we write much less code and have less opportunity to mess things up. It's the better choice unless you really know what you're doing with Django!

Note that we use both null and blank with our `age` field. These two terms are easy to confuse but quite distinct:

- `null` is **database-related**. When a field has `null=True` it can store a database entry as `NULL`, meaning no value.

- `blank` is **validation-related**, if `blank=True` then a form will allow an empty value, whereas if `blank=False` then a value is required.

In practice, `null` and `blank` are commonly used together in this fashion so that a form allows an empty value and the database stores that value as `NULL`.

A common gotcha to be aware of is that the **field type** dictates how to use these values. Whenever you have a string-based field like `CharField` or `TextField`, setting both `null` and `blank` as we've done will result in two possible values for "no data" in the database. Which is a bad idea. The Django convention is instead to use the empty string `''`, not `NULL`.

Forms

If we step back for a moment, what are the two ways in which we would interact with our new `CustomUser` model? One case is when a user signs up for a new account on our website. The other is within the `admin` app which allows us, as superusers, to modify existing users. So we'll need to update the two built-in forms for this functionality: UserCreationForm and UserChangeForm.

Stop the local server with `Control+c` and create a new file in the `users` app called `forms.py`.

Command Line

```
(news) $ touch users/forms.py
```

We'll update it with the following code to extend the existing `UserCreationForm` and `UserChangeForm` forms.

Code

```
# users/forms.py
from django import forms
from django.contrib.auth.forms import UserCreationForm, UserChangeForm

from .models import CustomUser


class CustomUserCreationForm(UserCreationForm):

    class Meta(UserCreationForm.Meta):
        model = CustomUser
        fields = UserCreationForm.Meta.fields + ('age',)


class CustomUserChangeForm(UserChangeForm):

    class Meta:
        model = CustomUser
        fields = UserChangeForm.Meta.fields
```

For both new forms we are setting the `model` to our `CustomUser` and using the default fields via `Meta.fields` which includes *all* default fields. To add our custom `age` field we simply tack it on at the end and it will display automatically on our future sign up page. Pretty slick, no?

The concept of fields on a form can be confusing at first so let's take a moment to explore it further. Our `CustomUser` model contains all the fields of the default `User` model **and** our additional `age` field which we set.

But what are these default fields? It turns out there are many including `username`, `first_name`, `last_name`, `email`, `password`, `groups`, and more. Yet when a user signs up for a new account on Django the default form only asks for a `username`, `email`, and `password`. This tells us that the default setting for fields on `UserCreationForm` is just `username`, `email`, and `password` even though there are many more fields available.

This might not click for you since understanding forms and models properly takes some time. In the next chapter we will create our own sign up, log in, and log out pages which will tie together our `CustomUser` model and forms more clearly. So hang tight!

The only other step we need is to update our `admin.py` file since Admin is tightly coupled to the default User model. We will extend the existing UserAdmin class to use our new `CustomUser` model.

Code

```
# users/admin.py
from django.contrib import admin
from django.contrib.auth.admin import UserAdmin

from .forms import CustomUserCreationForm, CustomUserChangeForm
from .models import CustomUser


class CustomUserAdmin(UserAdmin):
    add_form = CustomUserCreationForm
    form = CustomUserChangeForm
    model = CustomUser


admin.site.register(CustomUser, CustomUserAdmin)
```

Ok we're done! Type `Control+c` to stop the local server and go ahead and run `makemigrations` and `migrate` for the first time to create a new database that uses the custom user model.

Command Line

```
(news) $ python manage.py makemigrations users
(news) $ python manage.py migrate
```

Superuser

Let’s create a superuser account to confirm that everything is working as expected.

On the command line type the following command and go through the prompts.

Command Line

```
(news) $ python manage.py createsuperuser
```

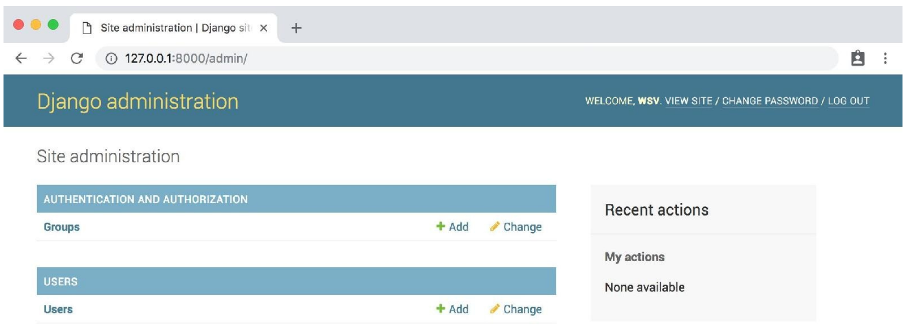
The fact that this works is the first proof our custom user model works as expected. Let’s view things in the admin too to be extra sure.

Start up the web server.

Command Line

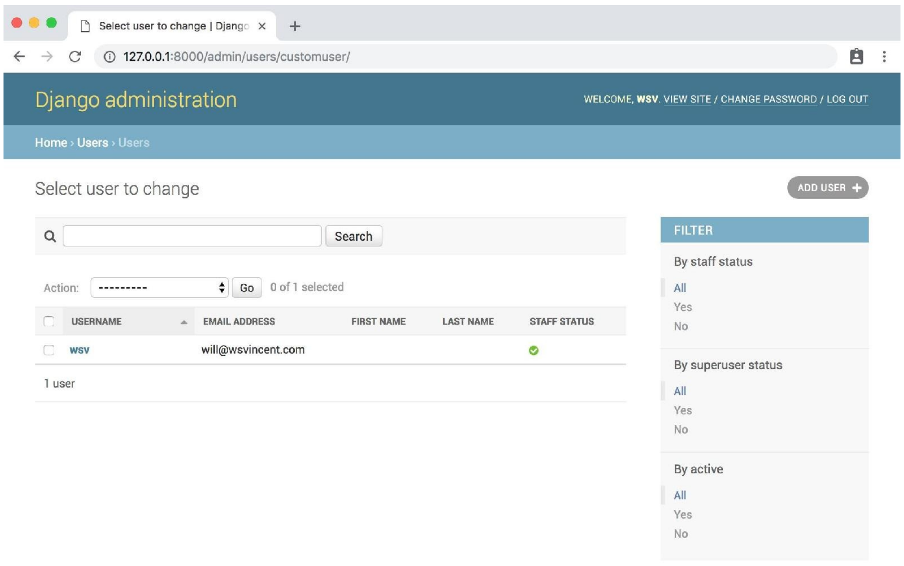
```
(news) $ python manage.py runserver
```

Then navigate to the admin at http://127.0.0.1:8000/admin and log in.



Admin page

If you click on the link for “Users” you should see your superuser account as well as the default fields of Username, Email Address, First Name, Last Name, and Staff Status.



USERNAME	EMAIL ADDRESS	FIRST NAME	LAST NAME	STAFF STATUS
wsv	will@wsvincent.com			✓

1 user

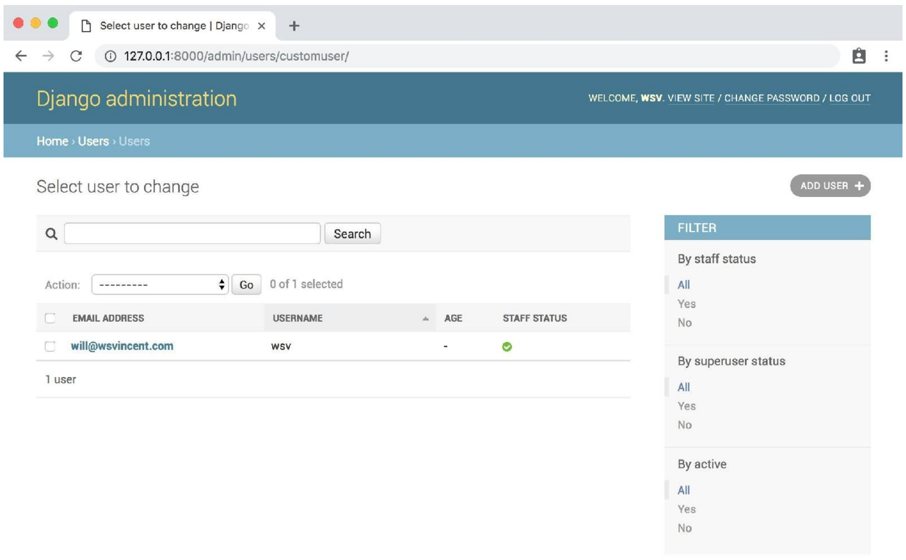
Admin one user

We can control the fields listed here via the `list_display` setting for `CustomUserAdmin`. Let's do that now so that it displays email, username, age, and staff status. This is a one-line change.

Code

```
from django.contrib import admin
from django.contrib.auth.admin import UserAdmin

from .forms import CustomUserCreationForm, CustomUserChangeForm
from .models import CustomUser


class CustomUserAdmin(UserAdmin):
    add_form = CustomUserCreationForm
    form = CustomUserChangeForm
    model = CustomUser
    list_display = ['email', 'username', 'age', 'is_staff', ] # new

admin.site.register(CustomUser, CustomUserAdmin)
```

Refresh the page and you should see the update.


Select user to change | Django
127.0.0.1:8000/admin/users/customuser/
Django administration
WELCOME, WSV. VIEW SITE / CHANGE PASSWORD / LOG OUT
Home › Users › Users
Select user to change
ADD USER
Search
Action: --------- Go 0 of 1 selected
FILTER
By staff status
All
Yes
No
By superuser status
All
Yes
No
By active
All
Yes
No
1 user

	EMAIL ADDRESS	USERNAME	AGE	STAFF STATUS
	will@wsvincent.com	wsv	-	✓

Admin custom list display

Conclusion

With our custom user model complete, we can now focus on building out the rest of our *Newspaper* app. In the next chapter we will configure and customize sign up, log in, and log out pages.

Chapter 9: User Authentication

Now that we have a working custom user model we can add the functionality every website needs: the ability to sign up, log in, and log out users. Django provides everything we need for log in and log out but we will need to create our own form to sign up new users. We'll also build a basic homepage with links to all three features so we don't have to type in the URLs by hand every time.

Templates

By default the Django template loader looks for templates in a nested structure within each app. So a `home.html` template in `users` would need to be located at `users/templates/users/home.html`. But a project-level `templates` folder approach is cleaner and scales better so that's what we'll use.

Let's create a new `templates` directory and within it a `registration` folder as that's where Django will look for the log in template.

Command Line

```
(news) $ mkdir templates
(news) $ mkdir templates/registration
```

Now we need to tell Django about this new directory by updating the configuration for `'DIRS'` in `settings.py`. This is a one-line change.

Code

```
# newspaper_project/settings.py
TEMPLATES = [
    {
        ...
        'DIRS': [os.path.join(BASE_DIR, 'templates')], # new
        ...
    }
]
```

If you think about what happens when you log in or log out of a site, you are immediately redirected to a subsequent page. We need to tell Django where to send users in each case. The `LOGIN_REDIRECT_URL` and `LOGOUT_REDIRECT_URL` settings do that. We'll configure both to redirect to our homepage which will have the named URL of `'home'`.

Remember that when we create our URL routes we have the option to add a `name` to each one. So when we make the homepage URL we'll make sure call it `'home'`.

Add these two lines at the bottom of the `settings.py` file.

Code

```
# newspaper_project/settings.py
LOGIN_REDIRECT_URL = 'home'
LOGOUT_REDIRECT_URL = 'home'
```

Now we can create four new templates:

Command Line

```
(news) $ touch templates/registration/login.html
(news) $ touch templates/base.html
(news) $ touch templates/home.html
(news) $ touch templates/signup.html
```

Here's the HTML code for each file to use. The `base.html` will be inherited by every other template in our project. By using a block like `{% block content %}` we can later override the content *just in this place* in other templates.

Code

```
<!-- templates/base.html -->
<!DOCTYPE html>
<html>
<head>
  <meta charset="utf-8">
  <title>Newspaper App</title>
</head>
<body>
  <main>
    {% block content %}
    {% endblock content %}
  </main>
</body>
</html>
```

Code

```
<!-- templates/home.html -->
{% extends 'base.html' %}

{% block title %}Home{% endblock title %}

{% block content %}
{% if user.is_authenticated %}
  Hi {{ user.username }}!
  <p><a href="{% url 'logout' %}">Log Out</a></p>
{% else %}
  <p>You are not logged in</p>
  <a href="{% url 'login' %}">Log In</a> |
  <a href="{% url 'signup' %}">Sign Up</a>
{% endif %}
{% endblock content %}
```

Code

```
<!-- templates/registration/login.html -->
{% extends 'base.html' %}

{% block title %}Log In{% endblock title %}

{% block content %}
<h2>Log In</h2>
<form method="post">
  {% csrf_token %}
  {{ form.as_p }}
  <button type="submit">Log In</button>
</form>
{% endblock content %}
```

Code

```
<!-- templates/signup.html -->
{% extends 'base.html' %}

{% block title %}Sign Up{% endblock title %}

{% block content %}
<h2>Sign Up</h2>
<form method="post">
  {% csrf_token %}
  {{ form.as_p }}
  <button type="submit">Sign Up</button>
</form>
{% endblock content %}
```

Our templates are now all set. Still to go are our URLs and views.

URLs

Let's start with the url routes. In our project-level `urls.py` file we want to have our `home.html` template appear as the homepage. But we don't want to build a dedicated `pages` app just yet, so we can use the shortcut of importing `TemplateView` and setting the `template_name` right in our url pattern.

Next we want to "include" both the `users` app and the built-in `auth` app. The reason is that the built-in `auth` app already provides views and urls for log in and log out. But for sign up we will need to create our own view and url. To ensure that our URL routes are consistent we place them *both* at `users/` so the eventual URLS will be `/users/login`, `/users/logout`, and `/users/signup`.

Code

```
# newspaper_project/urls.py
from django.contrib import admin
from django.urls import path, include # new
from django.views.generic.base import TemplateView # new

urlpatterns = [
    path('admin/', admin.site.urls),
    path('users/', include('users.urls')), # new
    path('users/', include('django.contrib.auth.urls')), # new
    path('', TemplateView.as_view(template_name='home.html'),
      name='home'), # new
]
```

Now create a `urls.py` file in the `users` app.

Command Line

```
(news) $ touch users/urls.py
```

Update `users/urls.py` with the following code:

Code

```
# users/urls.py
from django.urls import path

from .views import SignUpView

urlpatterns = [
    path('signup/', SignUpView.as_view(), name='signup'),
]
```

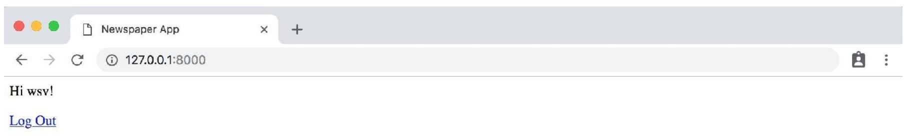
The last step is our `views.py` file which will contain the logic for our sign up form. We're using Django's generic `CreateView` here and telling it to use our `CustomUserCreationForm`, to redirect to `login` once a user signs up successfully, and that our template is named `signup.html`.

Code

```
# users/views.py
from django.urls import reverse_lazy
from django.views.generic import CreateView

from .forms import CustomUserCreationForm


class SignUpView(CreateView):
    form_class = CustomUserCreationForm
    success_url = reverse_lazy('login')
    template_name = 'signup.html'
```

Ok, phew! We're done. Let's test things out.

Start up the server with `python manage.py runserver` and go to the homepage at http://127.0.0.1:8000/.

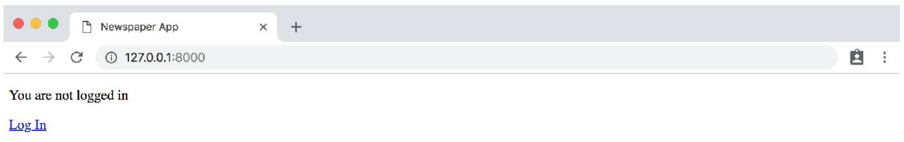


Hi wsv!

Log Out

Homepage logged in

We logged in to the admin in the previous chapter so you should see a personalized greeting here. Click on the "Log Out" link.


Newspaper App

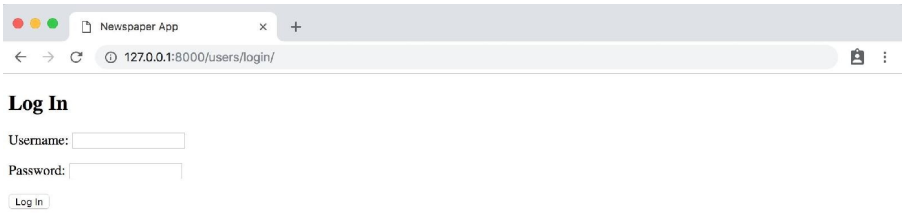
127.0.0.1:8000

You are not logged in

Log In

Homepage logged out

Now we're on the logged out homepage. Go ahead and click on *login* link and use your **superuser** credentials.


Newspaper App

127.0.0.1:8000/users/login/

Log In

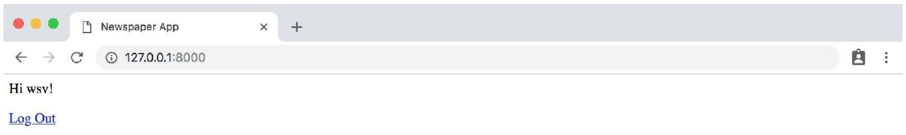
Username:

Password:

Log In

Log in

Upon successfully logging in you'll be redirected back to the homepage and see the same personalized greeting. It works!


Newspaper App

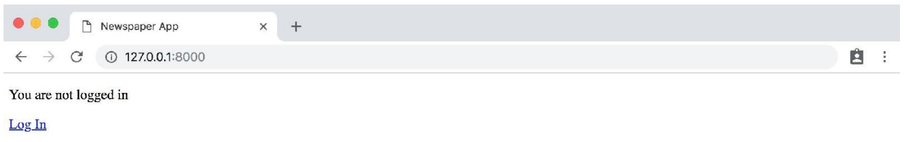
127.0.0.1:8000

Hi wsv!

Log Out

Homepage logged in

Now use the "Log Out" link to return to the homepage and this time click on the "Sign Up" link.


Newspaper App

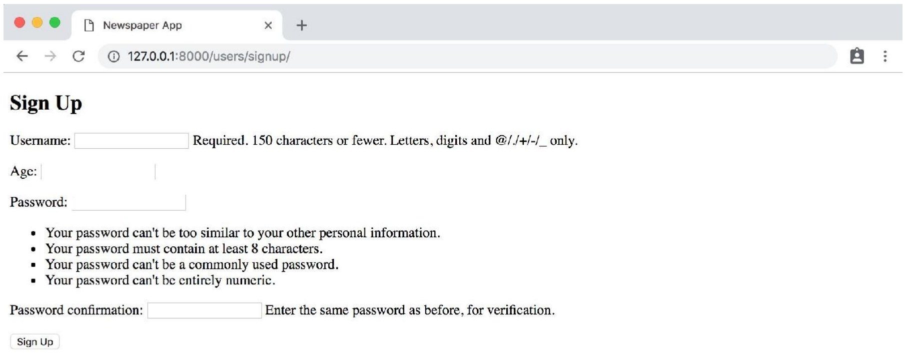
127.0.0.1:8000

You are not logged in

Log In

Homepage logged out

You'll be redirected to our signup page. See that the `age` field is included!


Newspaper App

127.0.0.1:8000/users/signup/

Sign Up

Username: Required. 150 characters or fewer. Letters, digits and @/./+/-/_ only.

Age:

Password:

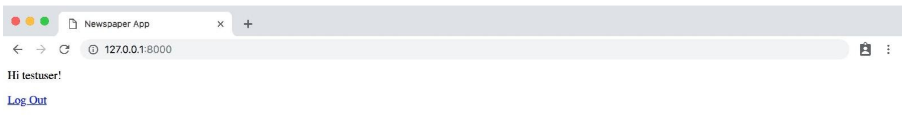
- Your password can't be too similar to your other personal information.
- Your password must contain at least 8 characters.
- Your password can't be a commonly used password.
- Your password can't be entirely numeric.

Password confirmation: Enter the same password as before, for verification.

Sign Up

Sign up page

Create a new user. Mine is called `testuser` and I've set the age to `25`. After successfully submitting the form you'll be redirected to the log in page. Log in with your new user and you'll again be redirected to the homepage with a personalized greeting for the new user.



Hi testuser!

Log Out

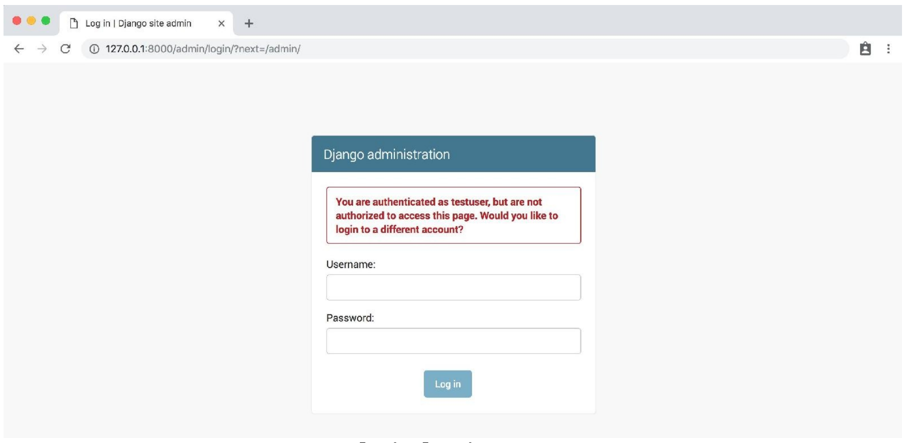
Homepage for testuser

Everything works as expected.

Admin

Let's also log in to the admin to view our two user accounts. Navigate to:

http://127.0.0.1:8000/admin and …


Log in | Django site admin
127.0.0.1:8000/admin/login/?next=/admin/
Django administration

You are authenticated as testuser, but are not authorized to access this page. Would you like to login to a different account?

Username:

Password:

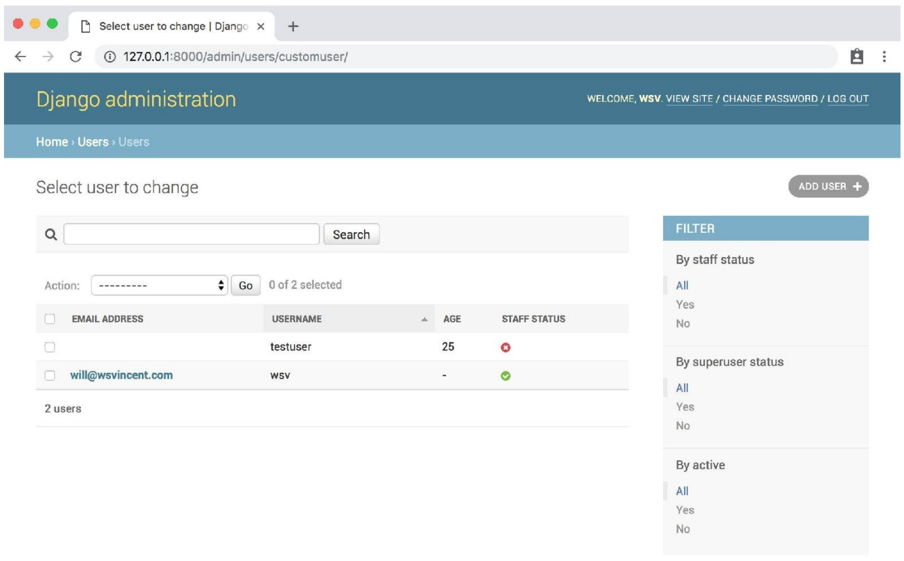
Log in

Admin log in wrong

What's this! Why can't we log in?

Well we're logged in with our new `testuser` account not our superuser account. Only a superuser account has the permissions to log in to the admin! So use your superuser account to log in instead.

After you've done that you should see the normal admin homepage. Click on `Users` and you can see our two users: the one we just created and your previous superuser name (mine is `wsv`).


Select user to change | Django

127.0.0.1:8000/admin/users/customuser/

Django administration

WELCOME, WSV. VIEW SITE / CHANGE PASSWORD / LOG OUT

Home › Users › Users

Select user to change

ADD USER

Search

Action: --------- Go 0 of 2 selected

	EMAIL ADDRESS	USERNAME	AGE	STAFF STATUS
☐		testuser	25	✗
☐	will@wsvincent.com	wsv	-	✓

2 users

FILTER

By staff status
All
Yes
No

By superuser status
All
Yes
No

By active
All
Yes
No

Users in the Admin

Everything is working but you may notice that there is no “Email address” for our `testuser`. Why is that? Well, look back at the sign up page at:

http://127.0.0.1:8000/users/signup/

You’ll see that it asks for username, age, and password but not an email! However we can easily change it. Let’s return to our `users/forms.py` file.

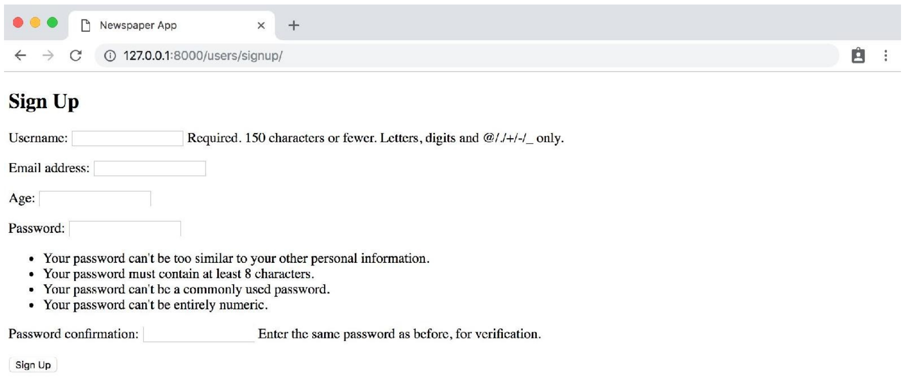
Currently under `fields` we’re using `Meta.fields` which just displays the default settings of username/password. But we can also explicitly set which fields we want displayed so let’s update it to ask for a username/email/password by setting it to `('username', 'email',)`. We don’t need to include the `password` fields because they are required! However all the other fields can be configured however we choose.

Code

```python
# users/forms.py
from django import forms
from django.contrib.auth.forms import UserCreationForm, UserChangeForm

from .models import CustomUser


class CustomUserCreationForm(UserCreationForm):

    class Meta(UserCreationForm.Meta):
        model = CustomUser
        fields = ('username', 'email', 'age',) # new


class CustomUserChangeForm(UserChangeForm):

    class Meta:
        model = CustomUser
        fields = ('username', 'email', 'age',) # new
```

The Python programming community agrees that [“explicit is better than implicit”] so naming our fields in this fashion is a good idea.

Now if you try out the sign up page again at http://127.0.0.1:8000/users/signup/ you can see the additional “Email address” field is there.



Sign Up

Username: Required. 150 characters or fewer. Letters, digits and @/./+/-/_ only.

Email address:

Age:

Password:

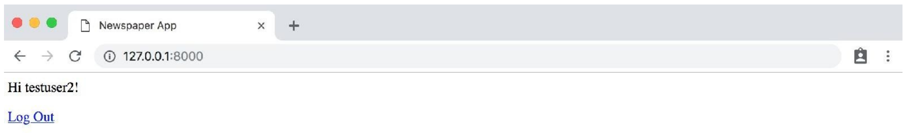
- Your password can't be too similar to your other personal information.
- Your password must contain at least 8 characters.
- Your password can't be a commonly used password.
- Your password can't be entirely numeric.

Password confirmation: Enter the same password as before, for verification.

Sign Up

New sign up page

Sign up with a new user account. I’ve named mine `testuser2` with an age of `18` and an email address of `testuser2@email.com`. Continue to log in and you’ll see a personalized greeting on the homepage.

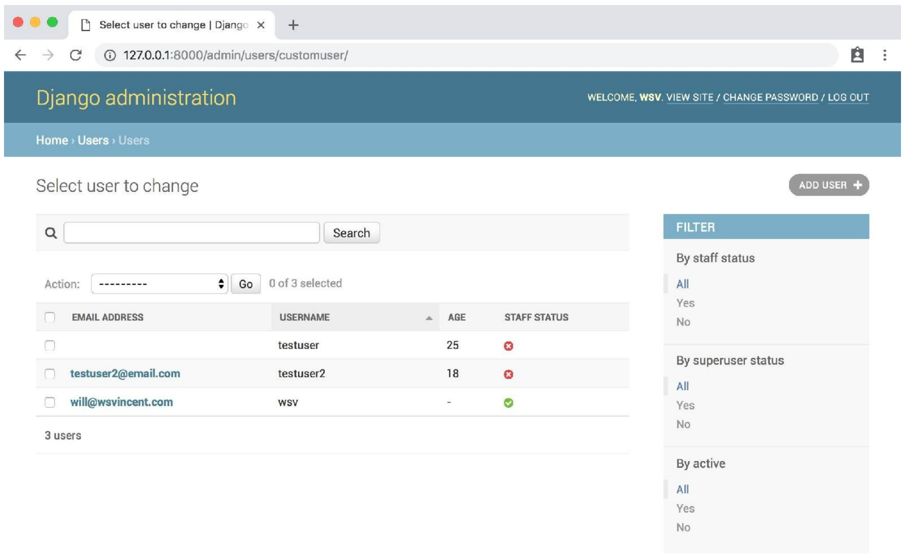


Hi testuser2!

Log Out

testuser2 homepage greeting

Then switch back to the admin page–log in using our superuser account to do so–and all three users are on display.



Select user to change

0 of 3 selected

	EMAIL ADDRESS	USERNAME	AGE	STAFF STATUS
☐		testuser	25	✗
☐	testuser2@email.com	testuser2	18	✗
☐	will@wsvincent.com	wsv	-	✓

3 users

Three users in the Admin

Django's user authentication flow requires a little bit of set up but you should be starting to see that it also provides us incredible flexibility to configure sign up and log in *exactly* how we want.

Conclusion

So far our *Newspaper* app has a custom user model and working sign up, log in, and log out pages. But you may have noticed our site doesn't look very good. In the next chapter we'll add Bootstrap for styling and create a dedicated `pages` app.

Chapter 10: Bootstrap

Web development requires a lot of skills. Not only do you have to program the website to work correctly, users expect it to look good, too. When you're creating everything from scratch, it can be overwhelming to also add all the necessary HTML/CSS for a beautiful site.

Fortunately there's Bootstrap, the most popular framework for building responsive, mobile-first projects. Rather than write all our own CSS and JavaScript for common website layout features, we can instead rely on Bootstrap to do the heavy lifting. This means with only a small amount of code on our part we can quickly have great looking websites. And if we want to make custom changes as a project progresses, it's easy to override Bootstrap where needed, too.

When you want to focus on the functionality of a project and not the design, Bootstrap is a great choice. That's why we'll use it here.

Pages app

In the previous chapter we displayed our homepage by including view logic in our `urls.py` file. While this approach works, it feels somewhat hackish to me and it certainly doesn't scale as a website grows over time. It is also probably somewhat confusing to Django newcomers. Instead we can and should create a dedicated `pages` app for all our static pages. This will keep our code nice and organized going forward.

On the command line use the `startapp` command to create our new `pages` app. If the server is still running you may need to type `Control+c` first to quit it.

Command Line

```
(news) $ python manage.py startapp pages
```

Then immediately update our `settings.py` file. I often forget to do this so it is a good practice to just think of creating a new app as a two-step process: run the `startapp` command then update `INSTALLED_APPS`.

Code

```
# newspaper_project/settings.py
INSTALLED_APPS = [
    'django.contrib.admin',
    'django.contrib.auth',
    'django.contrib.contenttypes',
    'django.contrib.sessions',
    'django.contrib.messages',
    'django.contrib.staticfiles',
    'users.apps.UsersConfig',
    'pages.apps.PagesConfig', # new
]
```

Now we can update our project-level `urls.py` file. Go ahead and remove the import of `TemplateView`. We will also update the `''` route to include the `pages` app.

Code

```
# newspaper_project/urls.py
from django.contrib import admin
from django.urls import path, include

urlpatterns = [
    path('admin/', admin.site.urls),
    path('users/', include('users.urls')),
    path('users/', include('django.contrib.auth.urls')),
    path('', include('pages.urls')), # new
]
```

It's time to add our homepage which means Django's standard urls/views/templates dance. We'll start with the `pages/urls.py` file. First create it.

Command Line

```
(news) $ touch pages/urls.py
```

Then import our not-yet-created views, set the route paths, and make sure to name each url, too.

Code

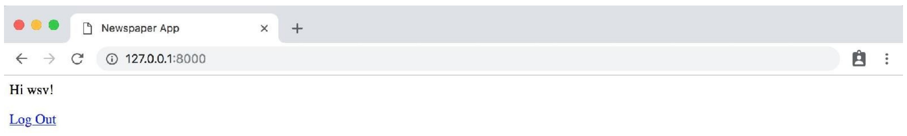
```
# pages/urls.py
from django.urls import path

from .views import HomePageView

urlpatterns = [
    path('', HomePageView.as_view(), name='home'),
]
```

The `views.py` code should look familiar at this point. We're using Django's `TemplateView` generic class-based view which means we only need to specify our `template_name` to use it.

Code

```
# pages/views.py
from django.views.generic import TemplateView


class HomePageView(TemplateView):
    template_name = 'home.html'
```

We already have an existing `home.html` template. Let's confirm it still works as expected with our new url and view. Start up the local server `python manage.py runserver` and navigate to the homepage at http://127.0.0.1:8000/ to confirm it remains unchanged.



Hi wsv!

Log Out

Homepage logged in

It should show the name of your logged in superuser account which we used at the end of the last chapter.

Tests

We've added new code and functionality which means it's time for tests. You can never have enough tests in your projects. Even though they take some upfront time to write, they always save you time down the road and give confidence as a project grows in complexity.

There are two ideal times to add tests: either before you write any code (test-driven-development) or immediately after you've added new functionality and it's clear in your mind.

Currently our project has four pages:

- home
- sign up
- log in
- log out

However we only need to test the first two. Log in and logo ut are part of Django and rely on internal views and url routes. They therefore already have test coverage. If we made substantial changes to them in the future, we *would* want to add tests for that. But as a general rule, you do not need to add tests for core Django functionality.

Since we have urls, templates, and views for each of our two new pages we'll add tests for each. Django's [SimpleTestCase](#) will suffice for testing the homepage but the sign up page uses the database so we'll need to use [TestCase](#) too.

Here's what the code should look like in your `pages/tests.py` file.

Code

```
# pages/tests.py
from django.contrib.auth import get_user_model
from django.test import SimpleTestCase, TestCase
from django.urls import reverse


class HomePageTests(SimpleTestCase):

    def test_home_page_status_code(self):
        response = self.client.get('/')
        self.assertEqual(response.status_code, 200)

    def test_view_url_by_name(self):
        response = self.client.get(reverse('home'))
        self.assertEqual(response.status_code, 200)

    def test_view_uses_correct_template(self):
        response = self.client.get(reverse('home'))
        self.assertEqual(response.status_code, 200)
        self.assertTemplateUsed(response, 'home.html')


class SignupPageTests(TestCase):

    username = 'newuser'
    email = 'newuser@email.com'

    def test_signup_page_status_code(self):
        response = self.client.get('/users/signup/')
        self.assertEqual(response.status_code, 200)

    def test_view_url_by_name(self):
        response = self.client.get(reverse('signup'))
        self.assertEqual(response.status_code, 200)

    def test_view_uses_correct_template(self):
        response = self.client.get(reverse('signup'))
        self.assertEqual(response.status_code, 200)
        self.assertTemplateUsed(response, 'signup.html')

    def test_signup_form(self):
        new_user = get_user_model().objects.create_user(
            self.username, self.email)
        self.assertEqual(get_user_model().objects.all().count(), 1)
        self.assertEqual(get_user_model().objects.all()
                         [0].username, self.username)
        self.assertEqual(get_user_model().objects.all()
                         [0].email, self.email)
```

On the top line we use get_user_model() to reference our custom user model. Then for both pages we test three things:

- the page exists and returns a HTTP 200 status code
- the page uses the correct url name in the view
- the proper template is being used

Our sign up page also has a form so we should test that, too. In the test `test_signup_form` we're verifying that when a username and email address are POSTed (sent to the database), they match what is stored on the `CustomUser` model.

Quit the local server with `Control+c` and then run our tests to confirm everything passes.

Command Line

```
(news) $ python manage.py test
```

Bootstrap

If you've never used Bootstrap before you're in for a real treat. It accomplishes so much in so little code.

There are two ways to add Bootstrap to a project: you can download all the files and serve them locally or rely on a Content Delivery Network (CDN). The second approach is simpler to implement provided you have a consistent internet connection so that's what we'll use here.

Bootstrap comes with a starter template that includes the basic files needed. Notably there are four that we incorporate:

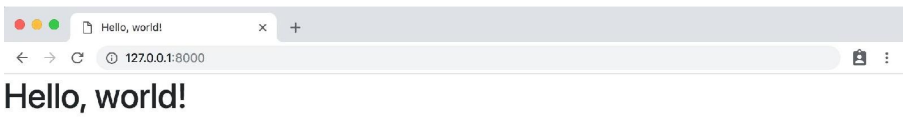
- `Bootstrap.css`
- `jQuery.js`
- `Popper.js`
- `Bootstrap.js`

Here's what the updated `base.html` file should look like. Generally you should type all code examples yourself but as this is one is quite long, it's ok to copy and paste here.

Code

```
<!-- templates/base.html -->
<!doctype html>
<html lang="en">
  <head>
    <!-- Required meta tags -->
    <meta charset="utf-8">
    <meta name="viewport" content="width=device-width,
    initial-scale=1, shrink-to-fit=no">

    <!-- Bootstrap CSS -->
    <link rel="stylesheet"
    href="https://stackpath.bootstrapcdn.com/bootstrap/4.1.3/css/\
    bootstrap.min.css"
    integrity="sha384-MCw98/SFnGE8fJT3GXwEOngsV7Zt27NXFoaoApmYm81i\
    uXoPkFOJwJ8ERdknLPMO"
    crossorigin="anonymous">

    <title>Hello, world!</title>
  </head>
  <body>
    <h1>Hello, world!</h1>

    <!-- Optional JavaScript -->
    <!-- jQuery first, then Popper.js, then Bootstrap JS -->
    <script src="https://code.jquery.com/jquery-3.3.1.slim.min.js"
    integrity="sha384-q8i/X+965DzO0rT7abK41JStQIAqVgRVzpbzo5smXKp4\
    YfRvH+8abtTE1Pi6jizo"
    crossorigin="anonymous"></script>
    <script src="https://cdnjs.cloudflare.com/ajax/libs/popper.js/\
    1.14.3/
    umd/popper.min.js"
    integrity="sha384-ZMP7rVo3mIykV+2+9J3UJ46jBk0WLaUAdn689aCwoqbB\
    JiSnjAK/
    l8WvCWPIPm49"
    crossorigin="anonymous"></script>
    <script src="https://stackpath.bootstrapcdn.com/bootstrap/4.1.3/\
    js/bootstrap.min.js"
    integrity="sha384-ChfqqxuZUCnJSK3+MXmPNIyE6ZbWh2IMqE241rYiqJxyMiZ\
    6OW/JmZQ5stwEULTy"
    crossorigin="anonymous"></script>
  </body>
</html>
```

If you start the server again with `python manage.py runserver` and refresh the homepage at http://127.0.0.1:8000/ you'll see that only the font size has changed at the moment.



Hello, world!

Homepage with Bootstrap

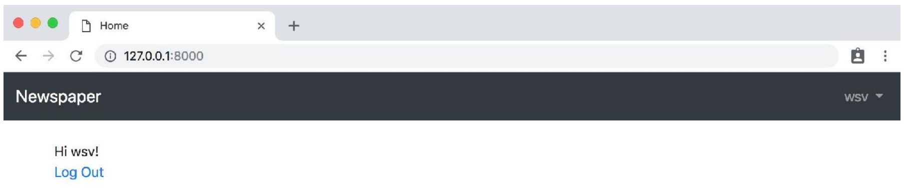
Let's add a navigation bar at the top of the page which contains our links for the homepage, log in, log out, and sign up. Notably we can use the if/else tags in the Django templating engine to add some basic logic. We want to show a "log in" and "sign up" button to users who are logged out, but a "log out" and "change password" button to users logged in.

Here's what the code looks like. Again, it's ok to copy/paste here since the focus of this book is on learning Django not HTML, CSS, and Bootstrap.

Code

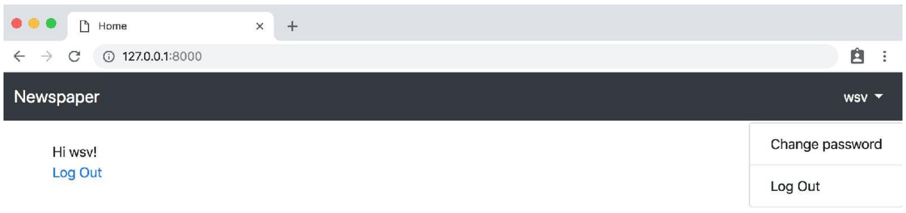
```
<!-- templates/base.html -->
<!doctype html>
<html lang="en">
  <head>
    <!-- Required meta tags -->
    <meta charset="utf-8">
    <meta name="viewport" content="width=device-width,
    initial-scale=1, shrink-to-fit=no">

    <!-- Bootstrap CSS -->
    <link rel="stylesheet"
    href="https://stackpath.bootstrapcdn.com/bootstrap/4.1.3/css/\
    bootstrap.min.css"
    integrity="sha384-MCw98/SFnGE8fJT3GXwEOngsV7Zt27NXFoaoApmYm81i\
    uXoPkFOJwJ8ERdknLPMO"
    crossorigin="anonymous">

    <title>{% block title %}Newspaper App{% endblock title %}</title>
  </head>
  <body>
    <nav class="navbar navbar-expand-md navbar-dark bg-dark mb-4">
      <a class="navbar-brand" href="{% url 'home' %}">Newspaper</a>
      <button class="navbar-toggler" type="button" data-toggle="collapse"
      data-target="#navbarCollapse" aria-controls="navbarCollapse"
      aria-expanded="false" aria-label="Toggle navigation">
        <span class="navbar-toggler-icon"></span>
      </button>
      <div class="collapse navbar-collapse" id="navbarCollapse">
        {% if user.is_authenticated %}
          <ul class="navbar-nav ml-auto">
            <li class="nav-item">
              <a class="nav-link dropdown-toggle" href="#" id="userMenu"
                data-toggle="dropdown" aria-haspopup="true"
                aria-expanded="false">
                {{ user.username }}
              </a>
              <div class="dropdown-menu dropdown-menu-right"
                aria-labelledby="userMenu">
                <a class="dropdown-item"
                href="{% url 'password_change'%}">Change password</a>
                <div class="dropdown-divider"></div>
                <a class="dropdown-item" href="{% url 'logout' %}">
                Log Out</a>
              </div>
            </li>
          </ul>
        {% else %}
          <form class="form-inline ml-auto">
            <a href="{% url 'login' %}" class="btn btn-outline-secondary">
            Log In</a>
            <a href="{% url 'signup' %}" class="btn btn-primary ml-2">
            Sign up</a>
          </form>
        {% endif %}
      </div>
    </nav>
    <div class="container">
      {% block content %}
      {% endblock content %}
    </div>

    <!-- Optional JavaScript -->
    <!-- jQuery first, then Popper.js, then Bootstrap JS -->
    <script src="https://code.jquery.com/jquery-3.3.1.slim.min.js"
    integrity="sha384-q8i/X+965DzO0rT7abK41JStQIAqVgRVzpbzo5smXKp4\
YfRvH+8abtTE1Pi6jizo"
    crossorigin="anonymous"></script>
    <script src="https://cdnjs.cloudflare.com/ajax/libs/popper.js/\
1.14.3/
umd/popper.min.js"
    integrity="sha384-ZMP7rVo3mIykV+2+9J3UJ46jBk0WLaUAdn689aCwoqbB\
JiSnjAK/
l8WvCWPIPm49"
    crossorigin="anonymous"></script>
    <script src="https://stackpath.bootstrapcdn.com/bootstrap/4.1.3/\
js/bootstrap.min.js"
    integrity="sha384-ChfqqxuZUCnJSK3+MXmPNIyE6ZbWh2IMqE241rYiqJxyMiZ\
6OW/JmZQ5stwEULTy"
    crossorigin="anonymous"></script>
  </body>
</html>
```

If you refresh the homepage at http://127.0.0.1:8000/ our new nav has magically appeared! We’ve also added in our `{% block content %}` tags so the user greeting has returned, as has our “Newspaper App” in the `title`.



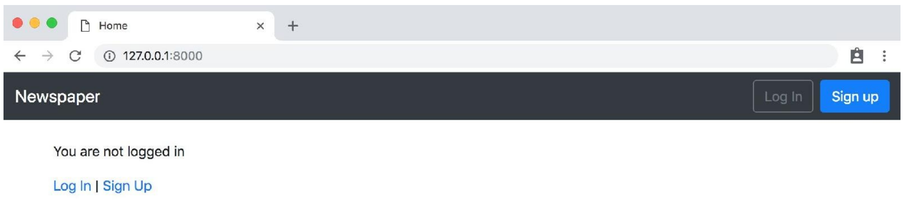
Homepage with Bootstrap nav logged in

Click on the username in the upper right hand corner–`wsv` in my case–to see the nice dropdown menu Bootstrap provides.



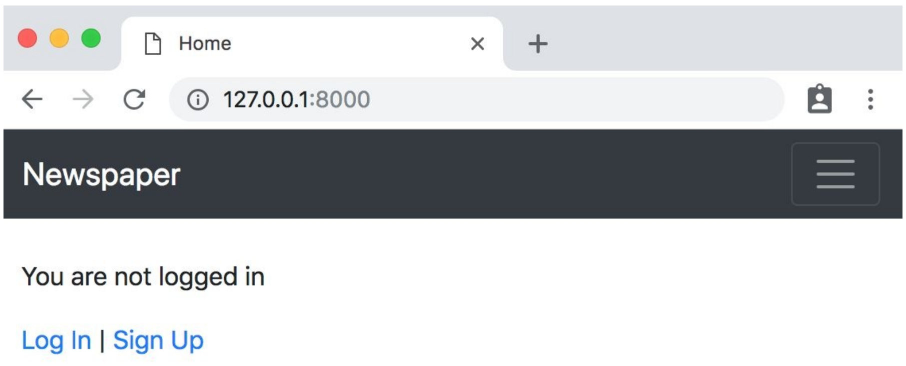
Homepage with Bootstrap nav logged in and dropdown

If you click on the “Log Out” link then our nav bar changes offering links to either “Log In” or “Sign Up.”



Homepage with Bootstrap nav logged out

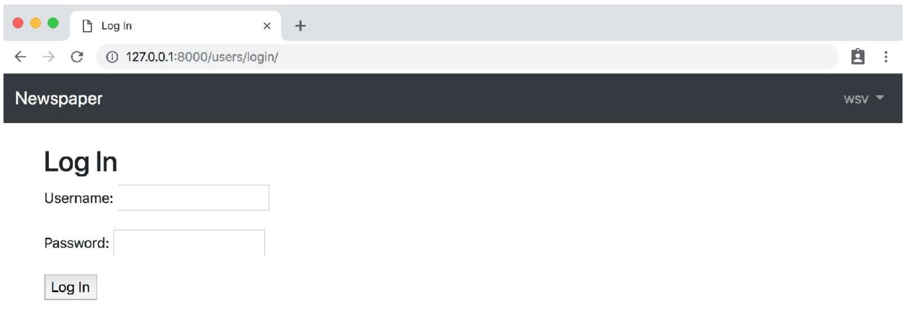
Better yet if you shrink the size of your browser window Bootstrap automatically resizes and makes adjustments so it looks good on a mobile device, too.



Homepage mobile with hamburger icon

You can even change the width of the web browser to see how the side margins change as the screen size increases and decreases.

If you click on the "Log Out" button and then "Log In" from the top nav you can also see that our log in page http://127.0.0.1:8000/users/login looks better too.



Bootstrap login

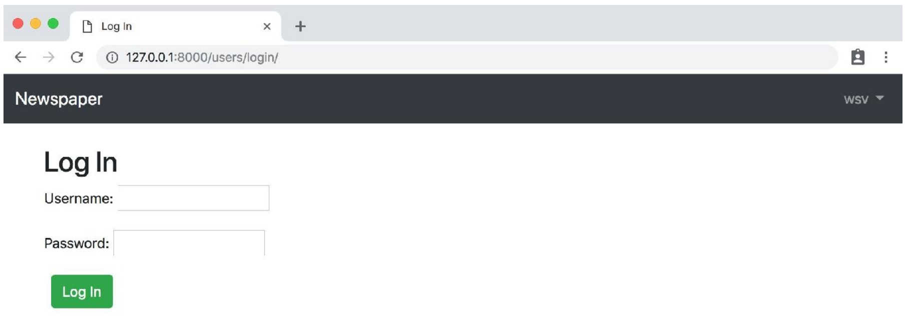
The only thing that looks off is our "Login" button. We can use Bootstrap to add some nice styling such as making it green and inviting.

Change the "button" line in `templates/registration/login.html` as follows.

Code

```
<!-- templates/registration/login.html -->
...
<button class="btn btn-success ml-2" type="submit">Log In</button>
...
```

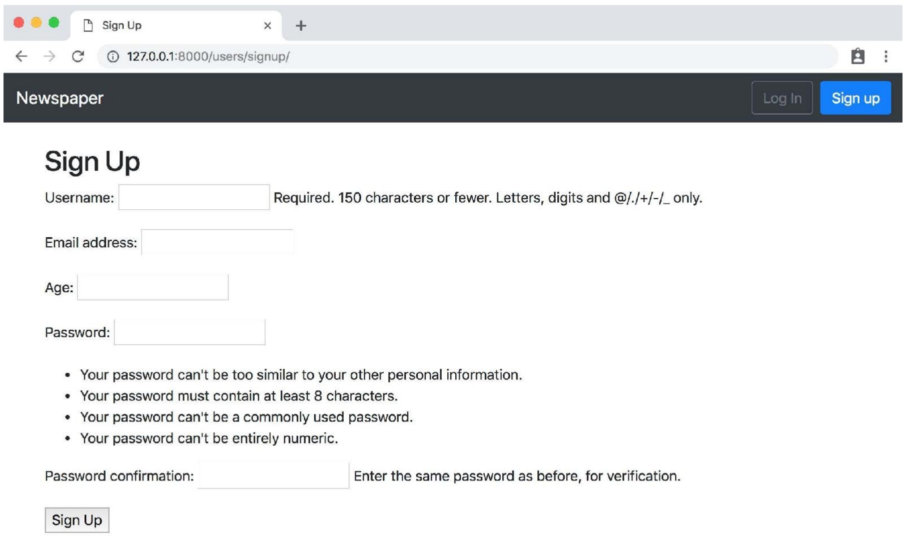
Now refresh the page to see our new button.



Bootstrap log in with new button

Sign Up Form

Our sign up page at http://127.0.0.1:8000/users/signup/ has Bootstrap stylings but also distracting helper text. For example after "Username" it says "Required. 150 characters or fewer. Letters, digits and @/./+/-/_ only."



Sign Up

Username: Required. 150 characters or fewer. Letters, digits and @/./+/-/_ only.

Email address:

Age:

Password:

- Your password can't be too similar to your other personal information.
- Your password must contain at least 8 characters.
- Your password can't be a commonly used password.
- Your password can't be entirely numeric.

Password confirmation: Enter the same password as before, for verification.

Sign Up

Updated navbar logged out

Where did that text come from, right? Whenever something feels like "magic" in Django rest assured that it is decidedly not. Likely the code came from an internal piece of Django.

The fastest method I've found to figure out what's happening under-the-hood in Django is to simply go to the Django source code on Github, use the search bar and try to find the specific piece of text.

For example, if you do a search for "150 characters or fewer" you'll find yourself on the `django/contrib/auth/models.py` page located here on line 301. The text comes as part of the `auth` app, on the `username` field for `AbstractUser`.

We have three options now:

- override the existing `help_text`
- hide the `help_text`
- restyle the `help_text`

We'll choose the third option since it's a good way to introduce the excellent 3rd party package django-crispy-forms.

Working with forms is a challenge and `django-crispy-forms` makes it easier to write DRY code.

First stop the local server with `Control+c`. Then use `Pipenv` to install the package in our project.

Command Line

```
(news) $ pipenv install django-crispy-forms==1.7.2
```

Add the new app to our `INSTALLED_APPS` list in the `settings.py` file. As the number of apps starts to grow, I find it helpful to distinguish between 3rd party apps and local apps I’ve added myself. Here’s what the code looks like now.

Code

```
# newspaper_project/settings.py
INSTALLED_APPS = [
    'django.contrib.admin',
    'django.contrib.auth',
    'django.contrib.contenttypes',
    'django.contrib.sessions',
    'django.contrib.messages',
    'django.contrib.staticfiles',

    # 3rd Party
    'crispy_forms', # new

    # Local
    'users.apps.UsersConfig',
    'pages.apps.PagesConfig',
]
```

Since we’re using Bootstrap4 we should also add that config to our `settings.py` file. This goes on the bottom of the file.

Code

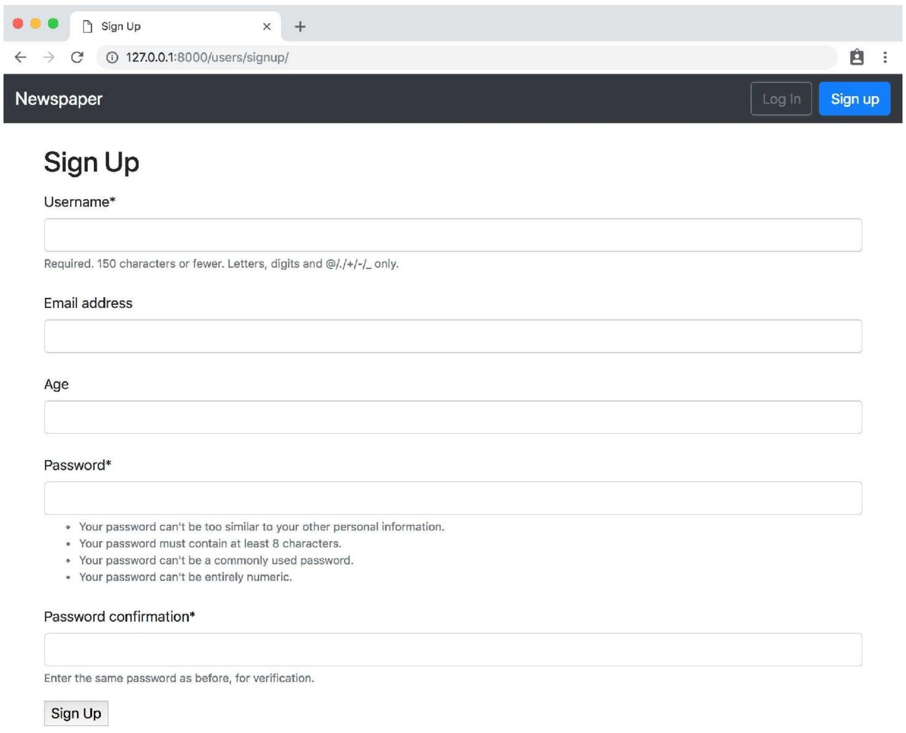
```
# newspaper_project/settings.py
CRISPY_TEMPLATE_PACK = 'bootstrap4'
```

Now in our `signup.html` template we can quickly use crispy forms. First we load `crispy_forms_tags` at the top and then swap out `{{ form.as_p }}` for `{{ form|crispy }}`.

Code

```
<!-- templates/signup.html -->
{% extends 'base.html' %}

{% load crispy_forms_tags %}

{% block title %}Sign Up{% endblock title%}

{% block content %}
  <h2>Sign up</h2>
  <form method="post">
    {% csrf_token %}
    {{ form|crispy }}
    <button type="submit">Sign Up</button>
  </form>
{% endblock content %}
```

If you start up the server again with `python manage.py runserver` and refresh the sign up page we can see the new changes.



Sign Up

Username*

Required. 150 characters or fewer. Letters, digits and @/./+/-/_ only.

Email address

Age

Password*

- Your password can't be too similar to your other personal information.
- Your password must contain at least 8 characters.
- Your password can't be a commonly used password.
- Your password can't be entirely numeric.

Password confirmation*

Enter the same password as before, for verification.

Sign Up

Crispy sign up page

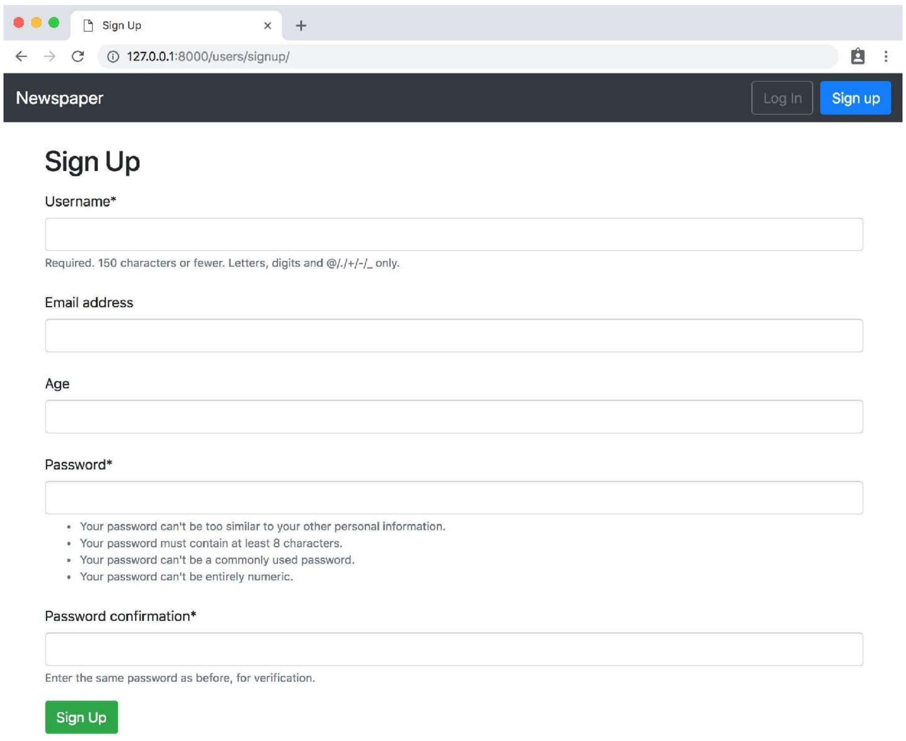
Much better. Although how about if our “Sign Up” button was a little more inviting? Maybe make it green? Bootstrap has all sorts of button styling options we can choose from. Let’s use the “success” one which has a green background and white text.

Update the `signup.html` file on the line for the sign up button.

Code

```
<!-- templates/signup.html -->
...
<button class="btn btn-success" type="submit">Sign Up</button>
...
```

Refresh the page and you can see our updated work.



Sign Up

Username*

Required. 150 characters or fewer. Letters, digits and @/./+/-/_ only.

Email address

Age

Password*

- Your password can't be too similar to your other personal information.
- Your password must contain at least 8 characters.
- Your password can't be a commonly used password.
- Your password can't be entirely numeric.

Password confirmation*

Enter the same password as before, for verification.

Crispy sign up page green button

Next Steps

Our *Newspaper* app is starting to look pretty good. The last step of our user auth flow is to configure password change and reset. Here again Django has taken care of the heavy lifting for us so it requires a minimal amount of code on our part.

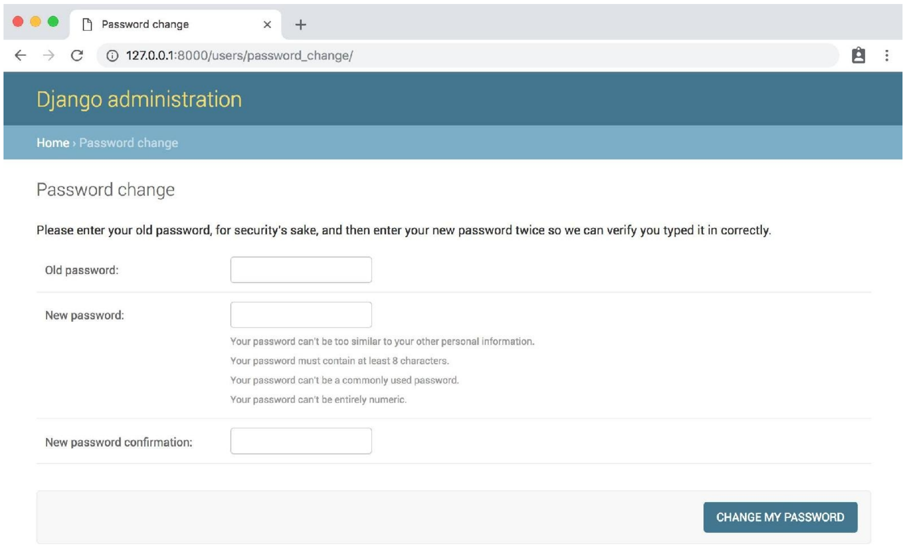
Chapter 11: Password Change and Reset

In this chapter we will complete the authorization flow of our *Newspaper* app by adding password change and reset functionality. Users will be able to change their current password or, if they've forgotten it, to reset it via email.

Just as Django comes with built-in views and URLs for log in and log out, so too it also comes with views/URLs for both password change and reset. We'll go through the default versions first and then learn how to customize them with our own Bootstrap-powered templates and email service.

Password Change

Letting users change their passwords is a common feature on many websites. Django provides a default implementation that already works at this stage. To try it out first click on the "Log In" button to make sure you're logged in. Then navigate to the "Password change" page at http://127.0.0.1:8000/users/password_change/.



Password change

Please enter your old password, for security's sake, and then enter your new password twice so we can verify you typed it in correctly.

Old password:

New password:

Your password can't be too similar to your other personal information.
Your password must contain at least 8 characters.
Your password can't be a commonly used password.
Your password can't be entirely numeric.

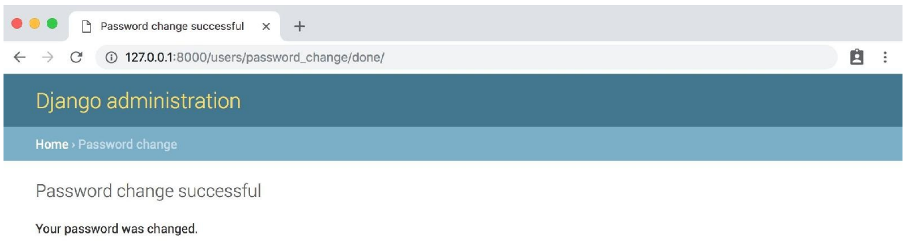
New password confirmation:

Password change

Enter in both your old password and then a new one. Then click the "Change My Password" button.

You'll be redirected to the "Password change successful" page located at:

http://127.0.0.1:8000/users/password_change/done/.


Password change successful

127.0.0.1:8000/users/password_change/done/

Django administration

Home › Password change

Password change successful

Your password was changed.

Password change done

Customizing password change

Let's customize these two password change pages so that they match the look and feel of our *Newspaper* site. Because Django already has created the views and URLs for us, we only need to add new templates.

On the command line stop the local server `Control+c` and create two new template files in the `registration` folder.

Command Line

```
(news) $ touch templates/registration/password_change_form.html
(news) $ touch templates/registration/password_change_done.html
```

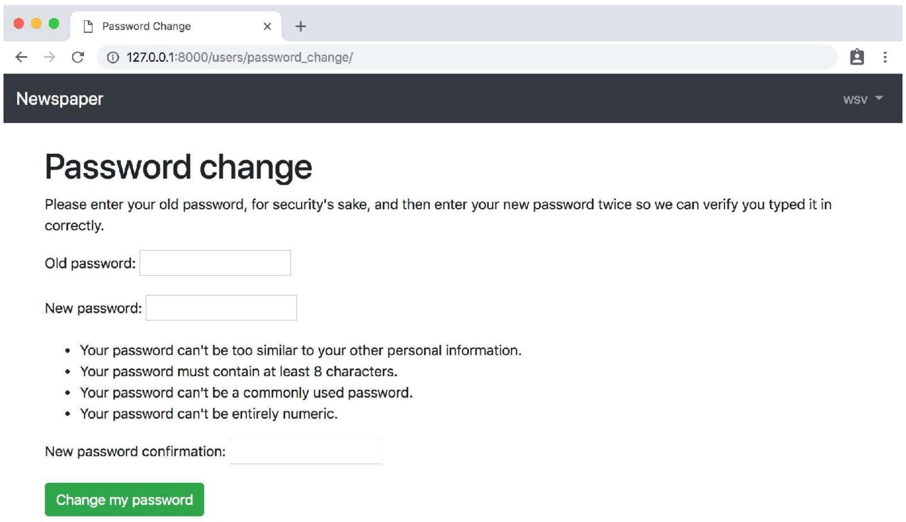
Update `password_change_form.html` with the following code.

Code

```
<!-- templates/registration/password_change_form.html -->
{% extends 'base.html' %}

{% block title %}Password Change{% endblock title %}

{% block content %}
  <h1>Password change</h1>
  <p>Please enter your old password, for security's sake, and then enter your
  new password twice so we can verify you typed it in correctly.</p>

  <form method="POST">
    {% csrf_token %}
    {{ form.as_p }}
    <input class="btn btn-success" type="submit" value="Change my password">
  </form>
{% endblock content %}
```

At the top we extend `base.html` and set our page title. Because we used "block" titles in our `base.html` file we can override them here. The form uses `POST` since we're sending data and a `csrf_token` for security reasons. By using `form.as_p` we're simply displaying in paragraphs the content of the default password reset form. And finally we include a submit button that uses Bootstrap's `btn btn-success` styling to make it green.

Go ahead and refresh the page at http://127.0.0.1:8000/users/password_change/ to see our changes.


Password Change

127.0.0.1:8000/users/password_change/

Newspaper wsv

Password change

Please enter your old password, for security's sake, and then enter your new password twice so we can verify you typed it in correctly.

Old password:

New password:

- Your password can't be too similar to your other personal information.
- Your password must contain at least 8 characters.
- Your password can't be a commonly used password.
- Your password can't be entirely numeric.

New password confirmation:

Change my password

New password change form

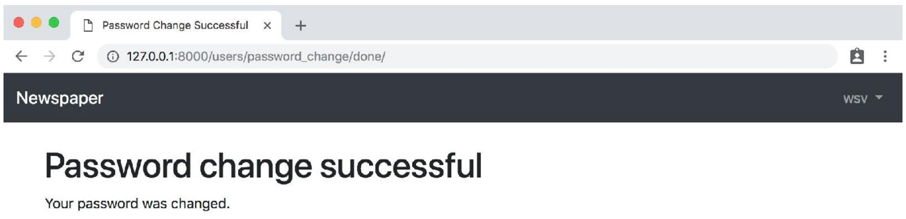
Next up is the `password_change_done` template.

Code

```
<!-- templates/registration/password_change_done.html -->
{% extends 'base.html' %}

{% block title %}Password Change Successful{% endblock title %}

{% block content %}
    <h1>Password change successful</h1>
    <p>Your password was changed.</p>
{% endblock content %}
```

It also extends `base.html` and includes a new title. However there's no form on the page, just new text.

The new page is at http://127.0.0.1:8000/users/password_change/done/.


Password Change Successful

127.0.0.1:8000/users/password_change/done/

Newspaper wsv

Password change successful

Your password was changed.

New password change done

That wasn't too bad, right? Certainly it was a lot less work than creating everything from scratch, especially all the code around securely updating a user's password.

Next up is our password reset functionality.

Password reset

Password reset handles the common case of users forgetting their passwords. The steps are very similar to configuring password change, as we just did. Django already provides a default implementation that we will use and then customize the templates so it matches the rest of our site.

The only configuration required is telling Django **how** to send emails. After all, a user can only reset a password if they have access to the email linked to the account. In production we'll use the email service SendGrid to actually send the emails but for testing purposes we can rely on Django's console backend setting which outputs the email text to our command line console instead.

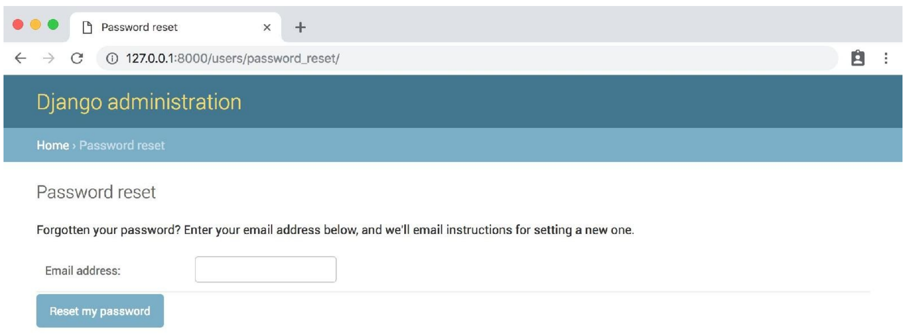
At the bottom of the `settings.py` file make the following one-line change.

Code

```
# newspaper_project/settings.py
EMAIL_BACKEND = 'django.core.mail.backends.console.EmailBackend'
```

And we're all set! Django will take care of all the rest for us. Let's try it out.

Navigate to http://127.0.0.1:8000/users/password_reset/ to view the default password reset page.



Password reset

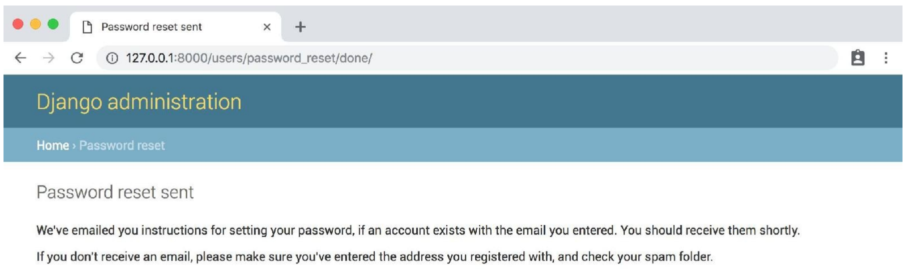
Forgotten your password? Enter your email address below, and we'll email instructions for setting a new one.

Email address:

Default password reset page

Make sure the email address you enter matches one of your user accounts. Upon submission you'll then be redirected to the password reset done page at:

http://127.0.0.1:8000/users/password_reset/done/.



Password reset sent

We've emailed you instructions for setting your password, if an account exists with the email you entered. You should receive them shortly.

If you don't receive an email, please make sure you've entered the address you registered with, and check your spam folder.

Default password reset done page

Which says to check our email. Since we've told Django to send emails to the command line console, the email text will now be there. This is what I see in my console.

Command Line

```
Content-Type: text/plain; charset="utf-8"
MIME-Version: 1.0Content-Transfer-Encoding: 7bit
Subject: Password reset on 127.0.0.1:8000
From: webmaster@localhost
To: will@wsvincent.com
Date: Wed, 22 Aug 2018 19:55:15 -0000
Message-ID: <153496771529.17508.13142438928745789128@1.0.0.127.in-addr.arpa>


You're receiving this email because you requested a password reset for your
user account at 127.0.0.1:8000.
Please go to the following page and choose a new password:
http://127.0.0.1:8000/users/reset/MQ/4yy-2dde95cd69631c8d938e/

Your username, in case you've forgotten: wsv

Thanks for using our site!

The 127.0.0.1:8000 team
```

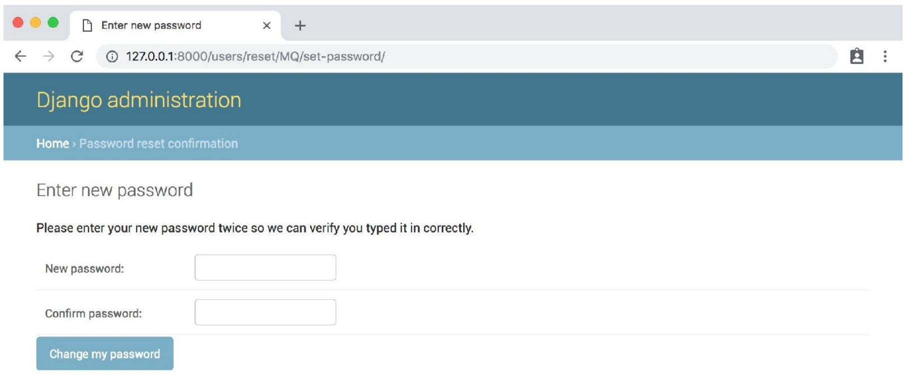
Your email text should be identical except for three lines:

- the "To" on the sixth line contains the email address of the user
- the URL link contains a secure token that Django randomly generates for us and can be used only once
- Django helpfully reminds us of our username

We will customize all of the email default text shortly but for now focus on finding the link provided. In the message above mine is:

http://127.0.0.1:8000/users/reset/MQ/4yy-2dde95cd69631c8d938e/

Enter this link into your web browser and you'll be redirected to the "change password page".


Enter new password
127.0.0.1:8000/users/reset/MQ/set-password/
Django administration
Home › Password reset confirmation

Enter new password

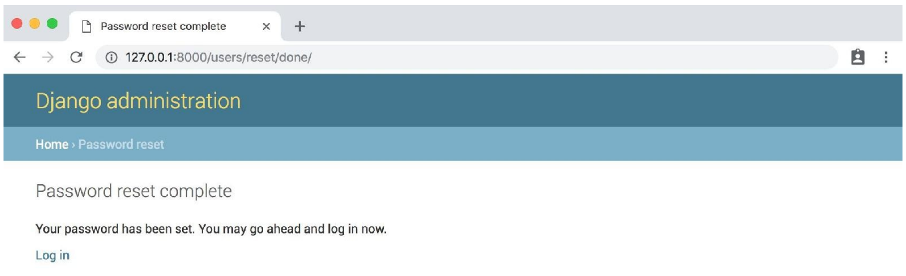
Please enter your new password twice so we can verify you typed it in correctly.

New password:

Confirm password:

Default change password page

Now enter in a new password and click on the "Change my password" button. The final step is you'll be redirected to the "Password reset complete" page.



Password reset complete

Your password has been set. You may go ahead and log in now.

Log in

Default password reset complete

To confirm everything worked, click on the "Log in" link and use your new password. It should work.

Custom Templates

As with "Password change" we only need to create new templates to customize the look and feel of password reset. Stop the local server with `Control+c` and then create four new template files.

Command Line

```
(news) $ touch templates/registration/password_reset_form.html
(news) $ touch templates/registration/password_reset_done.html
(news) $ touch templates/registration/password_reset_confirm.html
(news) $ touch templates/registration/password_reset_complete.html
```

Start with the password reset form which is `password_reset_form.html`.

Code

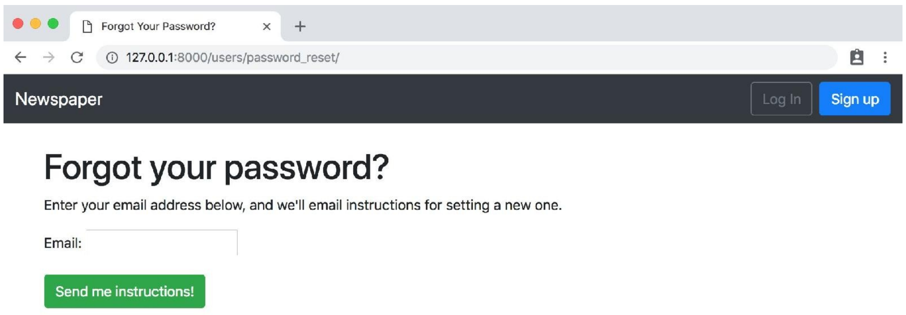
```
<!-- templates/registration/password_reset_form.html -->
{% extends 'base.html' %}

{% block title %}Forgot Your Password?{% endblock title %}

{% block content %}
<h1>Forgot your password?</h1>
<p>Enter your email address below, and we'll email instructions for setting
a new one.</p>

<form method="POST">
  {% csrf_token %}
  {{ form.as_p }}
  <input class="btn btn-success" type="submit" value="Send me instructions!">
</form>
{% endblock content %}
```

At the top we extend `base.html` and set our page title. Because we used "block" titles in our `base.html` file we can override them here. The form uses `POST` since we're sending data and a `csrf_token` for security reasons. By using `form.as_p` we're simply displaying in paragraphs the content of the default password reset form. Finally we include a submit button and use Bootstrap's `btn btn-success` styling to make it green.

Start up the server again with `python manage.py runserver`. Navigate to:

http://127.0.0.1:8000/users/password_reset/.

Refresh the page you can see our new page.



Forgot your password?

Enter your email address below, and we'll email instructions for setting a new one.

Email:

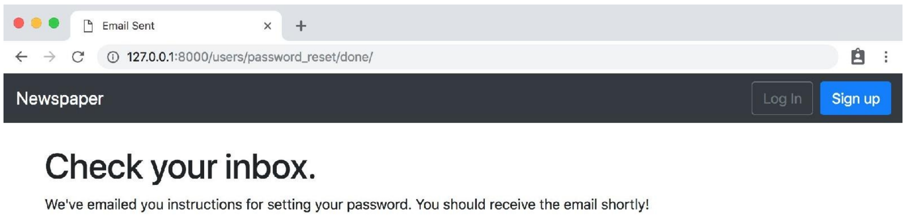
New password reset

Now we can update the other three pages. Each takes the same form of extending `base.html`, a new title, new content text, and for `password_reset_confirm.html` an updated form as well.

Code

```
<!-- templates/registration/password_reset_done.html -->
{% extends 'base.html' %}

{% block title %}Email Sent{% endblock title %}

{% block content %}
  <h1>Check your inbox.</h1>
  <p>We've emailed you instructions for setting your password.
  You should receive the email shortly!</p>
{% endblock content %}
```

Confirm the changes by going to http://127.0.0.1:8000/users/password_reset/done/.



Check your inbox.

We've emailed you instructions for setting your password. You should receive the email shortly!

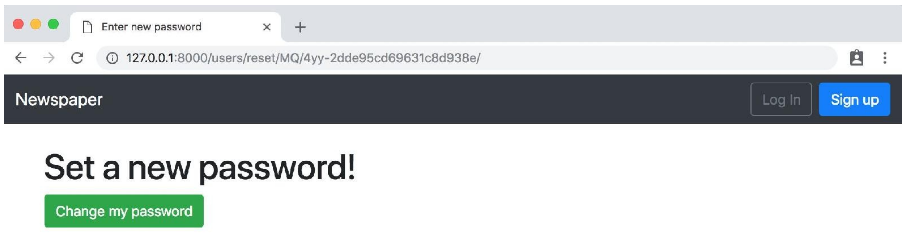
New reset done

Next the password reset confirm page.

Code

```
<!-- templates/registration/password_reset_confirm.html -->
{% extends 'base.html' %}
{% block title %}Enter new password{% endblock title %}

{% block content %}
<h1>Set a new password!</h1>
<form method="POST">
  {% csrf_token %}
  {{ form.as_p }}
  <input class="btn btn-success" type="submit" value="Change my password">
</form>
{% endblock content %}
```

In the command line grab the URL link from the email outputted to the console– mine was `http://127.0.0.1:8000/users/reset/MQ/4yy-2dde95cd69631c8d938e/`–and you'll see the following.



Set a new password!

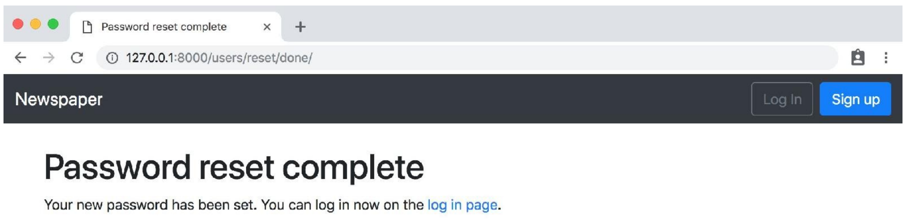
New set password

Finally here is the password reset complete code.

Code

```
<!-- templates/registration/password_reset_complete.html -->
{% extends 'base.html' %}

{% block title %}Password reset complete{% endblock title %}

{% block content %}
<h1>Password reset complete</h1>
<p>Your new password has been set. You can log in now on the
<a href=
"{% url 'login' %}">log in page</a>.</p>
{% endblock content %}
```

You can view it at http://127.0.0.1:8000/users/reset/done/.



Password reset complete

Your new password has been set. You can log in now on the log in page.

New password reset complete

Users can now reset their account password!

Conclusion

In the next chapter we will connect our *Newspaper* app to the email service SendGrid to actually send our automated emails to users as opposed to outputting them in our command line console.

Chapter 12: Email

At this point you may be feeling a little overwhelmed by all the user authentication configuration we've done up to this point. That's normal. After all, we haven't even created any core *Newspaper* app features yet! Everything has been about setting up custom user accounts and the rest.

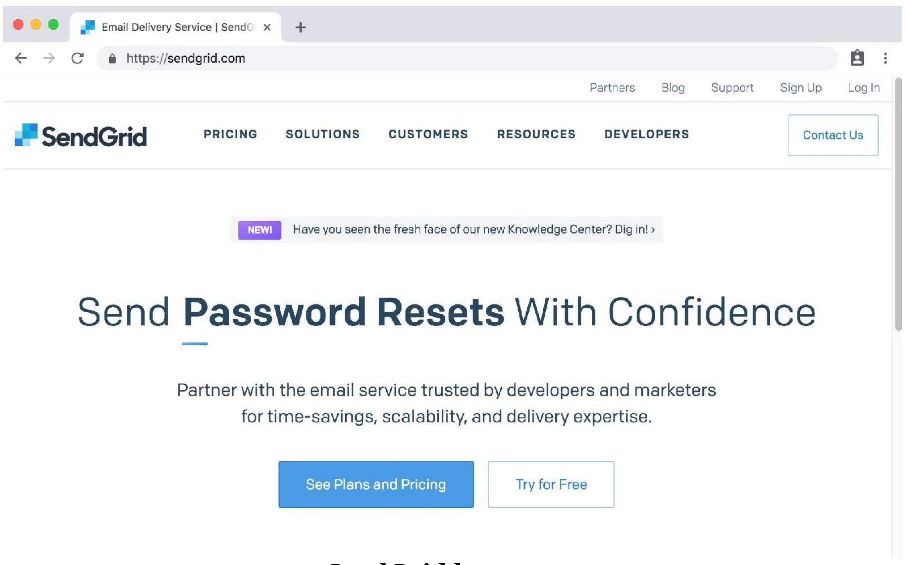
The upside to Django's approach is that it is incredibly easy to customize any piece of our website. The downside is Django requires a bit more out-of-the-box code than some competing web frameworks. As you become more and more experienced in web development, the wisdom of Django's approach will ring true.

Now we want to have our emails be actually sent to users, not just outputted to our command line console. We need to sign up for an account at SendGrid and update our `settings.py` files. Django will take care of the rest. Ready?

SendGrid

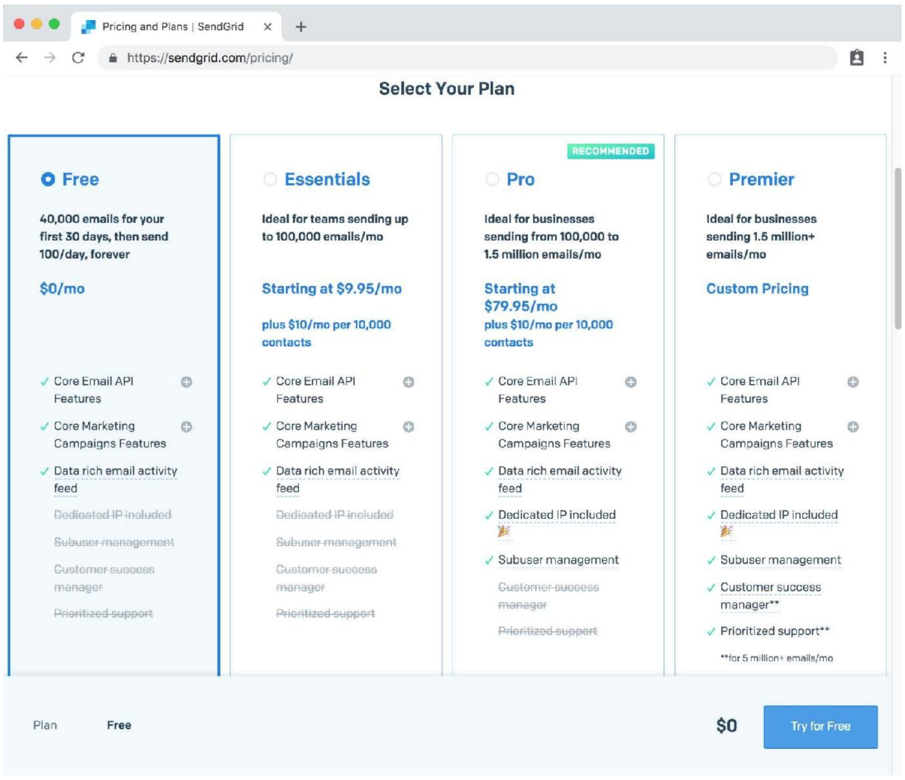
SendGrid is a popular service for sending transactional emails so we'll use it. Django doesn't care what service you choose though; you can just as easily use MailGun or any other service of your choice.

On the SendGrid homepage click on the large blue button for "See Plans and Pricing".


Email Delivery Service | SendG
https://sendgrid.com
Partners
Blog
Support
Sign Up
Log In
SendGrid
PRICING
SOLUTIONS
CUSTOMERS
RESOURCES
DEVELOPERS
Contact Us
NEW!
Have you seen the fresh face of our new Knowledge Center? Dig in! ›
Send Password Resets With Confidence
Partner with the email service trusted by developers and marketers for time-savings, scalability, and delivery expertise.
See Plans and Pricing
Try for Free

SendGrid homepage

On the next page scroll down slightly and look on the left side for the “Free” plan. Select it and click on the “Try for Free” blue button in the bottom righthand corner.



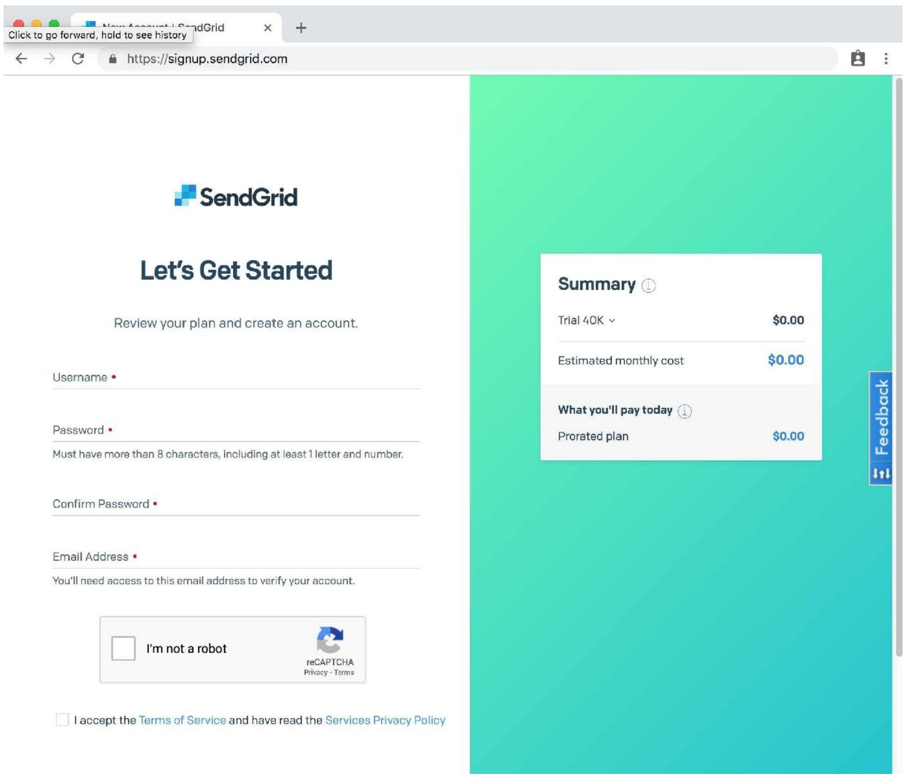
Select Your Plan

Free	Essentials	Pro (RECOMMENDED)	Premier
40,000 emails for your first 30 days, then send 100/day, forever	Ideal for teams sending up to 100,000 emails/mo	Ideal for businesses sending from 100,000 to 1.5 million emails/mo	Ideal for businesses sending 1.5 million+ emails/mo
$0/mo	Starting at $9.95/mo plus $10/mo per 10,000 contacts	Starting at $79.95/mo plus $10/mo per 10,000 contacts	Custom Pricing
✓ Core Email API Features	✓ Core Email API Features	✓ Core Email API Features	✓ Core Email API Features
✓ Core Marketing Campaigns Features	✓ Core Marketing Campaigns Features	✓ Core Marketing Campaigns Features	✓ Core Marketing Campaigns Features
✓ Data rich email activity feed	✓ Data rich email activity feed	✓ Data rich email activity feed	✓ Data rich email activity feed
~~Dedicated IP included~~	~~Dedicated IP included~~	✓ Dedicated IP included	✓ Dedicated IP included
~~Subuser management~~	~~Subuser management~~	✓ Subuser management	✓ Subuser management
~~Customer success manager~~	~~Customer success manager~~	~~Customer success manager~~	✓ Customer success manager**
~~Prioritized support~~	~~Prioritized support~~	~~Prioritized support~~	✓ Prioritized support**
			**for 5 million+ emails/mo

Plan Free $0 Try for Free

SendGrid pricing

Sign up for your free account on the next page.


New Account | SendGrid
Click to go forward, hold to see history
https://signup.sendgrid.com
SendGrid
Feedback

Let’s Get Started

Review your plan and create an account.

Username •

Password •

Must have more than 8 characters, including at least 1 letter and number.

Confirm Password •

Email Address •

You'll need access to this email address to verify your account.

I'm not a robot reCAPTCHA Privacy - Terms

I accept the Terms of Service and have read the Services Privacy Policy

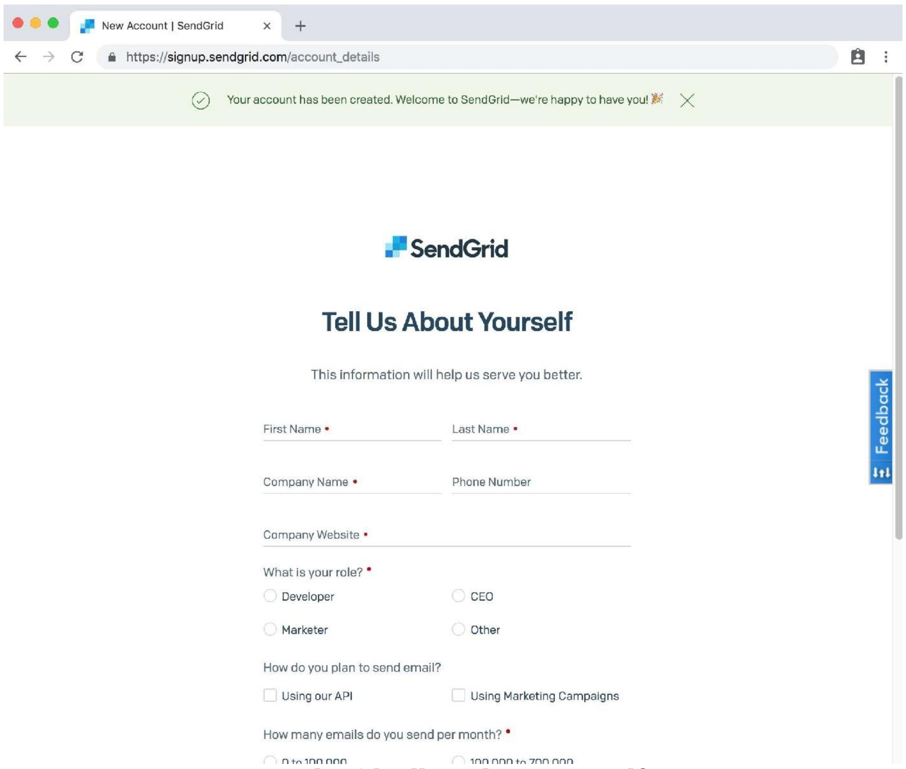
Summary

Trial 40K	$0.00
Estimated monthly cost	$0.00
What you'll pay today	
Prorated plan	$0.00

SendGrid new account

Make sure that the email account you use for SendGrid **is not** the same email account you have for your superuser account on the *Newspaper* project or there can be weird errors.

Finally complete the “Tell Us About Yourself” page. The only tricky part might be the “Company Website” section. I recommend using the URL of a Heroku deployment from a previous chapter here as this setting can later be changed. Then on the bottom of the page click the “Get Started” button.


New Account | SendGrid

https://signup.sendgrid.com/account_details

Your account has been created. Welcome to SendGrid—we're happy to have you!

SendGrid

Tell Us About Yourself

This information will help us serve you better.

First Name •
Last Name •
Company Name •
Phone Number
Company Website •

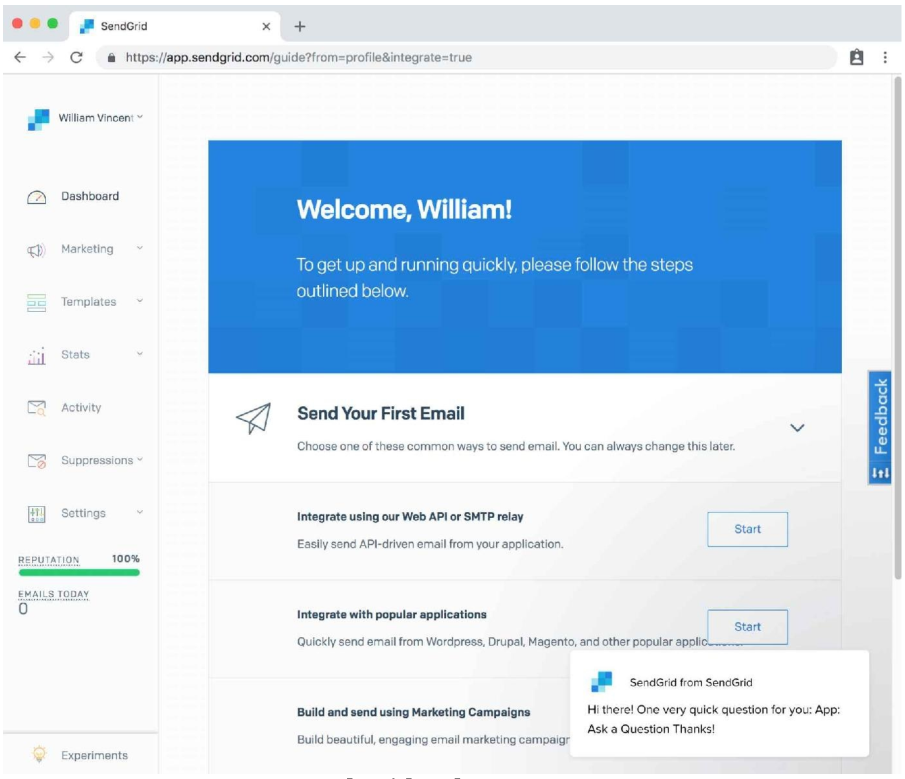
What is your role? •
Developer
CEO
Marketer
Other

How do you plan to send email?
Using our API
Using Marketing Campaigns

How many emails do you send per month? •
0 to 100,000
100,000 to 700,000

SendGrid tell us about yourself

SendGrid then presents us with a welcome screen that provides three different ways to send our first email. Select the first option, “Integrate using our Web API or SMTP relay” and click on the “Start” button next to it.



Welcome, William!

To get up and running quickly, please follow the steps outlined below.

Send Your First Email

Choose one of these common ways to send email. You can always change this later.

Integrate using our Web API or SMTP relay

Easily send API-driven email from your application.

Integrate with popular applications

Quickly send email from Wordpress, Drupal, Magento, and other popular applic

Build and send using Marketing Campaigns

Build beautiful, engaging email marketing campaigr

SendGrid from SendGrid

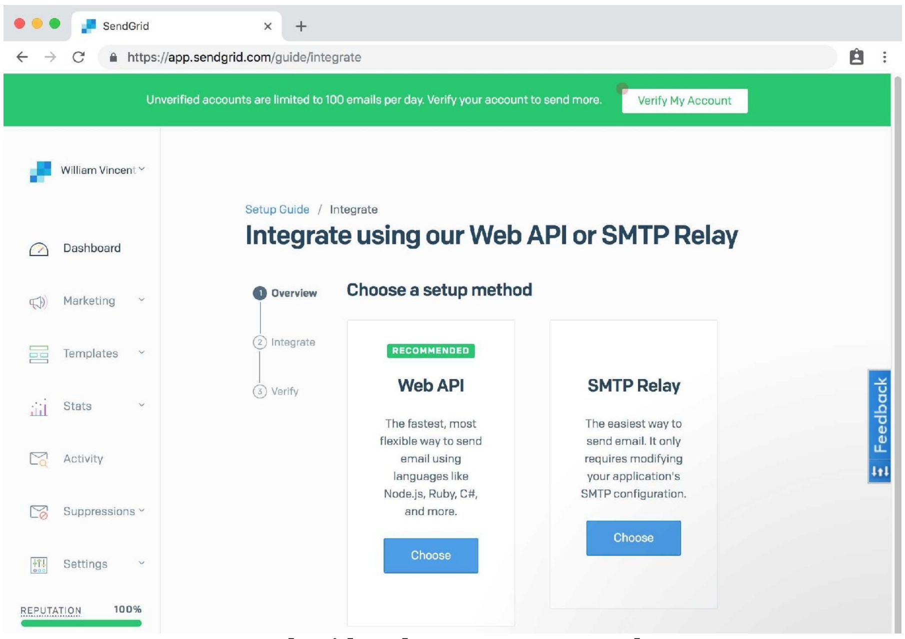
Hi there! One very quick question for you: App: Ask a Question Thanks!

SendGrid welcome screen

Now we have one more choice to make: Web API or SMTP Relay. We’ll use SMTP since it is the simplest and works well for our basic needs here. In a large-scale website you likely would want to use the Web API instead but… one thing at a time.

You’ll also note the “Verify My Account” banner on the top of the page. If you want that to go away, log in to the email account you used for the account and confirm your account.

Click on the “Choose” button under “SMTP Relay” to proceed.



Unverified accounts are limited to 100 emails per day. Verify your account to send more.

Setup Guide / Integrate

Integrate using our Web API or SMTP Relay

Choose a setup method

Web API

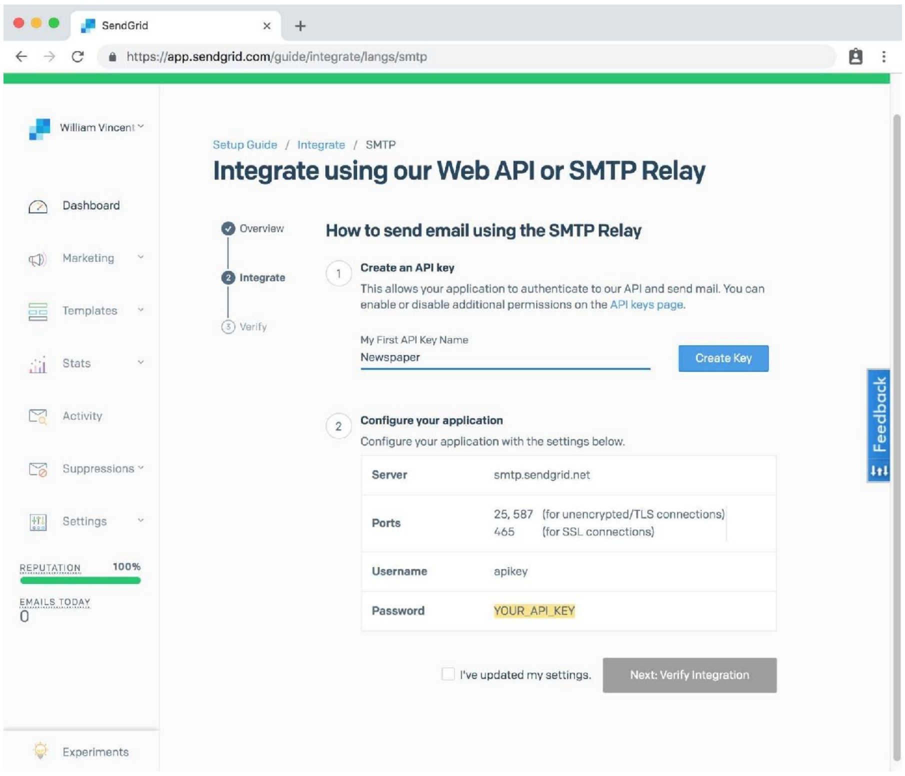
The fastest, most flexible way to send email using languages like Node.js, Ruby, C#, and more.

SMTP Relay

The easiest way to send email. It only requires modifying your application's SMTP configuration.

SendGrid Web API vs SMTP Relay

Ok, one more screen to navigate. Under step 1, "Create an API key", enter in a name for your first API Key. I've chosen the name "Newspaper" here. Then click on the blue "Create Key" button next to it.



Setup Guide / Integrate / SMTP

Integrate using our Web API or SMTP Relay

How to send email using the SMTP Relay

1 Create an API key

This allows your application to authenticate to our API and send mail. You can enable or disable additional permissions on the API keys page.

My First API Key Name

Newspaper

2 Configure your application

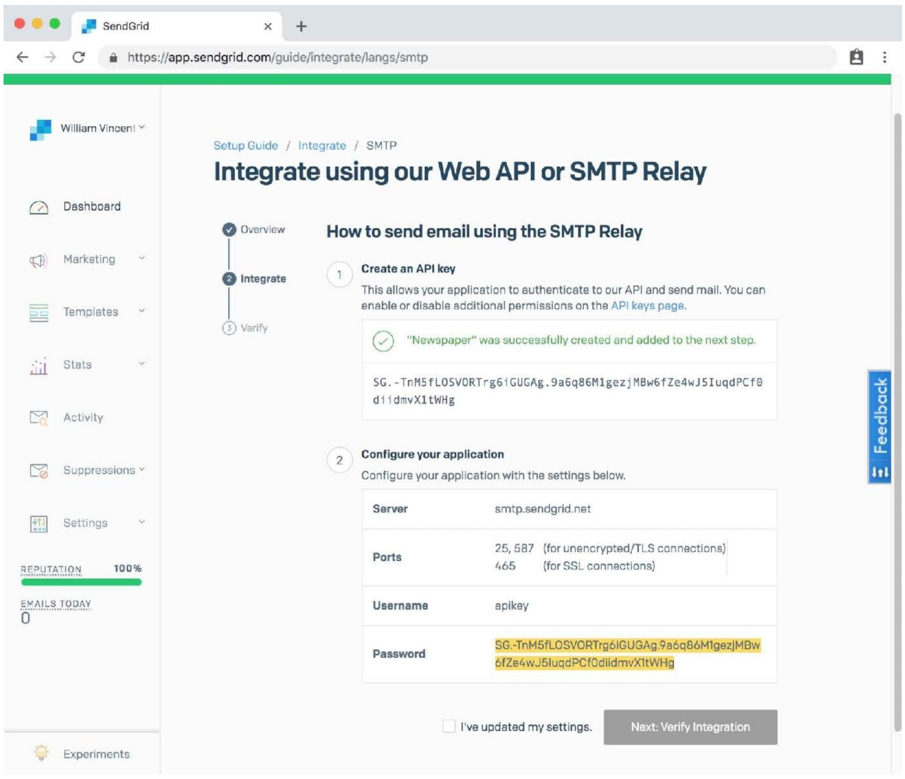
Configure your application with the settings below.

Server	smtp.sendgrid.net
Ports	25, 587 (for unencrypted/TLS connections) 465 (for SSL connections)
Username	apikey
Password	YOUR_API_KEY

I've updated my settings.

SendGrid Integrate

The page will update and generate a custom API key in part 1. SendGrid is really pushing us to use API keys, no? But that's ok, it will *also* under part 2, create a username and password for us that we can use with an SMTP relay. This is what we want.



Integrate using our Web API or SMTP Relay

How to send email using the SMTP Relay

1 Create an API key

This allows your application to authenticate to our API and send mail. You can enable or disable additional permissions on the API keys page.

"Newspaper" was successfully created and added to the next step.

```
SG.-TnM5fLOSVORTrg6iGUGAg.9a6q86M1gezjMBw6fZe4wJ5IuqdPCf0
diidmvX1tWHg
```

2 Configure your application

Configure your application with the settings below.

Server	smtp.sendgrid.net
Ports	25, 587 (for unencrypted/TLS connections) 465 (for SSL connections)
Username	apikey
Password	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

☐ I've updated my settings. Next: Verify Integration

SendGrid username and password

The username here, `apikey`, is the same for everyone but the password will be different for each account.

Now, time to add the new username and password into our Django project. This won't take long!

First in the `newspaper_project/settings.py` file update the email backend to use SMTP. We already configured this once before; the line should be at the bottom of the file. Instead of outputting emails to the console we want to instead send them for real using SMTP.

Code

```
# newspaper_project/settings.py
EMAIL_BACKEND = 'django.core.mail.backends.smtp.EmailBackend' # new
```

Then right below it add the following five lines of email configuration. Note that ideally you should store secure information like your password in environment variables, but we won't here to keep things simple.

Code

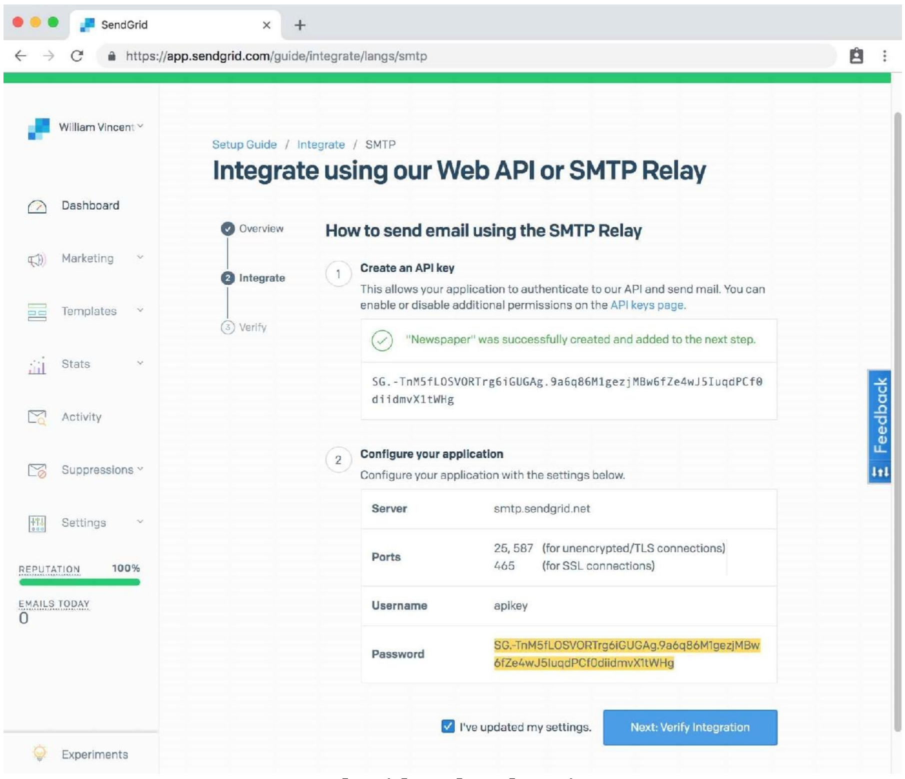
```
# newspaper_project/settings.py
EMAIL_HOST = 'smtp.sendgrid.net'
EMAIL_HOST_USER = 'apikey'
EMAIL_HOST_PASSWORD = 'sendgrid_password'
```

```
EMAIL_PORT = 587
EMAIL_USE_TLS = True
```

Make sure to use enter your own SendGrid `EMAIL_HOST_PASSWORD` here; `sendgrid_password` is just a placeholder!

The local server should be already running at this point but if not, type `python manage.py runserver` to ensure that it is.

Go *back* to the SendGrid “Integrate using our Web API or SMTP Relay” page and select the checkbox next to “I’ve updated my settings.” Then click on “Next: Verify Integration.”



Setup Guide / Integrate / SMTP

Integrate using our Web API or SMTP Relay

How to send email using the SMTP Relay

1 Create an API key

This allows your application to authenticate to our API and send mail. You can enable or disable additional permissions on the API keys page.

"Newspaper" was successfully created and added to the next step.

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

2 Configure your application

Configure your application with the settings below.

Server	smtp.sendgrid.net
Ports	25, 587 (for unencrypted/TLS connections) 465 (for SSL connections)
Username	apikey
Password	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

✓ I've updated my settings. Next: Verify Integration

SendGrid updated settings

Navigate to the password reset form in your web browser at:

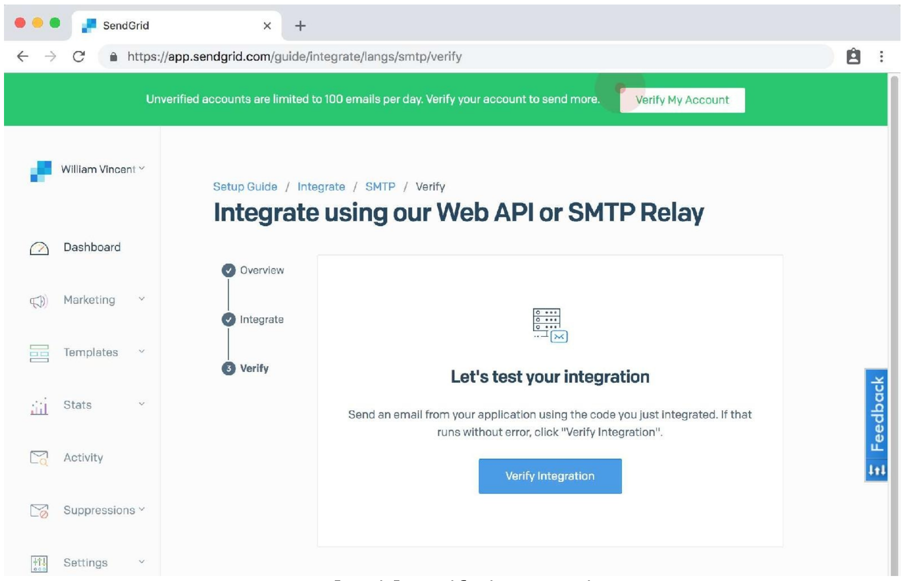
http://127.0.0.1:8000/users/password_reset/

Type in the email address for your superuser account. Do not use the email for your SendGrid account, which should be different. Fill in the form. Upon submission it will redirect you to:

http://127.0.0.1:8000/users/password_reset/done/.

Now check your email inbox. You should see a new email there from *webmaster@localhost*. The text will be exactly the same as that outputted to our command line console previously.

The final step, I promise, is go back to the SendGrid page. We’ve just successfully tested the application so click on the blue button to “Verify Integration.”


https://app.sendgrid.com/guide/integrate/langs/smtp/verify

Unverified accounts are limited to 100 emails per day. Verify your account to send more.

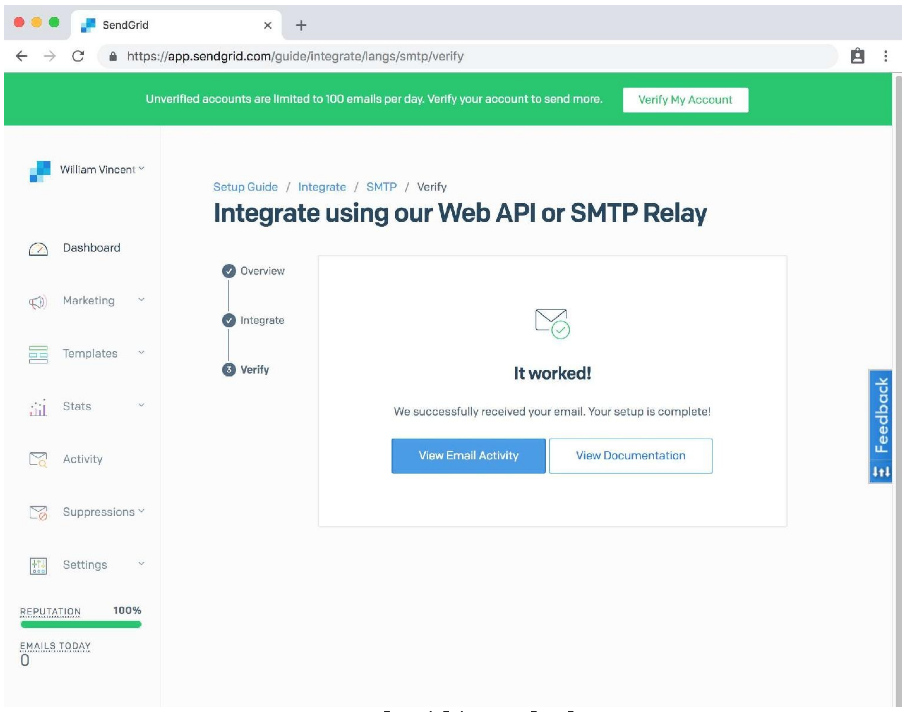
Integrate using our Web API or SMTP Relay

Let's test your integration

Send an email from your application using the code you just integrated. If that runs without error, click "Verify Integration".

SendGrid verify integration

Click the “Verify Integration” button in the middle of the page. The button will turn grey and display “Checking…” for a moment.


https://app.sendgrid.com/guide/integrate/langs/smtp/verify

Unverified accounts are limited to 100 emails per day. Verify your account to send more.

Integrate using our Web API or SMTP Relay

It worked!

We successfully received your email. Your setup is complete!

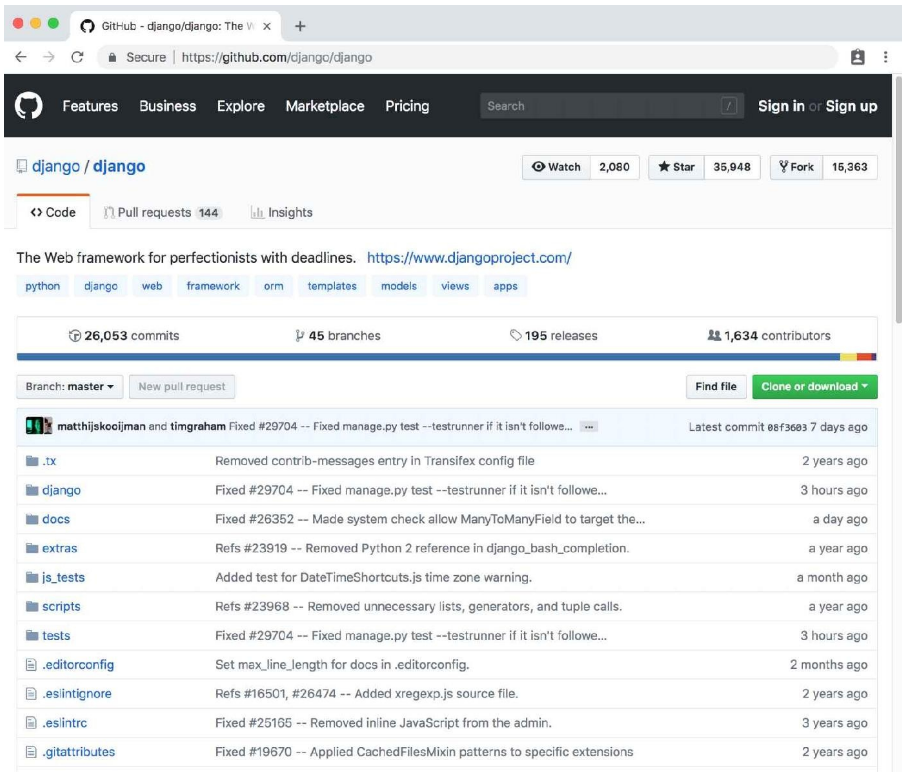
SendGrid it worked

Phew. We’re done! That was a lot of steps but our real-world email integration is now working.

Custom emails

The current email text isn't very personal, is it? Let's change things. At this point I could just show you what steps to take, but I think it's helpful if I can explain **how** I figured out how to do this. After all, you want to be able to customize all parts of Django as needed.

In this case, I knew what text Django was using by default but it wasn't clear where in the Django source code it was written. And since all of Django's source code is available on Github we can can just search it.



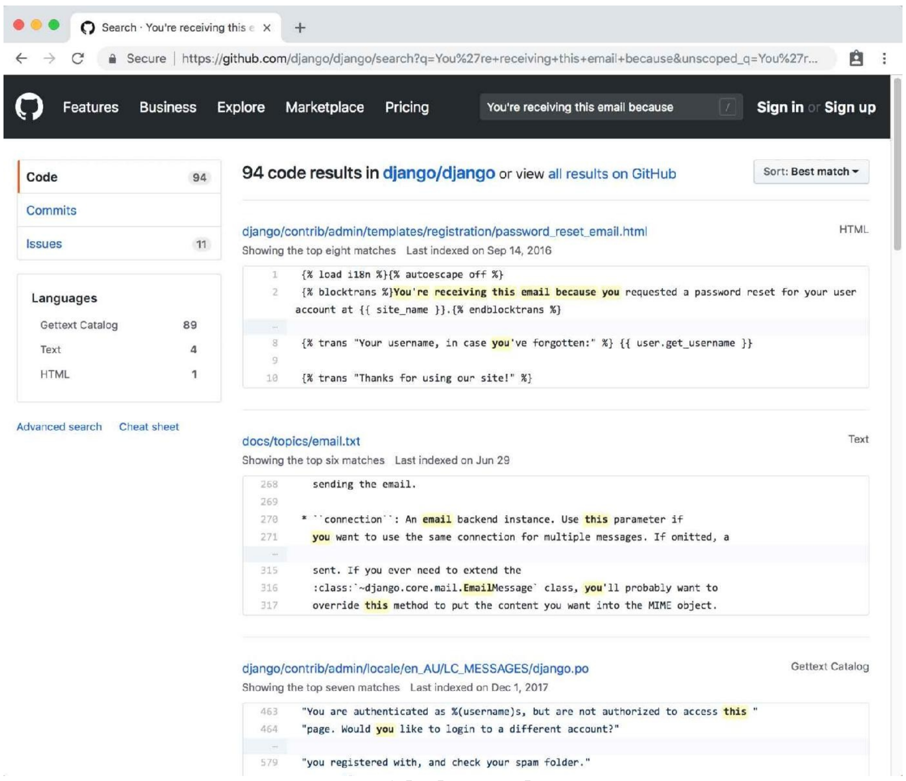
The Web framework for perfectionists with deadlines. https://www.djangoproject.com/

matthijskooijman and timgraham Fixed #29704 -- Fixed manage.py test --testrunner if it isn't followe... Latest commit 88f3603 7 days ago

.tx	Removed contrib-messages entry in Transifex config file	2 years ago
django	Fixed #29704 -- Fixed manage.py test --testrunner if it isn't followe...	3 hours ago
docs	Fixed #26352 -- Made system check allow ManyToManyField to target the...	a day ago
extras	Refs #23919 -- Removed Python 2 reference in django_bash_completion.	a year ago
js_tests	Added test for DateTimeShortcuts.js time zone warning.	a month ago
scripts	Refs #23968 -- Removed unnecessary lists, generators, and tuple calls.	a year ago
tests	Fixed #29704 -- Fixed manage.py test --testrunner if it isn't followe...	3 hours ago
.editorconfig	Set max_line_length for docs in .editorconfig.	2 months ago
.eslintignore	Refs #16501, #26474 -- Added xregexp.js source file.	2 years ago
.eslintrc	Fixed #25165 -- Removed inline JavaScript from the admin.	3 years ago
.gitattributes	Fixed #19670 -- Applied CachedFilesMixin patterns to specific extensions	2 years ago

Github Django

Use the Github search bar and enter a few words from the email text. If you type in "You're receiving this email because" you'll end up at this Github search page.


Search · You're receiving this e

https://github.com/django/django/search?q=You%27re+receiving+this+email+because&unscoped_q=You%27r...

Features Business Explore Marketplace Pricing You're receiving this email because Sign in or Sign up

Code	94
Commits	
Issues	11

Languages

Gettext Catalog	89
Text	4
HTML	1

Advanced search Cheat sheet

94 code results in django/django or view all results on GitHub

Sort: Best match

django/contrib/admin/templates/registration/password_reset_email.html HTML

Showing the top eight matches Last indexed on Sep 14, 2016

```
{% load i18n %}{% autoescape off %}
{% blocktrans %}You're receiving this email because you requested a password reset for your user
account at {{ site_name }}.{% endblocktrans %}
…
{% trans "Your username, in case you've forgotten:" %} {{ user.get_username }}

{% trans "Thanks for using our site!" %}
```

docs/topics/email.txt Text

Showing the top six matches Last indexed on Jun 29

```
  sending the email.

* ``connection``: An email backend instance. Use this parameter if
  you want to use the same connection for multiple messages. If omitted, a
…
  sent. If you ever need to extend the
  :class:`~django.core.mail.EmailMessage` class, you'll probably want to
  override this method to put the content you want into the MIME object.
```

django/contrib/admin/locale/en_AU/LC_MESSAGES/django.po Gettext Catalog

Showing the top seven matches Last indexed on Dec 1, 2017

```
"You are authenticated as %(username)s, but are not authorized to access this "
"page. Would you like to login to a different account?"
…
"you registered with, and check your spam folder."
```

Github search

The first result is the one we want. It shows the code is located at `django/contrib/\ admin/templates/registration/password_reset_email.html`. That means in the `contrib` app the file we want is called `password_reset_email.html`.

Here is that default text from the Django source code.

Code

```
{% load i18n %}{% autoescape off %}
{% blocktrans %}You're receiving this email because you requested a password
reset for your user account at {{ site_name }}.{% endblocktrans %}

{% trans "Please go to the following page and choose a new password:" %}
{% block reset_link %}
{{ protocol }}://{{ domain }}{% url 'password_reset_confirm' uidb64=uid
token=token %}
{% endblock  reset_link %}
{% trans "Your username, in case you've forgotten:" %} {{ user.get_username }}

{% trans "Thanks for using our site!" %}

{% blocktrans %}The {{ site_name }} team{% endblocktrans %}

{% endautoescape %}
```

Let's change it. We need to create a `password_reset_email.html` file in our `registration` folder. Stop the server with `Control+c` and use `touch` for the new file.

Command Line

```
(news) $ touch templates/registration/password_reset_email.html
```

Then use the following code which tweaks what Django provided by default.

Code

```
<!-- templates/registration/password_reset_email.html -->
{% load i18n %}{% autoescape off %}
{% trans "Hi" %} {{ user.get_username }},

{% trans "We've received a request to reset your password. If you didn't make
this request, you can safely ignore this email. Otherwise, click the button
below to reset your password." %}

{% block reset_link %}
{{ protocol }}://{{ domain }}{% url 'password_reset_confirm'
uidb64=uid token=token %}
{% endblock reset_link %}
{% endautoescape %}
```

This code might look a little scary so let's break it down line-by-line. Up top we load the template tag i18n which means this text is eligible to be translated into multiple languages. Django has robust internationalization support though covering it is beyond the scope of this book.

We're greeting the user by name thanks to `user.get_username`. Then we use the built-in `reset_link` block to include the custom URL link. You can read more about Django's password management approach in the official docs.

Let's also update the email's subject title. To do this we'll create another new file called `password_reset_subject.txt`.

Command Line

```
(news) $ touch templates/registration/password_reset_subject.txt
```

Then add the following line of code to the `password_reset_subject.txt` file.

```
Please reset your password
```

And we're all set. Go ahead and try out our new flow again by entering a new password at http://127.0.0.1:8000/users/password_reset/. Then check your email and it will have our new content and subject.

Conclusion

We've now finished implementing a complete user authentication flow. Users can sign up for a new account, log in, log out, change their password, and reset their password. It's time to build out our actual *Newspaper* app.

Chapter 13: Newspaper app

It’s time to build out our *Newspaper* app. We’ll have an articles page where journalists can post articles, set up permissions so only the author of an article can edit or delete it, and finally add the ability for other users to write comments on each article which will introduce the concept of foreign keys.

Articles app

To start create an `articles` app and define our database models. There are no hard and fast rules around what to name your apps except that you can’t use the name of a built-in app. If you look at the `INSTALLED_APPS` section of `settings.py` you can see which app names are off-limits: `admin`, `auth`, `contenttypes`, `sessions`, `messages`, and `staticfiles`. A general rule of thumb is to use the plural of an app name–`posts`, `payments`, `users`, etc.–unless doing so is obviously wrong as in the common case of `blog` where the singular makes more sense.

Start by creating our new `articles` app.

Command Line

```
(news) $ python manage.py startapp articles
```

Then add it to our `INSTALLED_APPS` and update the time zone since we’ll be timestamping our articles. You can find your time zone in this Wikipedia list. For example, I live in Boston, MA which is in the Eastern time zone of the United States. Therefore my entry is `America/New_York`.

Code

```
# newspaper_project/settings.py
INSTALLED_APPS = [
    'django.contrib.admin',
    'django.contrib.auth',
    'django.contrib.contenttypes',
    'django.contrib.sessions',
    'django.contrib.messages',
    'django.contrib.staticfiles',

    # 3rd Party
    'crispy_forms',

    # Local
    'users.apps.UsersConfig',
    'pages.apps.PagesConfig',
    'articles.apps.ArticlesConfig', # new
]

TIME_ZONE = 'America/New_York' # new
```

Next up we define our database model which contains four fields: `title`, `body`, `date`, and `author`. Note that we're letting Django automatically set the time and date based on our `TIME_ZONE` setting. For the `author` field we want to reference our custom user model `'users.CustomUser'` which we set in the `settings.py` file as `AUTH_USER_MODEL`.

We can do this via get_user_model. And we also implement the best practices of defining a `get_absolute_url` from the beginning and a `__str__` method for viewing the model in our admin interface.

Code

```
# articles/models.py
from django.conf import settings
from django.contrib.auth import get_user_model
from django.db import models
from django.urls import reverse


class Article(models.Model):
    title = models.CharField(max_length=255)
    body = models.TextField()
    date = models.DateTimeField(auto_now_add=True)
    author = models.ForeignKey(
        get_user_model(),
        on_delete=models.CASCADE,
    )

    def __str__(self):
        return self.title

    def get_absolute_url(self):
        return reverse('article_detail', args=[str(self.id)])
```

Since we have a brand new app and model, it's time to make a new migration file and then apply it to the database.

Command Line

```
(news) $ python manage.py makemigrations articles
(news) $ python manage.py migrate
```

At this point I like to jump into the admin to play around with the model before building out the urls/views/templates needed to actually display the data on the website. But first we need to update `admin.py` so our new app is displayed.

Code

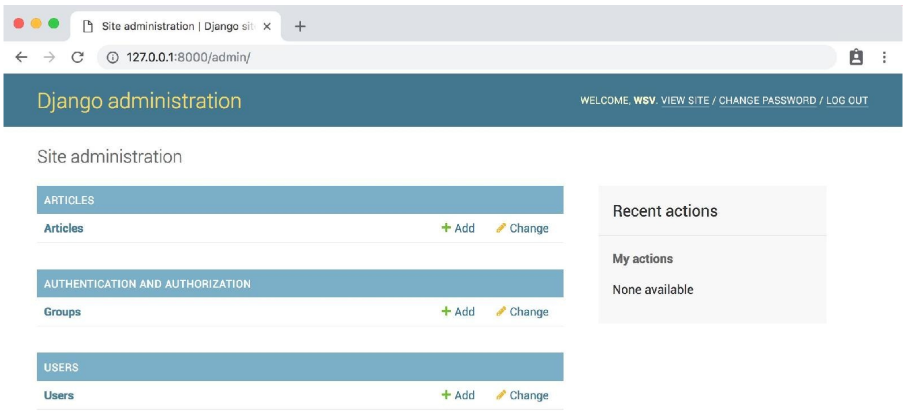
```
# articles/admin.py
from django.contrib import admin

from .models import Article

admin.site.register(Article)
```

Now we start the server.

Command Line

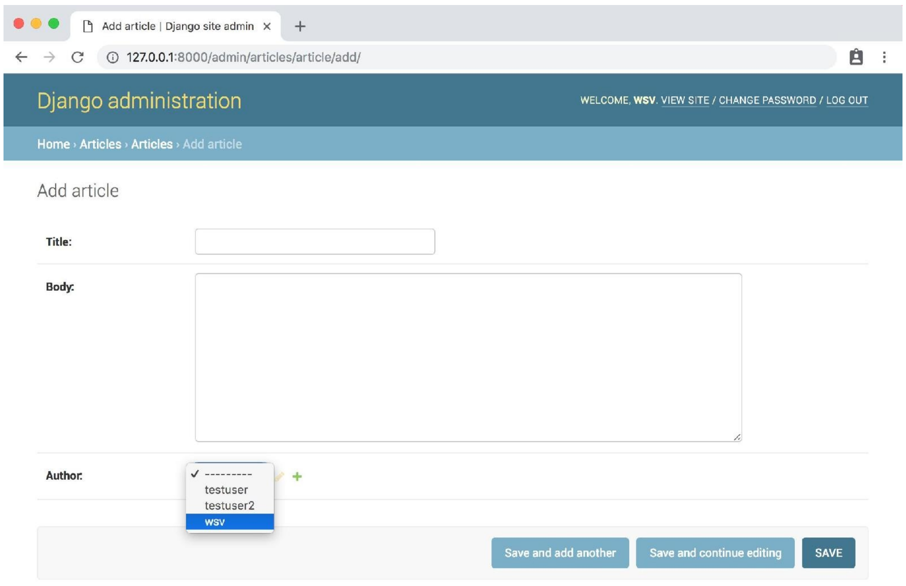
```
(news) $ python manage.py runserver
```

Navigate to http://127.0.0.1:8000/admin/ and log in.



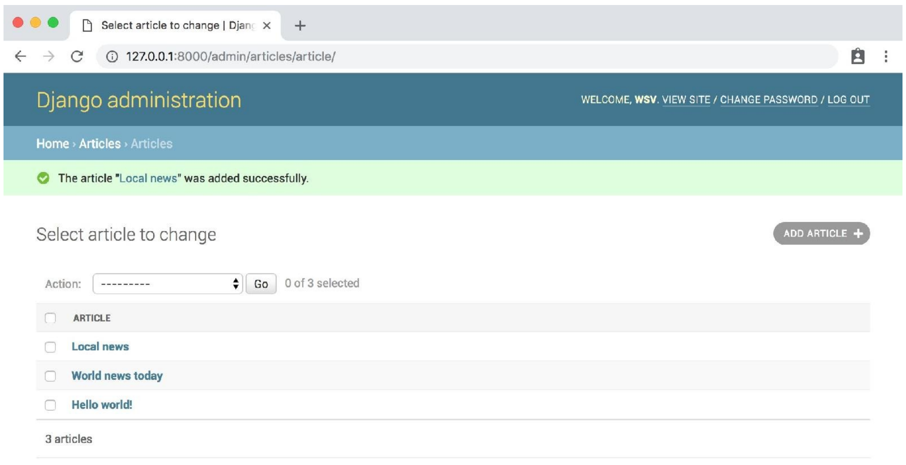
Admin page

If you click on “+ Add” next to “Articles” at the top of the page we can enter in some sample data. You’ll likely have three users available at this point: your `superuser`, `testuser`, and `testuser2` accounts. Use your superuser account as the `author` of all three articles.


Add article | Django site admin
127.0.0.1:8000/admin/articles/article/add/
Django administration
WELCOME, WSV. VIEW SITE / CHANGE PASSWORD / LOG OUT
Home › Articles › Articles › Add article
Add article
Title:
Body:
Author:
----
testuser
testuser2
wsv
Save and add another
Save and continue editing
SAVE

Admin articles add page

I’ve added three new articles as you can see on the updated Articles page.


Select article to change | Djang
127.0.0.1:8000/admin/articles/article/
Django administration
WELCOME, WSV. VIEW SITE / CHANGE PASSWORD / LOG OUT
Home › Articles › Articles
ADD ARTICLE
Action: ---------
Go
0 of 3 selected
ARTICLE

The article "Local news" was added successfully.

Select article to change

ARTICLE
Local news
World news today
Hello world!

3 articles

Admin three articles

If you click on an individual article you will see that the `title`, `body`, and `author` are displayed but not the `date`. That's because the `date` was automatically added by Django for us and therefore can't be changed in the admin. We *could* make the date editable–in more complex apps it's common to have both a `created_at` and `updated_at` field–but to keep things simple we'll just have the `date` be set upon creation by Django for us for now. Even though `date` is not displayed here we will still be able to access it in our templates so it can be displayed on web pages.

URLs and Views

The next step is to configure our URLs and views. Let's have our articles appear at `articles/`. Add a URL pattern for `articles` in our project-level `urls.py` file.

Code

```
# newspaper_project/urls.py
from django.contrib import admin
from django.urls import path, include

urlpatterns = [
    path('admin/', admin.site.urls),
    path('users/', include('users.urls')),
    path('users/', include('django.contrib.auth.urls')),
    path('articles/', include('articles.urls')), # new
    path('', include('pages.urls')),
]
```

Next we create an `articles/urls.py` file.

Command Line

```
(news) $ touch articles/urls.py
```

Then populate it with our routes. Let's start with the page to list all articles at `articles/` which will use the view `ArticleListView`.

Code

```
# articles/urls.py
from django.urls import path

from .views import ArticleListView

urlpatterns = [
    path('', ArticleListView.as_view(), name='article_list'),
]
```

Now create our view using the built-in generic `ListView` from Django.

Code

```
# articles/views.py
from django.views.generic import ListView

from .models import Article


class ArticleListView(ListView):
    model = Article
    template_name = 'article_list.html'
```

The only two fields we need to specify are the model `Article` and our template name which will be `article_list.html`.

The last step is to create our template. We can make an empty file from the command line.

Command Line

```
(news) $ touch templates/article_list.html
```

Bootstrap has a built-in component called Cards that we can customize for our individual articles. Recall that `ListView` returns an object called `object_list` which we can iterate over using a `for` loop.

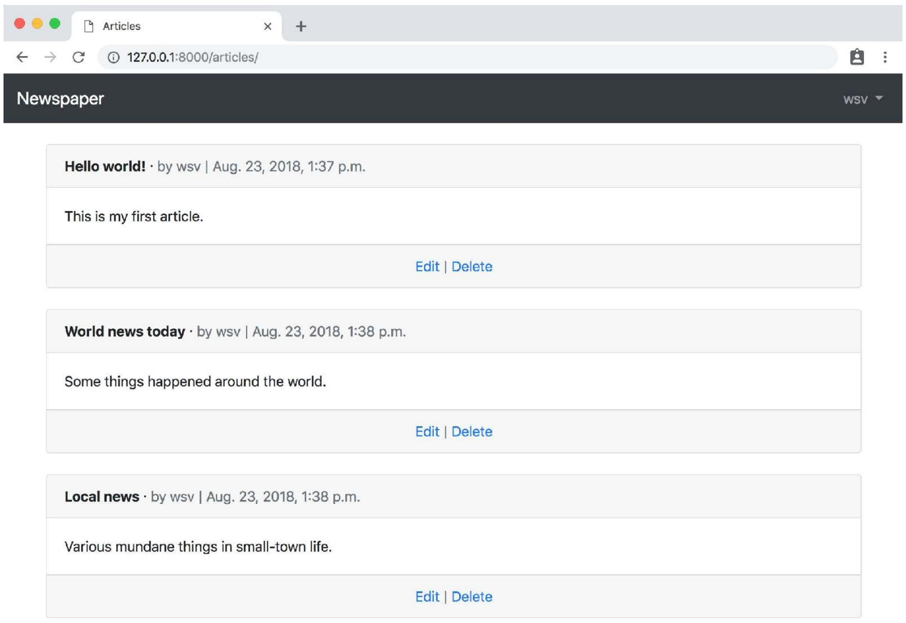
Within each `article` we display the title, body, author, and date. We can even provide links to “edit” and “delete” functionality that we haven’t built yet.

Code

```
<!-- templates/article_list.html -->
{% extends 'base.html' %}

{% block title %}Articles{% endblock title %}

{% block content %}
  {% for article in object_list %}
    <div class="card">
      <div class="card-header">
        <span class="font-weight-bold">{{ article.title }}</span> &middot;
        <span class="text-muted">by {{ article.author }} |
        {{ article.date }}</span>
      </div>
      <div class="card-body">
        {{ article.body }}
      </div>
      <div class="card-footer text-center text-muted">
```

```
        <a href="#">Edit</a> | <a href="#">Delete</a>
      </div>
    </div>
    <br />
  {% endfor %}
{% endblock content %}
```

Spin up the server again with `python manage.py runserver` and check out our page at http://127.0.0.1:8000/articles/.



Hello world! · by wsv | Aug. 23, 2018, 1:37 p.m.

This is my first article.

Edit | Delete

World news today · by wsv | Aug. 23, 2018, 1:38 p.m.

Some things happened around the world.

Edit | Delete

Local news · by wsv | Aug. 23, 2018, 1:38 p.m.

Various mundane things in small-town life.

Edit | Delete

Articles page

Not bad eh? If we wanted to get fancy we could create a [custom template filter](#) so that the date outputted is shown in seconds, minutes, or days. This can be done with some if/else logic and Django's [date options](#) but we won't implement it here.

Edit/Delete

How do we add edit and delete options? We need new urls, views, and templates. Let's start with the urls. We can take advantage of the fact that Django automatically adds a primary key to each database. Therefore our first article with a primary key of `1` will be at `articles/1/edit/` and the delete route will be at `articles/1/delete/`.

Code

```
# articles/urls.py
from django.urls import path

from .views import (
    ArticleListView,
    ArticleUpdateView,
    ArticleDetailView,
    ArticleDeleteView, # new
)

urlpatterns = [
    path('<int:pk>/edit/',
         ArticleUpdateView.as_view(), name='article_edit'), # new
    path('<int:pk>/',
         ArticleDetailView.as_view(), name='article_detail'), # new
    path('<int:pk>/delete/',
         ArticleDeleteView.as_view(), name='article_delete'), # new
    path('', ArticleListView.as_view(), name='article_list'),
]
```

Now write up our views which will use Django's generic class-based views for `DetailView`, `UpdateView` and `DeleteView`. We specify which fields can be updated–`title` and `body`–and where to redirect the user after deleting an article: `article_list`.

Code

```python
# articles/views.py
from django.views.generic import ListView, DetailView # new
from django.views.generic.edit import UpdateView, DeleteView # new
from django.urls import reverse_lazy # new

from .models import Article


class ArticleListView(ListView):
    model = Article
    template_name = 'article_list.html'


class ArticleDetailView(DetailView): # new
    model = Article
    template_name = 'article_detail.html'


class ArticleUpdateView(UpdateView): # new
    model = Article
    fields = ('title', 'body',)
    template_name = 'article_edit.html'


class ArticleDeleteView(DeleteView): # new
    model = Article
    template_name = 'article_delete.html'
    success_url = reverse_lazy('article_list')
```

Finally we need to add our new templates. Stop the server with `Control+c` and type the following.

Command Line

```
(news) $ touch templates/article_detail.html
(news) $ touch templates/article_edit.html
(news) $ touch templates/article_delete.html
```

We'll start with the details page which will display the title, date, body, and author with links to edit and delete. It will also link back to all articles. Recall that the Django templating language's `url` tag wants the URL name and then

any arguments passed in. The name of our edit route is `article_edit` and we need to pass in its primary key `article.pk`. The delete route name is `article_delete` and it also needs a primary key `article.pk`. Our `articles` page is a `ListView` so it does not need any additional arguments passed in.
Code

```
<!-- templates/article_detail.html -->
{% extends 'base.html' %}

{% block content %}
<div class="article-entry">
  <h2>{{ object.title }}</h2>
    <p>by {{ object.author }} | {{ object.date }}</p>
    <p>{{ object.body }}</p>
  </div>

  <p><a href="{% url 'article_edit' article.pk %}">Edit</a> |
    <a href="{% url 'article_delete' article.pk %}">Delete</a></p>
  <p>Back to <a href="{% url 'article_list' %}">All Articles</a>.</p>
{% endblock content %}
```

For the edit and delete pages we can use Bootstrap's button styling to make the edit button light blue and the delete button red.
Code

```
<!-- templates/article_edit.html -->
{% extends 'base.html' %}

{% block content %}
    <h1>Edit</h1>
    <form action="" method="post">{% csrf_token %}
      {{ form.as_p }}
    <button class="btn btn-info ml-2" type="submit">Update</button>
</form>
{% endblock content %}
```

Code

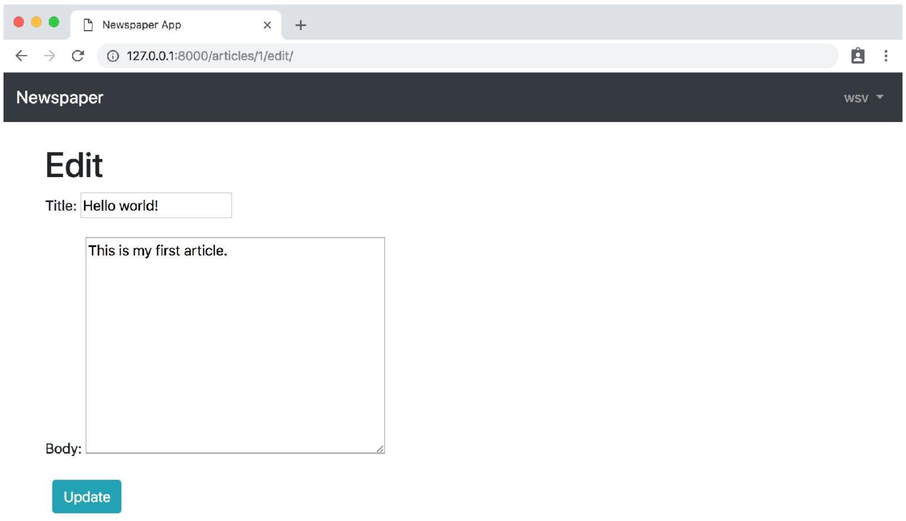
```
<!-- templates/article_delete.html -->
{% extends 'base.html' %}

{% block content %}
    <h1>Delete</h1>
    <form action="" method="post">{% csrf_token %}
      <p>Are you sure you want to delete "{{ article.title }}"?</p>
      <button class="btn btn-danger ml-2" type="submit">Confirm</button>
    </form>
{% endblock content %}
```

As a final step we can add the edit and delete links to our lists page at the div class for `card-footer.`. These will be the same as those added to the detail page.
Code

```
<!-- templates/article_list.html -->
...
<div class="card-footer text-center text-muted">
  <a href="{% url 'article_edit' article.pk %}">Edit</a> |
  <a href="{% url 'article_delete' article.pk %}">Delete</a>
</div>
...
```

Ok, we're ready to view our work. Start up the server with `python manage.py runserver` and navigate to articles page at http://127.0.0.1:8000/articles/. Click on the link for "edit" on the first article and you'll be redirected to:

http://127.0.0.1:8000/articles/1/edit/



Edit

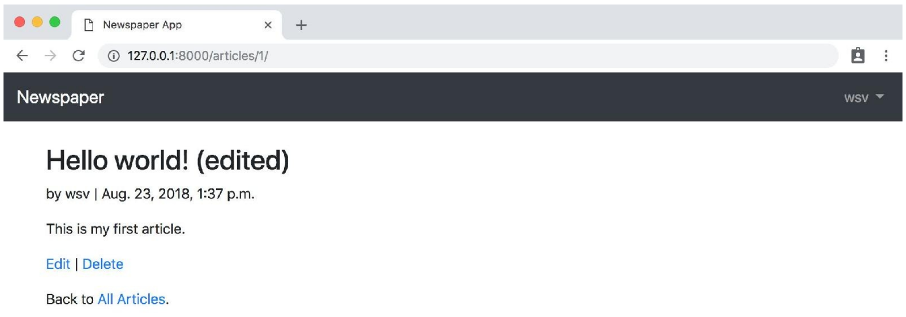
Title: Hello world!

This is my first article.

Body:

Edit page

If you update the "title" field and click update you'll be redirected to the detail page which shows the new change.



Hello world! (edited)

by wsv | Aug. 23, 2018, 1:37 p.m.

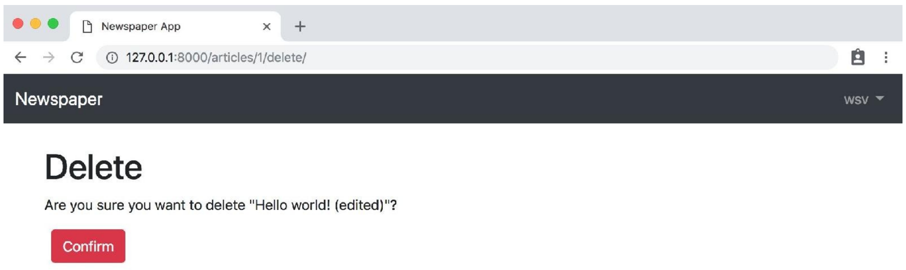
This is my first article.

Edit | Delete

Back to All Articles.

Detail page

If you click on the "Delete" link you'll be redirected to the delete page.

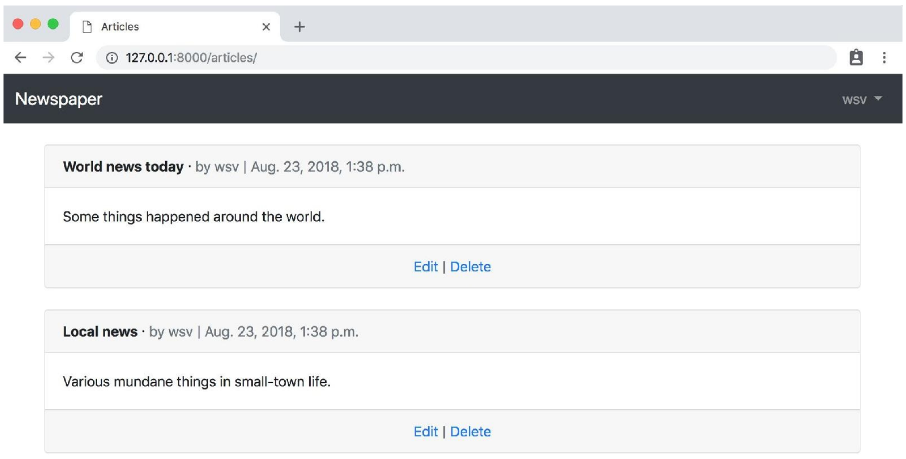


Delete

Are you sure you want to delete "Hello world! (edited)"?

Delete page

Press the scary red button for “Delete” and you’ll be redirected to the articles page which now only has two entries.



World news today · by wsv | Aug. 23, 2018, 1:38 p.m.

Some things happened around the world.

Local news · by wsv | Aug. 23, 2018, 1:38 p.m.

Various mundane things in small-town life.

Articles page two entries

Create page

The final step is a create page for new articles which we can do with Django’s `CreateView`. Our three steps are to create a view, url, and template. This flow should feel pretty familiar by now.

In our views file add `CreateView` to the imports at the top and make a new class at the bottom of the file `ArticleCreateView` that specifies our model, template, and the fields available.

Code

```
# articles/views.py
...
from django.views.generic.edit import UpdateView, DeleteView, CreateView # new

...
class ArticleCreateView(CreateView):
    model = Article
    template_name = 'article_new.html'
    fields = ('title', 'body', 'author',)
```

Note that our `fields` has `author` since we want to associate a new article with an author, however once an article has been created we do not want a user to be able to change the `author` which is why `ArticleUpdateView` only has the fields `['title', 'body',]`.

Update our urls file with the new route for the view.

Code

```
# articles/urls.py
from django.urls import path

from .views import (
    ArticleListView,
    ArticleUpdateView,
    ArticleDetailView,
    ArticleDeleteView,
    ArticleCreateView, # new
)

urlpatterns = [
    path('<int:pk>/edit/',
         ArticleUpdateView.as_view(), name='article_edit'),
    path('<int:pk>/',
         ArticleDetailView.as_view(), name='article_detail'),
    path('<int:pk>/delete/',
         ArticleDeleteView.as_view(), name='article_delete'),
    path('new/', ArticleCreateView.as_view(), name='article_new'), # new
    path('', ArticleListView.as_view(), name='article_list'),
]
```

Then quit the server `Control+c` to create a new template named `article_new.html`.

Command Line

```
(news) $ touch templates/article_new.html
```

And update it with the following HTML code.

Code

```
<!-- templates/article_new.html -->
{% extends 'base.html' %}

{% block content %}
    <h1>New article</h1>
    <form action="" method="post">{% csrf_token %}
      {{ form.as_p }}
      <button class="btn btn-success ml-2" type="submit">Save</button>
    </form>
{% endblock content %}
```

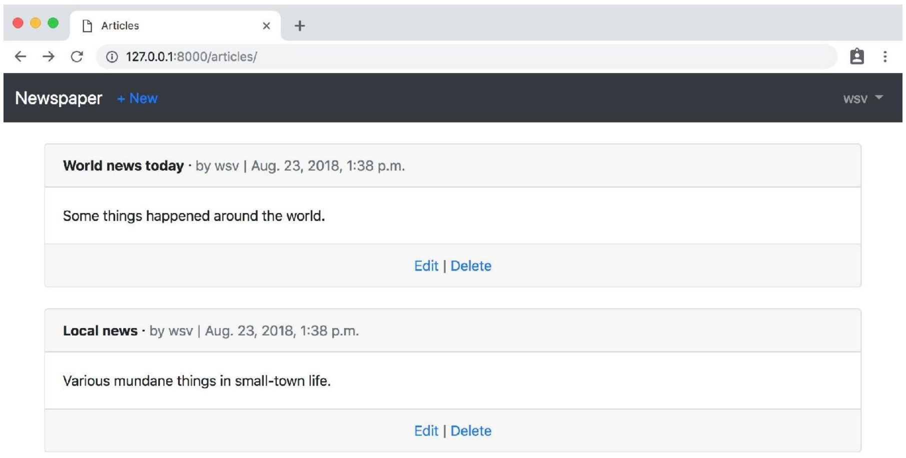
As a final step we should add a link to creating new articles in our nav so it is accessible everywhere on the site to logged-in users.

Code

```
<!-- templates/base.html -->
...
<body>
  <nav class="navbar navbar-expand-md navbar-dark bg-dark mb-4">
    <a class="navbar-brand" href="{% url 'home' %}">Newspaper</a>
    {% if user.is_authenticated %}
```

```
      <ul class="navbar-nav mr-auto">
        <li class="nav-item"><a href="{% url 'article_new' %}">+ New</a></li>
      </ul>
    {% endif %}
    <button class="navbar-toggler" type="button" ...
```

Refresh the articles page and the change is evident in the top navbar:



World news today · by wsv | Aug. 23, 2018, 1:38 p.m.

Some things happened around the world.

Edit | Delete

Local news · by wsv | Aug. 23, 2018, 1:38 p.m.

Various mundane things in small-town life.

Edit | Delete

Navbar new link

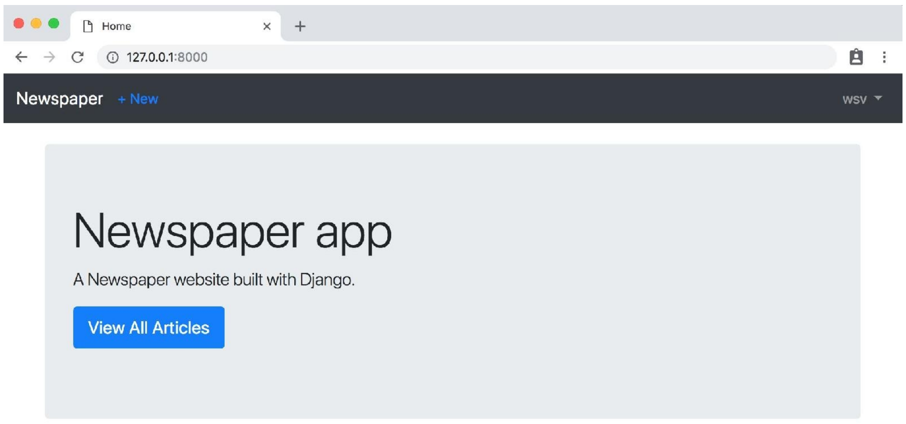
Why not use Bootstrap to improve our original homepage now too? We can update `templates/home.html` as follows.

Code

```
<!-- templates/home.html -->
{% extends 'base.html' %}

{% block title %}Home{% endblock title %}

{% block content %}
<div class="jumbotron">
  <h1 class="display-4">Newspaper app</h1>
  <p class="lead">A Newspaper website built with Django.</p>
  <p class="lead">
    <a class="btn btn-primary btn-lg" href="{% url 'article_list' %}"
    role="button">View All Articles</a>
  </p>
</div>
{% endblock content %}
```

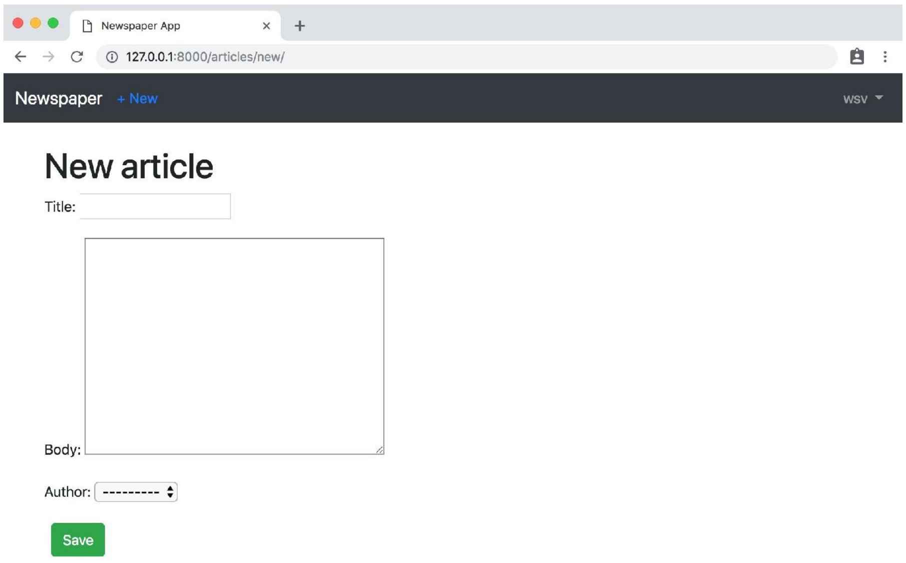
We're all done. Let's just confirm everything works as expected. Start up the server again `python manage.py runserver` and navigate to our homepage at:

http://127.0.0.1:8000/.



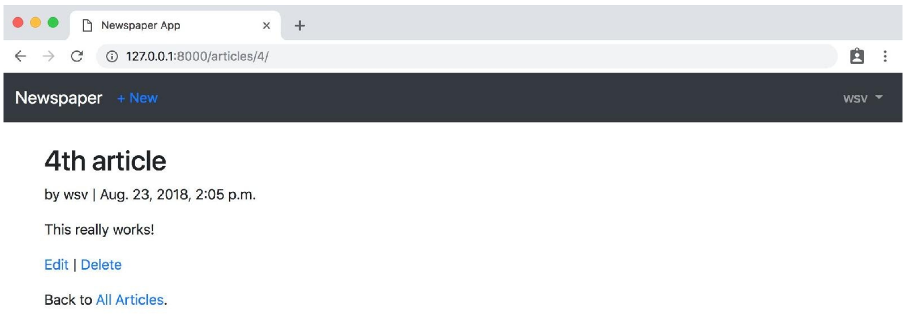
Homepage with new link in nav

Click on the link for "+ New" in the top nav and you'll be redirected to our create page.



Create page

Go ahead and create a new article. Then click on the "Save" button. You will be redirected to the detail page. Why? Because in our `models.py` file we set the `get_absolute_url` method to `article_detail`. This is a good approach because if we later change the url pattern for the detail page to, say, `articles/details/4/`, the redirect will still work. Whatever route is associated with `article_detail` will be used; there is no hardcoding of the route itself.



4th article

by wsv | Aug. 23, 2018, 2:05 p.m.

This really works!

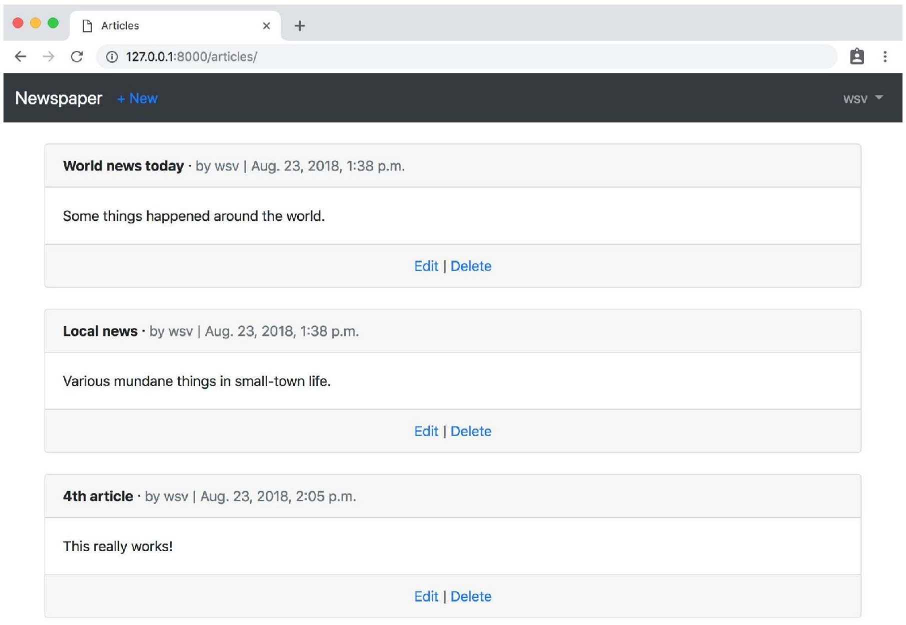
Edit | Delete

Back to All Articles.

Detail page

Note also that the primary key here is `4` in the URL. Even though we're only displaying three articles right now, Django doesn't reorder the primary keys just because we deleted one. In practice, most real-world sites don't actually delete anything; instead they "hide" deleted fields since this makes it easier to maintain the integrity of a database and gives the option to "undelete" later on if needed. With our current approach once something is deleted it's gone for good!

Click on the link for "All Articles" to see our new `/articles` page.



World news today · by wsv | Aug. 23, 2018, 1:38 p.m.

Some things happened around the world.

Edit | Delete

Local news · by wsv | Aug. 23, 2018, 1:38 p.m.

Various mundane things in small-town life.

Edit | Delete

4th article · by wsv | Aug. 23, 2018, 2:05 p.m.

This really works!

Edit | Delete

Updated articles page

There's our new article on the bottom as expected.

Conclusion

We have created a dedicated `articles` app with CRUD functionality. But there are no permissions or authorizations yet, which means anyone can do anything! A logged-out user can visit all URLs and any logged-in user can make edits or deletes to an existing article, even one that's not their own! In the next chapter we will add permissions and authorizations to our project to fix this.

Chapter 14: Permissions and Authorization

There are several issues with our current *Newspaper* website. For one thing we want our newspaper to be financially sustainable. With more time we could add a `payments` app to charge for access, but for now we will require a user to log in to view any articles. This is known as *authorization*. It's common to set different rules around who is authorized to view areas of your site. Note that this is different than **authentication** which is the process of registering and logging-in users. Authorization restricts access; authentication enables a user sign up and log in flow.

As a mature web framework, Django has built-in functionality for authorization that we can quickly use. In this chapter we'll limit access to various pages only to logged-in users.

Improved CreateView

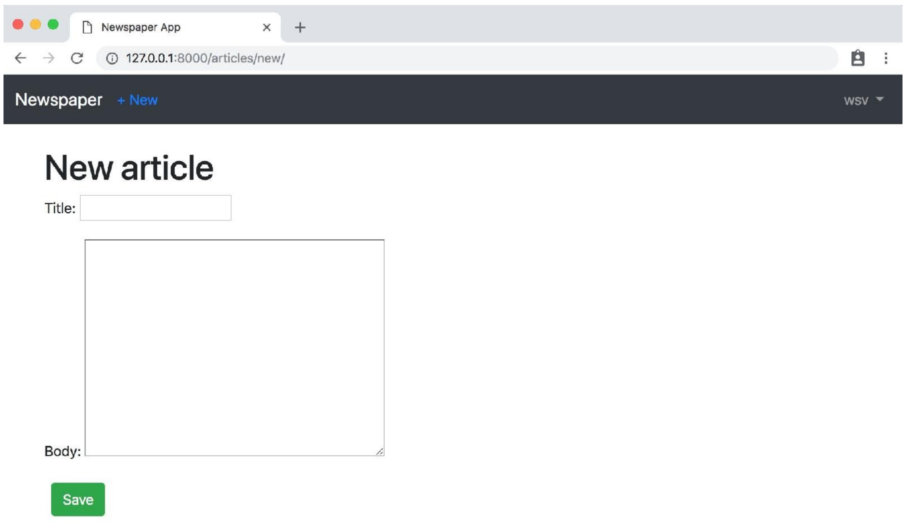
At present the `author` on a new article can be set to any user. Instead it should be automatically set to the current user. The default `CreateView` provides a lot of functionality for us but in order to set the current user to `author` we need to customize it. We will remove `author` from the `fields` and instead set it automatically via the `form_valid` method.

Code

```
# articles/views.py
...
class ArticleCreateView(CreateView):
    model = Article
    template_name = 'article_new.html'
    fields = ('title', 'body') # new

    def form_valid(self, form): # new
        form.instance.author = self.request.user
        return super().form_valid(form)
...
```

How did I know I could update `CreateView` like this? The answer is I looked at the source code and used Google. Generic class-based views are amazing for starting new projects but when you want to customize them, it is necessary roll up your sleeves and start to understand what's going on under the hood. The more you use and customize built-in views, the more comfortable you will become making customizations like this. Chances are whatever you are trying to do has already been solved somewhere, either within Django itself or on a forum like Stack Overflow. Don't be afraid to ask for help!

Now reload the browser and try clicking on the “+ New” link in the top nav. It will redirect to the updated create page where `author` is no longer a field.



New article link

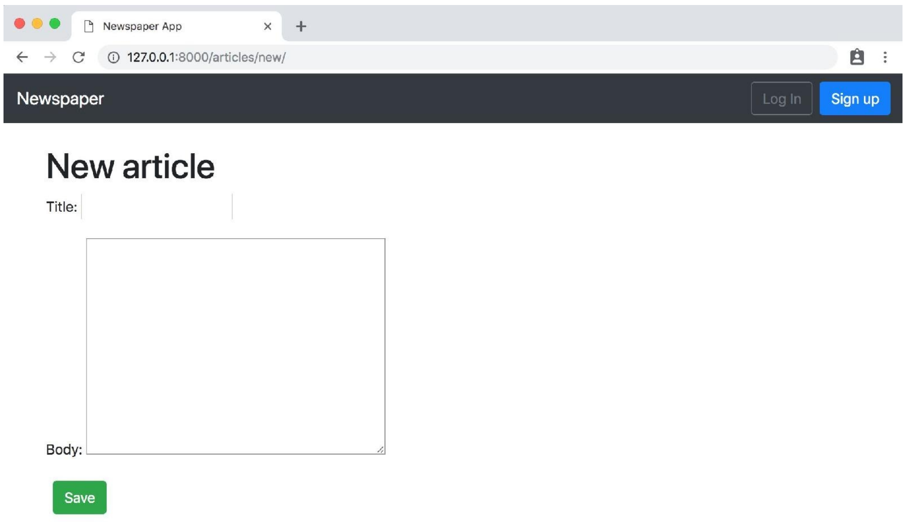
If you create a new article and then go into the admin you will see it is automatically set to the current logged-in user.

Authorizations

There are multiple issues around the lack of authorizations in our current project. Obviously we would like to restrict access to only users so we have the option of one day charging readers to our newspaper. But beyond that, any random logged-out user who knows the correct URL can access any part of the site.

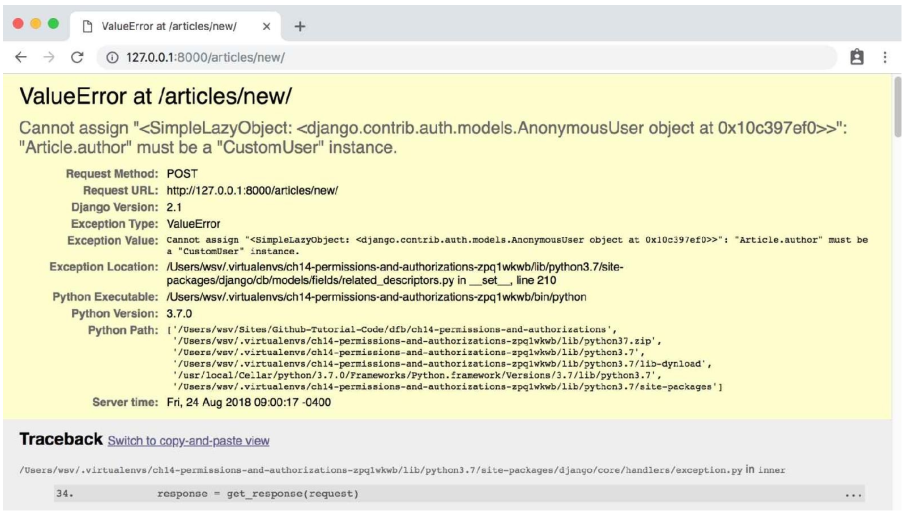
Consider what would happen if a logged-out user tried to create a new article? To try it out, click on your username in the upper right corner of the nav bar, then select “Log out” from the dropdown options. The “+ New” link disappears from the nav bar but what happens if you go to it directly: http://127.0.0.1:8000/articles/new/?

The page is still there.



Logged out new

Now try to create a new article with a title and body. Click on the "Save" button.



ValueError at /articles/new/

127.0.0.1:8000/articles/new/

```
ValueError at /articles/new/

Cannot assign "<SimpleLazyObject: <django.contrib.auth.models.AnonymousUser object at 0x10c397ef0>>":
"Article.author" must be a "CustomUser" instance.

     Request Method: POST
        Request URL: http://127.0.0.1:8000/articles/new/
     Django Version: 2.1
     Exception Type: ValueError
    Exception Value: Cannot assign "<SimpleLazyObject: <django.contrib.auth.models.AnonymousUser object at 0x10c397ef0>>": "Article.author" must be
                     a "CustomUser" instance.
 Exception Location: /Users/wsv/.virtualenvs/ch14-permissions-and-authorizations-zpq1wkwb/lib/python3.7/site-
                     packages/django/db/models/fields/related_descriptors.py in __set__, line 210
  Python Executable: /Users/wsv/.virtualenvs/ch14-permissions-and-authorizations-zpq1wkwb/bin/python
     Python Version: 3.7.0
        Python Path: ['/Users/wsv/Sites/Github-Tutorial-Code/dfb/ch14-permissions-and-authorizations',
                      '/Users/wsv/.virtualenvs/ch14-permissions-and-authorizations-zpq1wkwb/lib/python37.zip',
                      '/Users/wsv/.virtualenvs/ch14-permissions-and-authorizations-zpq1wkwb/lib/python3.7',
                      '/Users/wsv/.virtualenvs/ch14-permissions-and-authorizations-zpq1wkwb/lib/python3.7/lib-dynload',
                      '/usr/local/Cellar/python/3.7.0/Frameworks/Python.framework/Versions/3.7/lib/python3.7',
                      '/Users/wsv/.virtualenvs/ch14-permissions-and-authorizations-zpq1wkwb/lib/python3.7/site-packages']
        Server time: Fri, 24 Aug 2018 09:00:17 -0400

Traceback Switch to copy-and-paste view

/Users/wsv/.virtualenvs/ch14-permissions-and-authorizations-zpq1wkwb/lib/python3.7/site-packages/django/core/handlers/exception.py in inner

    34.             response = get_response(request)                                                    ...
```

Create page error

An error! This is because our model **expects** an `author` field which is linked to the current logged-in user. But since we are not logged in, there's no author, and therefore the submission fails. What to do?

Mixins

We clearly want to set some authorizations so only logged-in users can access the site. To do this we can use a *mixin*, which is a special kind of multiple inheritance that Django uses to avoid duplicate code and still allows customization. For example, the built-in generic ListView needs a way to return a template. But so does DetailView and in fact almost every other view. Rather than repeat the same code in each big generic view, Django breaks out this functionality into a “mixin” known as TemplateResponseMixin. Both `ListView` and `DetailView` use this mixin to render the proper template.

If you read the Django source code, which is freely available on Github, you’ll see mixins used all over the place.

To restrict view access to only logged in users, Django has a LoginRequired mixin that we can use. It’s powerful and extremely concise.

In the `articles/views.py` file import it at the top and then add `LoginRequiredMixin` to our `ArticleCreateView`. Make sure that the mixin is to the left of `ListView` so it will be read first. We want the `ListView` to already know we intend to restrict access.

And that’s it! We’re done.

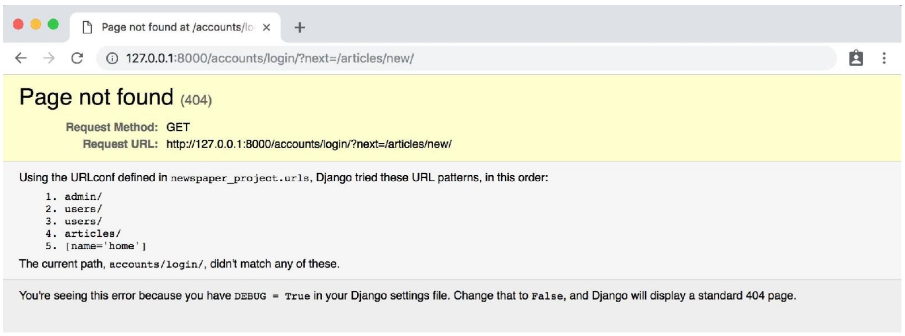
Code

```
# articles/views.py
from django.contrib.auth.mixins import LoginRequiredMixin # new
from django.views.generic import ListView, DetailView
from django.views.generic.edit import UpdateView, DeleteView, CreateView
from django.urls import reverse_lazy

from .models import Article

...

class ArticleCreateView(LoginRequiredMixin, CreateView): # new
    ...
```

Now return to the homepage briefly at http://127.0.0.1:8000/ so we avoid resubmitting the form. Then go to our new message URL directly again at:

http://127.0.0.1:8000/articles/new/

You’ll see the following “Page not found” error:


Page not found at /accounts/lo

127.0.0.1:8000/accounts/login/?next=/articles/new/

Page not found (404)

Request Method: GET
Request URL: http://127.0.0.1:8000/accounts/login/?next=/articles/new/

Using the URLconf defined in `newspaper_project.urls`, Django tried these URL patterns, in this order:

```
1. admin/
2. users/
3. users/
4. articles/
5. [name='home']
```

The current path, `accounts/login/`, didn't match any of these.

You're seeing this error because you have `DEBUG = True` in your Django settings file. Change that to `False`, and Django will display a standard 404 page.

Error page

What’s happening? Django has automatically redirected us to the default location for the `login` page which is at `/accounts/login` however if you recall, in our project-level URLs we are using `users/` as our route. That’s why our log in page is at `users/login`. So how do we tell our `ArticleCreateView` about this?

The documentation for the LoginRequired mixin tells us the answer. We can add a `login_url` to override the default parameter. We're using the named URL of our login route here, `login`.

Code

```
# articles/views.py
...
class ArticleCreateView(LoginRequiredMixin, CreateView):
    model = Article
    template_name = 'article_new.html'
    fields = ('title', 'body',)
    login_url = 'login' # new

    def form_valid(self, form):
        form.instance.author = self.request.user
        return super().form_valid(form)
```

Try the link for creating new messages again: http://127.0.0.1:8000/articles/new/.

It now redirects users to the log in page. Just as we desired!

LoginRequiredMixin

Now we see that restricting view access is just a matter of adding `LoginRequiredMixin` at the beginning of all existing views and specifying the correct `login_url`. Let's update the rest of our `articles` views since we don't want a user to be able to create, read, update, or delete a message if they aren't logged in.

The complete `views.py` file should now look like this:

Code

```
# articles/views.py
from django.contrib.auth.mixins import LoginRequiredMixin
from django.views.generic import ListView, DetailView
from django.views.generic.edit import CreateView, UpdateView, DeleteView
from django.urls import reverse_lazy

from .models import Article


class ArticleListView(LoginRequiredMixin, ListView): # new
    model = Article
    template_name = 'article_list.html'
    login_url = 'login' # new


class ArticleDetailView(LoginRequiredMixin, DetailView): # new
    model = Article
    template_name = 'article_detail.html'
    login_url = 'login' # new
```

```
class ArticleUpdateView(LoginRequiredMixin, UpdateView): # new
    model = Article
    fields = ('title', 'body',)
    template_name = 'article_edit.html'
    login_url = 'login' # new


class ArticleDeleteView(LoginRequiredMixin, DeleteView): # new
    model = Article
    template_name = 'article_delete.html'
    success_url = reverse_lazy('article_list')
    login_url = 'login' # new


class ArticleCreateView(LoginRequiredMixin, CreateView):
    model = Article
    template_name = 'article_new.html'
    fields = ('title', 'body',)
    login_url = 'login'

    def form_valid(self, form):
        form.instance.author = self.request.user
        return super().form_valid(form)
```

Go ahead and play around with the site to confirm that the log in redirects now work as expected. If you need help recalling what the proper URLs are, log in first and write down the URLs for each of the routes for create, edit, delete, and all articles.

UpdateView and DeleteView

We're making progress but there's still the issue of our edit and delete views. Any *logged in* user can make changes to any article. What we want is to restrict this access so that only the author of an article has this permission.

We could add permissions logic to each view for this but a more elegant solution is to create a dedicated mixin, a class with a particular feature that we want to reuse in our Django code. And better yet, Django ships with a built-in mixin, UserPassesTestMixin, just for this purpose!

To use `UserPassesTestMixin` we first import it at the top of the `articles/views.py` file and then add it to both views where we want this restriction: `ArticleUpdateView` and `ArticleDetailView`.

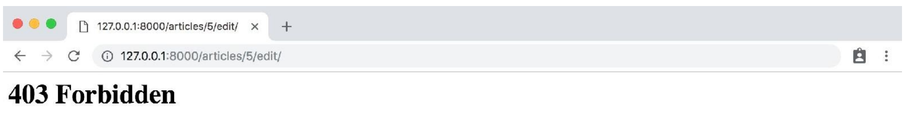
The `test_func` method is used by `UserPassesTestMixin` for our logic. We need to override it. In this case we set the variable `obj` to the current object returned by the view using `get_object()`. Then we say, if the `author` on the current object matches the current user on the webpage (whoever is logged in and trying to make the change), then allow it. If false, an error will automatically be thrown.

The code looks like this:

Code

```python
# articles/views.py
from django.contrib.auth.mixins import (
    LoginRequiredMixin,
    UserPassesTestMixin # new
)
from django.views.generic import ListView, DetailView
from django.views.generic.edit import UpdateView, DeleteView, CreateView
from django.urls import reverse_lazy

from .models import Article

...

class ArticleUpdateView(LoginRequiredMixin, UserPassesTestMixin, UpdateView): #
new
    model = Article
    fields = ('title', 'body',)
    template_name = 'article_edit.html'
    login_url = 'login'

    def test_func(self): # new
        obj = self.get_object()
        return obj.author == self.request.user


class ArticleDeleteView(LoginRequiredMixin, UserPassesTestMixin, DeleteView): #
new
    model = Article
    template_name = 'article_delete.html'
    success_url = reverse_lazy('article_list')
    login_url = 'login'

    def test_func(self): # new
        obj = self.get_object()
        return obj.author == self.request.user
```

Now log out of your superuser account and log in with `testuser`. If the code works, then you should not be able to edit or delete any posts written by your superuser, which is all of them right now. Instead you will see a Permission Denied 403 error page.


127.0.0.1:8000/articles/5/edit/

127.0.0.1:8000/articles/5/edit/

403 Forbidden

403 error page

Conclusion

Our *Newspaper* app is almost done. There are further steps we could take at this point, such as only displaying edit and delete links to the appropriate users, which would involve custom template tags but overall the app is in good shape. We have our articles properly configured, set permissions and authorizations, and user authentication is in order. The last item needed is the ability for fellow logged-in users to leave comments which we’ll cover in the next chapter.

Chapter 15: Comments

There are two ways we could add comments to our *Newspaper* site. The first is to create a dedicated *comments* app and link it to *articles*, however that seems like over-engineering at this point. Instead we can simply add an additional model called `Comment` to our *articles* app and link it to the `Article` model through a foreign key. We will take the simpler approach since it's always easy to add more complexity later. By the end of this chapter users will have the ability to leave comments on any other users articles.

Model

To start we can add another table to our existing database called `Comment`. This model will have a many-to-one foreign key relationship to `Article`: one article can have many comments, but not the other way around. Traditionally the name of the foreign key field is simply the model it links to, so this field will be called `article`. The other two fields will be `comment` and `author`.

Open up the file `articles/models.py` and underneath the existing code add the following.

Code

```
# articles/models.py
...

class Comment(models.Model): # new
    article = models.ForeignKey(Article, on_delete=models.CASCADE)
    comment = models.CharField(max_length=140)
    author = models.ForeignKey(
        get_user_model(),
        on_delete=models.CASCADE,
    )

    def __str__(self):
        return self.comment

    def get_absolute_url(self):
        return reverse('article_list')
```

Our `Comment` model also has a `__str__` method and a `get_absolute_url` method that returns to the main `articles/` page.

Since we've updated our models it's time to make a new migration file and then apply it. Note that by adding `articles` at the end of each command–which is optional–we are specifying we want to use just the `articles` app here. This is a good habit to use. For example, what if we made changes to models in two different apps? If we **did not** specify an app, then both apps' changes would be incorporated in the same migrations file which makes it harder, in the future, to debug errors. Keep each migration as small and contained as possible.

Command Line

```
(news) $ python manage.py makemigrations articles
(news) $ python manage.py migrate
```

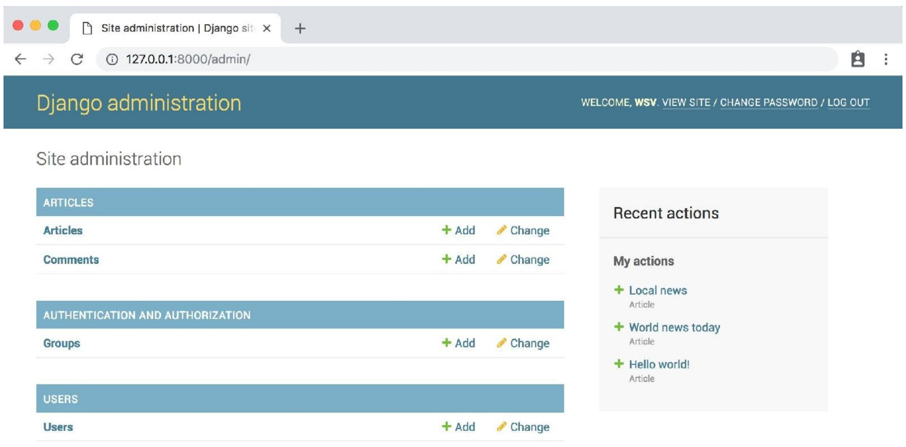
Admin

After making a new model it's good to play around with it in the admin app before displaying it on our actual website. Add `Comment` to our `admin.py` file so it will be visible.

Code

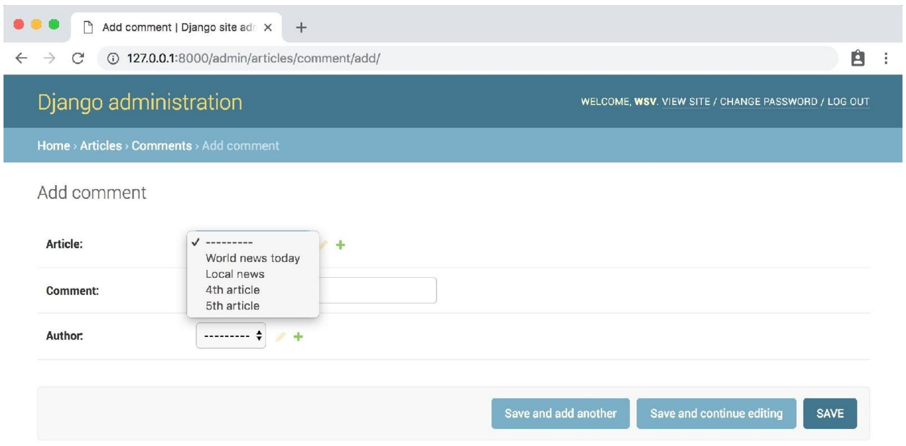
```python
# articles/admin.py
from django.contrib import admin

from .models import Article, Comment # new

admin.site.register(Article)
admin.site.register(Comment) # new
```

Then start up the server with `python manage.py runserver` and navigate to our main page http://127.0.0.1:8000/admin/



Admin page with Comments

Under our app "Articles" you'll see our two tables: Comments and Articles. Click on the "+ Add" next to Comments. You'll see that under Article is a dropdown of existing articles, same thing for Author, and there is a text field next to Comment.


Add comment | Django site ad

127.0.0.1:8000/admin/articles/comment/add/

Django administration

WELCOME, WSV. VIEW SITE / CHANGE PASSWORD / LOG OUT

Home › Articles › Comments › Add comment

Add comment

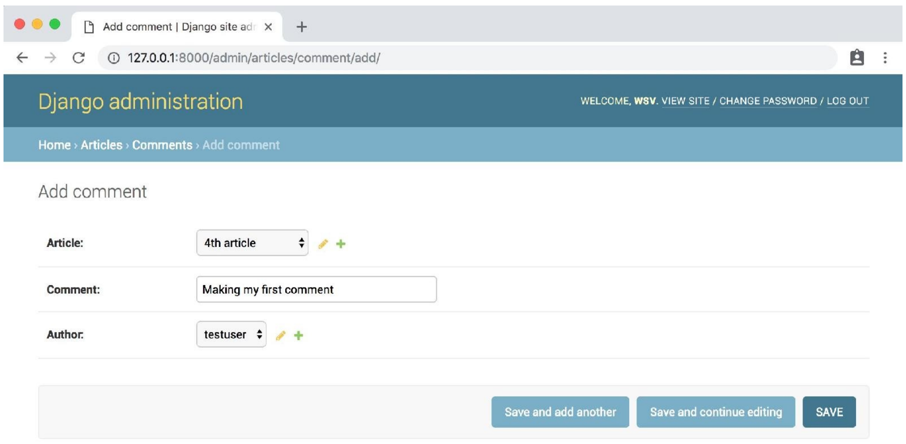
Article: ✓ ---------
World news today
Local news
4th article
5th article

Comment:

Author: ---------

Admin Comments

Select an Article, write a comment, and then select an author that is not your superuser, perhaps `testuser` as I've done in the picture. Then click on the "Save" button.


Add comment | Django site ad

127.0.0.1:8000/admin/articles/comment/add/

Django administration

WELCOME, WSV. VIEW SITE / CHANGE PASSWORD / LOG OUT

Home › Articles › Comments › Add comment

Add comment

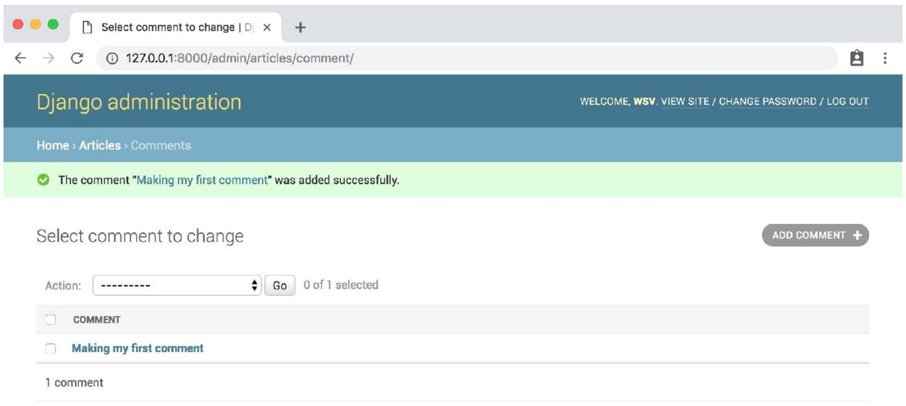
Article: 4th article

Comment: Making my first comment

Author: testuser

Admin testuser comment

You should next see your comment on the "Comments" page.


Select comment to change | D

127.0.0.1:8000/admin/articles/comment/

Django administration

WELCOME, WSV. VIEW SITE / CHANGE PASSWORD / LOG OUT

Home › Articles › Comments

The comment "Making my first comment" was added successfully.

Select comment to change

Action: --------- Go 0 of 1 selected

COMMENT

Making my first comment

1 comment

Admin Comment One

At this point we could add an additional admin field so we’d see the comment and the article on this page. But wouldn’t it be better to just see all `Comment` models related to a single `Post` model? It turns out we can with a Django admin feature called **inlines** which displays foreign key relationships in a nice, visual way.

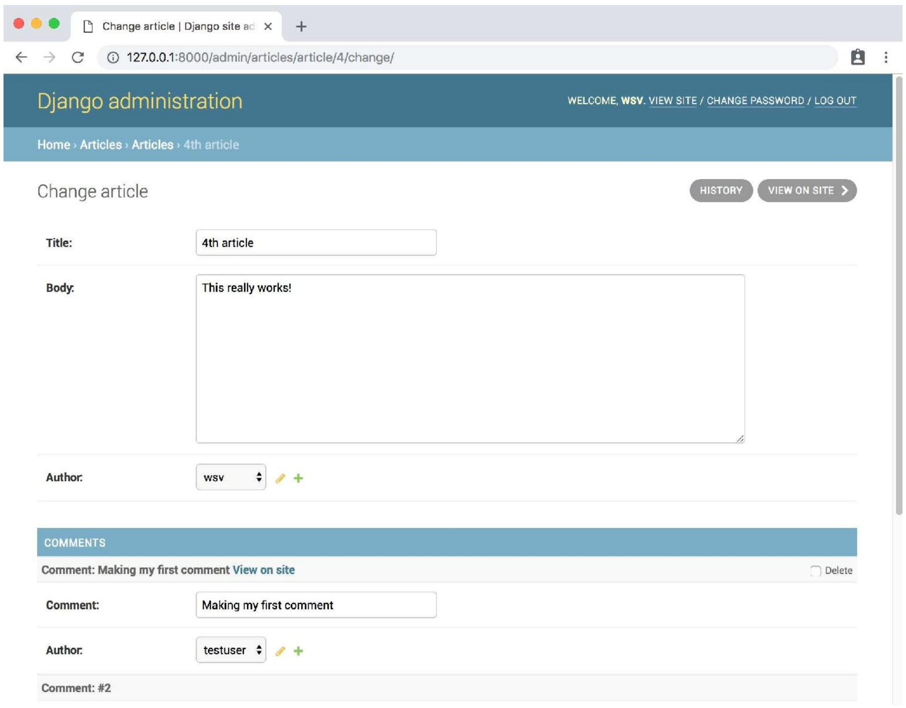
There are two main inline views used: TabularInline and StackedInline. The only difference between the two is the template for displaying information. In a TabularInline all model fields appear on one line while in a StackedInline each field has its own line. We’ll implement both so you can decide which one you prefer.

Update `articles/admin.py` as follows in your text editor.

Code

```
# articles/admin.py
from django.contrib import admin

from .models import Article, Comment

class CommentInline(admin.StackedInline): # new
    model = Comment


class ArticleAdmin(admin.ModelAdmin): # new
    inlines = [
        CommentInline,
    ]

admin.site.register(Article, ArticleAdmin) # new
admin.site.register(Comment)
```

Now go back to the main admin page at http://127.0.0.1:8000/admin/ and click on “Articles.” Select the article which you just added a comment for which was “4th article” in my case.


Change article | Django site ad
127.0.0.1:8000/admin/articles/article/4/change/
Django administration
WELCOME, WSV. VIEW SITE / CHANGE PASSWORD / LOG OUT
Home › Articles › Articles › 4th article
Change article
HISTORY
VIEW ON SITE
Title:
4th article
Body:
This really works!
Author:
wsv
COMMENTS
Comment: Making my first comment View on site
Delete
Comment:
Making my first comment
Author:
testuser
Comment: #2

Admin change page

Better, right? We can see and modify all our related articles and comments in one place. Note that by default, the Django admin will display 3 empty rows here. You can change the default number that appear with the `extra` field. So if you wanted no fields by default, the code would look like this:

Code

```
# articles/admin.py
...
class CommentInline(admin.StackedInline):
    model = Comment
    extra = 0 # new
```

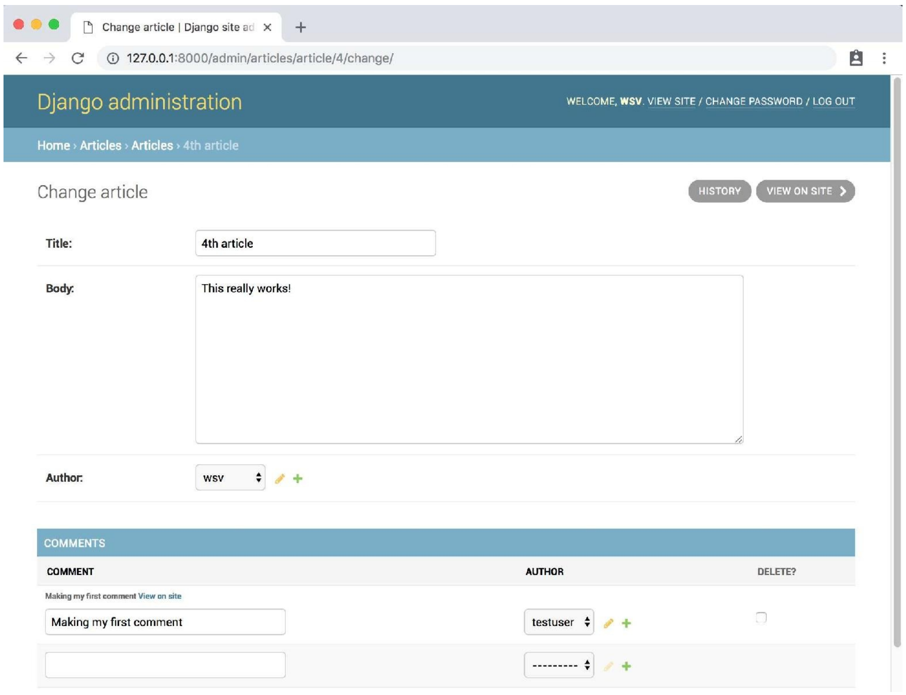
Personally though I prefer using `TabularInline` as it shows more information in less space. To switch to to it we only need to change our `CommentInline` from `admin.StackedInline` to `admin.TabularInline`.

Code

```
# articles/admin.py
from django.contrib import admin

from .models import Article, Comment


class CommentInline(admin.TabularInline): # new
    model = Comment


class ArticleAdmin(admin.ModelAdmin):
    inlines = [
        CommentInline,
    ]
```

```
admin.site.register(Article, ArticleAdmin)
admin.site.register(Comment)
```

Refresh the admin page and you'll see the new change: all fields for each model are displayed on the same line.


Change article | Django site ad
127.0.0.1:8000/admin/articles/article/4/change/
Django administration
WELCOME, WSV. VIEW SITE / CHANGE PASSWORD / LOG OUT
Home › Articles › Articles › 4th article
HISTORY
VIEW ON SITE

Change article

Title: 4th article

Body: This really works!

Author: wsv

COMMENTS

COMMENT	AUTHOR	DELETE?
Making my first comment View on site Making my first comment	testuser	

TabularInline page

Much better. Now we need to update our template to display comments.

Template

Since `Comment` lives within our existing `articles` app we only need to update the existing templates for `article_list.html` and `article_detail.html` to display our new content. We don't have to create new templates and mess around with URLs and views.

What we want to do is display **all** comments related to a specific article. This is called a "query" as we're asking the database for a specific bit of information. In our case, working with a foreign key, we want to follow a relationship backward: for each `Article` look up related `Comment` models.

Django has a built-in syntax for following relationships "backward" known as `FOO_set` where `FOO` is the lowercased source model name. So for our `Article` model we can use `article_set` to access all instances of the model.

But personally I strongly dislike this syntax as I find it confusing and non-intuitive. A better approach is to add a `related_name` attribute to our model which lets us explicitly set the name of this reverse relationship instead. Let’s do that.

To start add a `related_name` attribute to our `Comment` model. A good default is to name it the plural of the model holding the ForeignKey.

Code

```
# articles/models.py
...
class Comment(models.Model):
    article = models.ForeignKey(
        Article,
        on_delete=models.CASCADE,
        related_name='comments', # new
    )
    comment = models.CharField(max_length=140)
    author = models.ForeignKey(
        get_user_model(),
        on_delete=models.CASCADE,
    )

    def __str__(self):
        return self.comment

    def get_absolute_url(self):
        return reverse('article_list')
```

Since we just made a change to our database model we need to create a migrations file and update the database. Stop the local server with `Control+c` and execute the following two commands. Then spin up the server again as we will be using it shortly.

Command Line

```
(news) $ python manage.py makemigrations articles
(news) $ python manage.py migrate
(news) $ python manage.py runserver
```

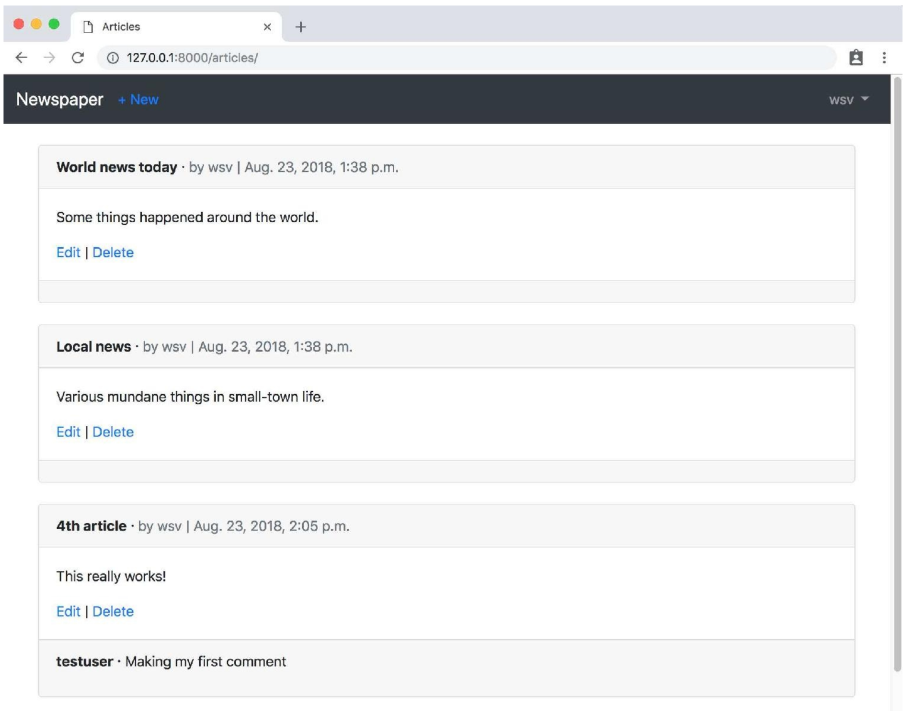
Understanding queries takes some time so don’t be concerned if the idea of reverse relationships is confusing. I’ll show you how to implement the code as desired. And once you’ve mastered these basic cases you can explore how to filter your querysets in great detail so they return exactly the information you want.

In our `article_list.html` file we can add our comments to the `card-footer`. Note that I’ve moved our edit and delete links up into `card-body`. To access each comment we’re calling `article.comments.all` which means first look at the `article` model, then `comments` which is the related name of the entire `Comment` model, and select `all` included. It can take a little while to become accustomed to this syntax for referencing foreign key data in a template!

Code

```
<!-- template/article_list.html -->
{% extends 'base.html' %}

{% block title %}Articles{% endblock title %}

{% block content %}
  {% for article in object_list %}
    <div class="card">
      <div class="card-header">
        <span class="font-weight-bold">{{ article.title }}</span> &middot;
        <span class="text-muted">by {{ article.author }} |
        {{ article.date }}</span>
      </div>
      <div class="card-body">
        <p>{{ article.body }}</p>
        <!-- Changes start here! -->
        <a href="{% url 'article_edit' article.pk %}">Edit</a> |
        <a href="{% url 'article_delete' article.pk %}">Delete</a>
      </div>
      <div class="card-footer">
        {% for comment in article.comments.all %}
          <p>
            <span class="font-weight-bold">{{ comment.author }} &middot;</span>
            {{ comment }}
          </p>
        {% endfor %}
      </div>
    </div>
    <br />
  {% endfor %}
{% endblock content %}
```

If you refresh the articles page at http://127.0.0.1:8000/articles/ we can see our new comment displayed on the page.



World news today · by wsv | Aug. 23, 2018, 1:38 p.m.

Some things happened around the world.

Edit | Delete

Local news · by wsv | Aug. 23, 2018, 1:38 p.m.

Various mundane things in small-town life.

Edit | Delete

4th article · by wsv | Aug. 23, 2018, 2:05 p.m.

This really works!

Edit | Delete

testuser · Making my first comment

Articles page with comments

Yoohoo! It works. We can see comments listed underneath the initial message.

Conclusion

With more time we would focus on forms now so a user could write a new article directly on the `articles/` page as well as add comments too. But the main focus of this chapter is to demonstrate how foreign key relationships work in Django.

Our *Newspaper* app is now complete. It has a robust user authentication flow including the use of email for password resets. We are also using a custom user model so if we want to add additional fields to our `CustomUser` model it is as simple as adding an additional field. We already have an `age` field for all users that is currently being set to `0` by default. If we wanted to, we could add an age dropdown to the sign up form and restrict user access only to users over age 13. Or we could offer discounts to users over age 65. Whatever we want to do to our `CustomUser` model is an option.

Most of web development follows the same patterns and by using a web framework like Django 99% of what we want in terms of functionality is either already included or only a small customization of an existing feature away.

Conclusion

Congratulations on finishing *Django for Beginners*! After starting from absolute zero we've now built five different web applications from scratch. And we've covered all the major features of Django: templates, views, urls, users, models, security, testing, and deployment. You now have the knowledge to go off and build your own modern websites with Django.

As with any new skill, it's important to practice and apply what you've just learned. The CRUD functionality in our *Blog* and *Newspaper* sites is common in many, many other web applications. For example, can you make a Todo List web application? You already have all the tools you need.

Web development is a very deep field and there's always something new to learn. When you're starting out I believe the best approach is to build as many small projects as possible and incrementally add complexity and research new things. If you try and build a production-ready version of, say, Twitter as your next project it won't be a good experience.

For example, it's unlikely our *Newspaper* app could handle the millions of users that a real-world newspaper website, like The New York Times, does. However Django itself is more than up to the task! After all, Django is used by Instagram which has **billions** of users and is one of the largest web applications in the world.

I've written two additional books on Django that are worth considering:

- Django for Professionals tackles many of the challenges around building truly *production-ready* websites, as well as handling payments, working with Docker and PostgreSQL, environment variables, advanced user registration, security, performance, and more.
- REST APIs with Django describes how to turn any Django website into a powerful web API with a minimal amount of code. This *full-stack* approach of separating the back-end from the front-end is used by an increasingly large number of companies.

Open Source Resources

A good place to find more information on Django resources is the awesome-django repo, which is a free curated list of awesome things related to Django.

There are also starter projects for both Django itself, DjangoX, and Django REST Framework, DRFX, that speed up development of new projects.

As you become more comfortable with Django and web development in general, you'll find the official Django documentation and source code increasingly valuable. I refer to both on an almost daily basis. Also Classy Class-Based Views provides a fantastic look at built-in classes and their respective methods.

A final resource is my personal website, wsvincent.com, which is regularly updated and features articles on many Django, Python, and JavaScript topics including:

- Django, PostgreSQL, and Docker
- Django Social Authentication
- Django Log In Mega-Tutorial
- Official Django REST Framework Tutorial - A Beginner's Guide
- Django Rest Framework Tutorial
- Django Rest Framework with React

Django Resources

To continue learning Django, I recommend working through the following free online tutorials:

- Official Polls Tutorial
- Django Girls Tutorial
- MDN: Django Web Framework
- A Complete Beginner's Guide to Django

All talksfrom the annual DjangoCon conference are available for free online and well worth watching for both beginners and advanced developers.

I also strongly recommend Two Scoops of Django 1.11: Best Practices for the Django Web Framework, which is the current best-practices bible for Django developers. Don't be put off by its *1.11* version number; almost all of the advice is still relevant to current versions of Django.

Python Books

If you're new to Python, there are several excellent books available for beginners to advanced Pythonistas:

- Python Crash Course is a fantastic introduction to Python that also walks you through three real-world projects, including a Django application.

- Think Python introduces Python and computer science fundamentals at the same time.
- Automate the Boring Stuff is another great guide to learning and using Python in real-world settings.
- The Hitchhiker’s Guide to Python covers best practices in Python programming.
- Python Tricks demonstrates how to write Pythonic code.
- Effective Python is an excellent guide not just to Python but programming in general.
- Fluent Python is amazing and provides a deep understanding of the Python language.

Blogs to Follow

These sites provide regular, high-quality writings on Python and web development.

- TestDriven
- Real Python
- Dan Bader
- Trey Hunner
- Full Stack Python
- Ned Batchelder
- Armin Ronacher
- Kenneth Reitz
- Daniel Greenfeld

Feedback

If you’ve made it through the entire book, I’d love to hear your thoughts. What did you like or dislike? What areas were especially difficult? And what new content would you like to see? I can be reached at will@wsvincent.com.