

DJANGO CRASH COURSE

COVERS PYTHON 3.8
AND DJANGO 3.X

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Django Crash Course

Covers Python 3.8 and Django 3.x

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Contents

Copyright	22
Introduction	23
Why Learn Django?	24
When the Going Gets Tough	26
This Book is intended for Django 3.x and Python 3.8	26
How This Book is Structured	26
Conventions Used in this Book	27
1 The Ultimate Django Setup	29
1.1 Goal: A Professional-Quality Development Environment	29
1.2 Core Concepts	30
1.3 Step 1: Install Visual Studio Code	31

1.4	Step 2: Installing Git	34
1.5	Step 3: Installing Conda	37
1.6	Step 4: Installing PostgreSQL	40
1.7	Summary	41
I	Hello, World in Django	42
2	Hello, World in Django	43
2.1	The “Hello, World” of Python	43
2.2	“Hello, World” of Django: Simple on Purpose . .	44
2.3	Projects Goals	44
2.4	Prerequisites	45
3	Preparation: Install Dependencies	46
3.1	What’s a Dependency?	46
3.2	Set Up a New Conda Environment	46
3.3	Install Django	47
3.4	Summary	48
4	Generate a Starter Django Project	49
4.1	Anatomy of a Bare-Bones Django Project	49
4.2	manage.py	50
4.3	settings.py	51
4.4	Other Settings	52
4.5	Exercise	53

5 Create a Database and Run the Project	54
5.1 Ensure We Are in the <code>helldjango</code> project	54
5.2 Creating the Database	54
5.3 Start Up Runserver	56
5.4 Runserver Has Started Up	56
5.5 Success!	57
6 Create a Django-Superuser	58
6.1 Stop <code>runserver</code> if It Is Still Running	58
6.2 Run <code>createsuperuser</code>	58
6.3 Summary	59
7 Practice Using the Admin	60
7.1 Restart <code>runserver</code>	60
7.2 Visit the Admin	60
7.3 Log in as Our Superuser	60
7.4 Explore the Admin	60
7.5 Recreating the Hello, World in Django Database	62
7.6 Summary	63
8 Generate a Homepage App	64
8.1 Stop <code>runserver</code> if Needed	64
8.2 Generate a Starter Django App	64
8.3 Anatomy of a Simple 1-App Django Project	64
8.4 Exercise	65
8.5 Main Django Project vs Django Apps	65

9 Prepping the Project for Templates	67
9.1 Configure Your Templates	67
9.2 Save!	68
9.3 Lists? Dictionaries?	68
10 Add a Simple Homepage View	70
10.1 Get to Know URL Routing	70
10.2 Add a URL Pattern for the Homepage	71
10.3 Double-Check the Code	72
10.4 Terminology: “Wire in the URL”	73
10.5 Refresh the Page and Trigger an Error	73
11 Create Our First Django Template	75
11.1 Create a Templates Directory	75
11.2 Add Index Template	75
11.3 Start Up Runserver	76
11.4 View the First Page	76
11.5 Recap	77
11.6 Understanding Views and the TemplateView Class	77
12 Working With Variables in Templates	79
12.1 Our First Templatized Value	79
12.2 What Is <code>my_statement?</code>	79
12.3 Extend HomepageView	80
12.4 Refresh the Homepage	80

12.5 Exercise: Play Around!	81
12.6 Common Questions	81
13 Calling View Methods From Templates	83
13.1 Define a View Method	83
13.2 Call the View Method From index.html	83
13.3 Reload the Homepage	84
14 Our First Project is Complete!	86
14.1 Summary	86
14.2 Next Steps	86
II EveryCheese	88
15 The EveryCheese Project	89
15.1 Prerequisites	89
15.2 Prepare the EveryCheese Programming Environment	89
15.3 Create a New Virtual Environment	90
15.4 Reactivating Conda Environments	90
15.5 Summary	91
16 Using Cookiecutter and Template	92
16.1 Install the Cookiecutter Library	92
16.2 Cookiecutter Project Templates	94
16.3 Using django-crash-starter	94

16.4	What Happened?	96
16.5	Tips and Troubleshooting	97
16.6	A Little Cookiecutter Background	98
17	Exploring the Generated Boilerplate	99
17.1	Some Basic Components	99
17.2	Summary	100
18	Starting Up Our New Django Project	101
18.1	Let's Run the Project	101
18.2	Go Into the EveryCheese Directory	101
18.3	Start PostgreSQL if Needed	102
18.4	What to name the database?	103
18.5	How to Create It	104
18.6	Install the Dependencies	104
18.7	Run the Migrations	105
18.8	Start Up Runserver	105
19	Cheese Boilers	106
20	Initializing the Git Repo Committing and Pushing	107
20.1	Why?	107
20.2	We'll Use GitHub	107
20.3	Create the GitHub Project	107
20.4	Examine the GitHub Instructions	109
20.5	Verify That the Files Got Committed	110

21 Git Is Not for Stinky Cheeses	111
22 What We Get From The Users App	112
22.1 Register a Normal User	112
22.2 Verify Our Email	115
22.3 Why Are Emails Printed in the Console?	116
22.4 Explore the User Profile	118
22.5 Edit User Data	118
22.6 Introducing <code>UserUpdateView</code>	119
22.7 Introducing <code>UserDetailView</code>	120
22.8 Understand the Name Field	121
22.9 Understand the Code for <code>UserUpdateView</code>	122
22.10 Add Email Addresses	123
22.11 What About the Code?	123
23 Adding User Bios	125
23.1 Add a Bio Field	125
23.2 Create and Run Migrations	125
23.3 Update <code>UserUpdateView</code>	126
23.4 Try It Out	126
24 Adding Bio to User Detail Template	129
24.1 Update the User Detail Template	129
24.2 Add Line Breaks	130
24.3 Commit Our Work	131

25 Introducing Tests	132
25.1 Why Test?	132
25.2 Running Tests	132
25.3 What Does a Test Look Like?	134
25.4 The Test Foundations	134
25.5 The Actual Test	135
25.6 Using the <code>assert</code> KeyWord	136
25.7 Introducing <code>coverage.py</code>	137
25.8 Using <code>coverage.py</code>	137
25.9 Generate an HTML Coverage Report	138
25.10 More Users App Tests	139
25.11 Summary	139
26 User Profile Cheese	140
26.1 Avatars Will Fit Into Cheese Holes	140
27 The Cheeses App and Model	141
27.1 Make Sure We're at the Project Root	141
27.2 Create an App Called Cheeses	141
27.3 Move It Into the Project	141
27.4 Set the Cheese Config	142
27.5 Add It to the List of Installed Apps	142
27.6 Add the Cheese Model	143
27.7 Create and Run the Initial Cheese Migration . .	147

28 Trying Out the Cheese Model	148
28.1 Let's Try It Out!	148
28.2 Django Shell vs. Shell Plus	148
28.3 Create a Cheese	148
28.4 Evaluate and Print the Cheese	149
28.5 View the Cheese's Name	149
28.6 Add a String Method	150
28.7 Try It Again	150
28.8 Commit Our Work	151
29 Tests and Test Coverage	152
29.1 Check Test Coverage	152
29.2 Create a Module for Cheese Model Tests	154
29.3 Let's Test the <code>__str__()</code> Method.	155
29.4 Enter “The Game of Test Coverage”	156
29.5 Rules of the Game	156
29.6 What’s the Point of All This Anyway?	157
29.7 Commit the Cheese Model Tests	158
29.8 Summary	158
30 The Cheeserator	159
31 Adding Cheeses to the Admin	160
31.1 We Need a Superuser	160
31.2 Go to the Admin	160

31.3 Explore the Admin So Far	161
31.4 Register Cheese Model With the Admin	161
31.5 Find Colby	161
31.6 Enter More Cheeses via the Admin	162
31.7 Some Notes About the Django Admin	164
31.8 Commit Changes	164
31.9 Summary	165
32 Behind the Curtain	166
32.1 We Are in Control	166
33 Class Based View Fundamentals	168
33.1 The Simplest Class-Based View	168
33.2 Adding More HTTP Methods	169
33.3 Advantages of Class Based Views	170
33.4 Composition	170
33.5 Composition Part II	171
33.6 Intelligent Defaults	172
33.7 Standardized HTTP Method Handling	172
33.8 Tips for Writing Class-Based Views	173
34 Writing the Cheese List View	174
35 Wiring in the List View Url	175
35.1 Define Cheese URL Patterns	175
35.2 Include Cheese URLs in Root URLConf	175
35.3 See the View in Action	176

36 The Cheese List Template	178
36.1 Create the List Template	178
36.2 Fill in the Template	178
36.3 See the List in Action	179
36.4 Add a Nav Link to the Cheese List	180
36.5 Explaining the <code>cheeses:list</code> Name	181
36.6 Commit Our Work	182
37 Add the CheeseDetailView	183
37.1 Add the CheeseDetailView URL Pattern	183
37.2 Link List Items to Detail Pages	184
38 The Cheese Detail Template	186
38.1 Add a Cheese Detail Template	186
38.2 Visit Cheese Detail	187
38.3 Commit Our Work	188
39 Where to Dip Class Based Views	189
40 Writing Factories for Tests	190
40.1 Produce Cheese Test Data From Factories	190
40.2 Define a <code>CheeseFactory</code>	190
40.3 Try Out <code>CheeseFactory</code>	191
40.4 Delete the Bogus Cheese	192
40.5 Commit the Changes	193

41 Why Use Factories	195
41.1 Factories and Unit Testing	195
41.2 Approach 1: Calling <code>create()</code>	195
41.3 Approach 2: Calling <code>CheeseFactory()</code>	196
41.4 Other Uses	197
41.5 Learn More About Factory Boy	197
42 Using Factories in Tests	198
42.1 Passing in Field Values Explicitly	198
42.2 Bulk Generation	198
42.3 Reviewing Our Cheeses	199
42.4 Cheese Cleanup	199
42.5 Replacing the Direct Cheese Model Call in Our Existing Test	200
42.6 Removing the Name Entirely	201
42.7 Commit Our Work	202
42.8 Summary	203
43 How Our Cheese Objects Feel About Your Tests	204
44 Finding and Adding a Third Party Countries App	206
44.1 Country of Origin	206
44.2 Benefiting From Open Source	208
44.3 Check Django Packages	208
44.4 Review Django Countries on GitHub	208
44.5 Look for the Release Number on PyPI	209

44.6	Install It	209
44.7	Implement in cheeses/models.py	211
44.8	Migrations!	213
45	Display Cheese Country Data	214
45.1	Add Cheese Countries in the Admin	214
45.2	Display Country in Cheese Detail	215
45.3	Run the Tests	216
45.4	Update <code>CheeseFactory</code>	216
45.5	Verify That <code>CheeseFactory</code> Works	217
45.6	Commit Our Work	218
46	Implement Cheese Creation by Users	219
46.1	Add a Cheese Creation View	219
46.2	Add the Corresponding URL Pattern	220
46.3	Specify the Desired Form Fields	223
46.4	Define the Cheese Form Template	223
46.5	Submit the Form	225
46.6	Implement <code>get_absolute_url()</code>	225
46.7	Resubmit the Form	227
46.8	Link to the Add Cheese Form	229
46.9	Commit the Changes	230

47 Use Django Crispy Forms for Better Display	232
47.1 Isn't <code>as_p()</code> Enough?	232
47.2 A Quick History Lesson	233
47.3 Crispy Forms and Cookiecutter Django	234
47.4 Our Non-Crispy Form	234
47.5 Use the <code>crispy</code> Template Tag	234
47.6 Reload the Add Cheese Form	236
47.7 Commit the Changes	236
48 Understand View Mixins and LoginRequired-Mixin	238
48.1 User-Generated Content and Accountability	238
48.2 Try Accessing the Add Cheese Form Anonymously	238
48.3 Require Login	239
48.4 Try Accessing It as Cheesehead	241
48.5 View Mixins	241
48.6 Commit the Changes	242
49 Add a Creator Field and Update Our Cheese Records	243
49.1 Add a Creator Field	243
49.2 Make and Apply the Migration	244
49.3 Commit the Changes	245

50 Track and Display the Cheese Creator	246
50.1 Set the Cheese Creator After Form Validation	246
50.2 Display the Creator on the Cheese Detail Pages	247
50.3 Try It Out	248
50.4 Commit the Changes	249
51 Update the Cheese Factory	250
51.1 Run the Tests	250
51.2 Modify Cheese Factory	250
51.3 Run the Tests, Again	251
51.4 Try <code>cheeseFactory</code> in the Shell	251
51.5 Delete the Random Cheese	252
51.6 Delete the Random User	252
51.7 Commit the Changes	253
52 Update the Cheese Model Tests	254
52.1 Test <code>get_absolute_url()</code>	254
52.2 Commit the Changes	255
53 Test All the Cheese Views	256
53.1 What to Test?	256
53.2 Start With Imports	256
53.3 The First Cheese View Tests	257
53.4 Really Test the Cheese List View	261
53.5 Test the Cheese Detail View	262

53.6	Test the Cheese Create View	263
53.7	Commit the Changes	264
53.8	Conclusion	264
54	Test All the Cheese URL Patterns	266
54.1	Add the Imported Cheese	266
54.2	Write Our First Fixture	266
54.3	Test the Cheese List URL Pattern	267
54.4	Test the Add Cheese URL Pattern	267
54.5	Test the Cheese Detail URL Pattern	268
54.6	Commit the Changes	269
55	Adding a CheeseUpdateView and Form Recycling	270
55.1	Add the CheeseUpdateView	270
55.2	Wire in the URL Pattern	271
55.3	Try It in the Browser	271
55.4	What Happened?!?	273
55.5	Link to the Update Form	276
55.6	Try It in the Browser	276
55.7	Make Login Required	276
55.8	Commit the Changes	277
56	Test the Cheese Forms and Update View	279
56.1	Refactoring our Cheese Fixture	279
56.2	Test the Add Cheese Page Title	280

56.3	Test That <code>cheeseUpdateView</code> Is a Good View	281
56.4	Test That a Cheese Updates Correctly	282
56.5	Commit the Changes	283
57	EveryCheese is the Foundation!	284
57.1	Summary	284
57.2	Next Steps After This Book	285
57.3	Tutorial Books by Other Authors	286
57.4	Level Up With Two Scoops of Django 3.x	286
57.5	Giving Us Feedback	286
III	Aftermatter	287
58	Troubleshooting	287
58.1	Troubleshooting Conda Installations on Pre-Catalina OSX	287
58.2	Troubleshooting Conda Installations on Catalina or higher OSX	287
58.3	Troubleshooting PostgreSQL: Role Does Not Exist	288
58.4	Troubleshooting PostgreSQL: Cannot Create Database	289
58.5	Troubleshooting PsycoPG2	289
58.6	Troubleshooting GCC Errors on the Mac	289
58.7	Troubleshooting the MS Visual Studio Build Tools Error	290

59 Changelog	291
59.1 Beta Changelog 2020-05-28	291
59.2 Beta Changelog 2020-05-23	291
59.3 Beta Changelog 2020-05-09	291
59.4 Beta Changelog 2020-05-04	291
59.5 Beta Changelog 2020-04-14	292
59.6 Beta Changelog 2020-04-08	293
59.7 Beta Changelog 2020-03-25	293
59.8 Beta Changelog 2020-03-22	293
59.9 Beta Changelog 2020-03-19	293
59.10Beta Changelog 2020-03-13	294
59.11Beta Changelog 2020-03-10	294
59.12Beta Changelog 2020-03-06	295
59.13Beta Changelog 2020-03-03	295
59.14Beta Changelog 2020-02-26	296
59.15Beta Changelog 2020-02-22	296
59.16Beta Changelog 2020-02-21	296
59.17Beta Changelog 2020-02-19	297
59.18Alpha Changelog 2020-02-14	298
59.19Alpha Changelog 2020-02-11	298
59.20Alpha Changelog 2020-02-07	299
59.21Alpha Changelog 2020-02-05	299
59.22Alpha Changelog 2020-02-04	300
59.23Alpha Changelog 2020-02-03	300

60 Acknowledgements	301
60.1 Tech Reviewers	301
60.2 Contributors to 3.x Beta	302
60.3 Contributors to 3.x Alpha	302
60.4 Typesetting	303

List of Figures

1 Scientific Cheese-Based Diagram Explaining Why To Learn Django	24
2 Let's start with the basics.	42
3 It worked! Hooray!	57
4 Admin login screen	61
5 Greetings, Hello World	76
6 Greetings	81
7 Greeting with view method	84
8 The Tasty Cookiecutter Logo	98
9 Illustration of cheese boiler, and the location of its boilerplate	106
10 Create repository on GitHub	108
11 Stinky cheeses getting kicked out by a foot. . . .	111
12 Verify email page	115
13 Verification email in console window	117
14 Page with Confirm button	118
15 Minimal user profile	119

16	UserUpdateView	119
17	UserDetailView	120
18	UserUpdateView With Bio	127
19	UserDetailView Without Bio	128
20	UserDetailView With Bio	130
21	No line breaks in UserDetailView	131
22	A block of user profile cheese	140
23	Slugs are awesome!	145
24	94% coverage	152
25	Cheese model coverage	153
26	The Cheeserator device for manipulating cheese.	159
27	Cheeses on the Django admin index page	162
28	Add cheese in the Django admin	163
29	The cheese behind the curtain	166
30	TemplateDoesNotExist	176
31	Cheese list	179
32	Cheese List With Nav Link	181
33	Missing cheese_detail.html TemplateDoesNotExist exception	185
34	Cheese detail	187
35	Dipping CBVs in fondue.	189
36	Django admin list of cheeses, including bogus cheese	193
37	A good cheese that passed its test.	205
38	Django Packages' countries grid	209

39	Django Countries README on GitHub	210
40	Cheese country data in the admin	214
41	No cheese found!	220
42	Need Fields Attribute	222
43	Cheese Form Template Does Not Exist	224
44	Add Cheese Form	226
45	No URL to Redirect To	227
46	Resubmit Cheese	228
47	Cheese Detail for Havarti	228
48	Cheese List With Add Cheese Button	230
49	Cheese form with unstyled form fields	232
50	Add Cheese Form	235
51	Add Cheese Form, Rendered With Crispy Forms	237
52	Add Cheese Form, As Anonymous User	239
53	Incognito Redirect to Sign In Page	241
54	Cheese Detail With Creator	249
55	Pre-populated Add Cheese Form	272
56	Cheese Detail With Update Button	277

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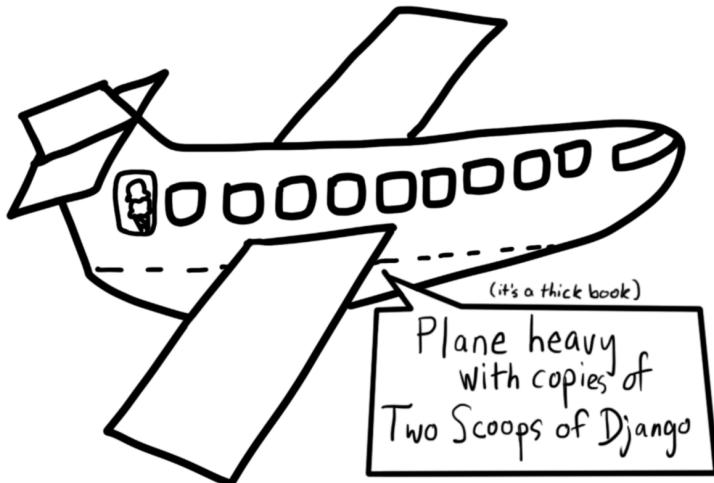
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Introduction



Once upon a time, we traveled the world doing Django training for companies. These private training sessions were custom-designed for companies needing to get engineers up and running fast with Django. Engineers who've been through this training describe them as compressing months of learning Django on your own into the span of one intense, exhausting week.

Django Crash Course is the foundation portion of our corporate training sessions. It's the first and sometimes the second day of our corporate training, for which we charge **\$3000 an attendee**.

When people pay that much for a workshop, they make sure they're getting their money's worth. They take detailed notes, study every code sample as if it were gold, and appreciate every minute of it. They also complete every single part of the course, including the difficult or tedious parts.

If you do follow that same pattern with this book you will learn. Trust us.

Once you've gone through this book, you'll be ready for the forthcoming **Django Crash Course extension series**. Like this book, these are patterned after our corporate training, specifically intermediate-to-advanced material from days 3, 4, and 5. They build directly off the foundations laid in this book, readying you for the serious work of professional Django development.

Why Learn Django?

In today's world, one might ask what's the point of learning a 17-year old application framework. Here are three reasons why:

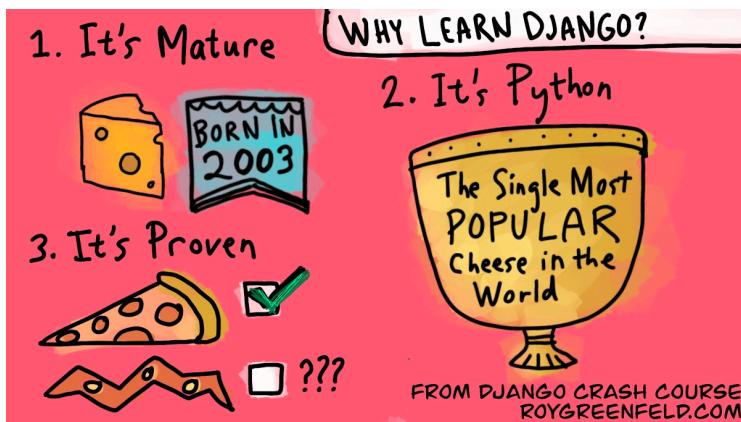


Figure 1: Scientific Cheese-Based Diagram Explaining Why To Learn Django

Reason #1 - Django is Mature

Started in 2003, Django isn't some new framework that hasn't accounted yet for all common edge cases. Rather Django's main-

tainers have handled those edge cases at least once. Instead, the maintainers are worried that Django is now old enough to be interested in dating and has a US driving learner's permit.

We like to think of Django like a delicious aged cheese like **Boerenkaas Gouda**, with a sweet, intense flavor that only comes with maturity.

Reason #2 - Django is Python

Python is an immensely popular programming language and is by far #1 in the field of data science. Python is easy to learn yet powerful in execution. It has a gigantic global community of users and hundreds of thousands of libraries to draw on, including Pandas, Numpy, Keras, and of course, Django.

We like to think of Python like **Mozzarella**, arguably one of the most popular cheeses in the world. Its use in pizza as the base cheese makes mozzarella such a universal cheese much in the same way that Django's use of Python makes it such a universal platform.

Reason #3 - Django is Proven

No tool remains popular for as long as Django unless it proves itself. Because it is so proven, Django is relied on by startups building dreams, science and fintech efforts presenting their data, and of course, tech giants like Instagram.

We like to think of Django as the cheese on pie-sliced pizza, a dish proven around the world. No matter where one goes on the planet, a slice of cheese pizza is always available. That's because pizza is proven, much like Django is proven as an application framework.

Now that we know why to learn Django, let's get started!

When the Going Gets Tough

We've tried to minimize the tedious parts, but sometimes it takes getting past that sort of material to break through to the fun stuff. We've also tried to keep the difficulty level manageable, but sometimes you'll find things you don't understand, and you'll have to experiment and research concepts.

We've put so much love over the years into these materials, iterating and hand-crafting them with the utmost care. Yet you may find errors or omissions. This is not the final version of the book, so remember, you can help us make it even better.

We hope you have fun with this book. We've had fun putting it together for you.

This Book is intended for Django 3.x and Python 3.8

This book should work well with the Django 3.x series, less so with Django 2.x and so on. As for the Python version, this book is tested on Python 3.8. Most code examples should work on Python 3.7.x and 3.6.x, but some exceptions may have to be worked through.

How This Book is Structured

After this introduction chapter, Django Crash Course¹ is structured in three parts:

The Ultimate Django Setup Our simple but comprehensive guide for setting up computers for building Django projects.

¹ <https://www.feldroy.com/collections/two-scoops-press/products/django-crash-course>

Hello, World in Django Getting comfortable with the basics of Django development.

The EveryCheese Project A gentle but deep introduction to techniques and patterns used by professional Django developers. It's also the foundation of the Extension Series.

Conventions Used in this Book

We use code examples like the following throughout the book:

```
class Cheese:  
    def __init__(self, aged=False):  
        self.aged = aged
```

To keep these snippets compact, we sometimes violate the PEP 8 conventions on comments, line spacing, and line length. Code samples are available at:

<https://github.com/feldroy/django-crash-course/tree/master/code>

We use the following typographical conventions throughout the book:

- `Constant width` for code fragments or commands.
- *Italic* for filenames.
- **Bold** when introducing a new term or important word.

Boxes containing notes, warnings, tips, and little anecdotes are also used in this book:



Something You Should Know

Tip boxes give handy advice



Some Dangerous Pitfall

Warning boxes help you avoid common mistakes and pitfalls.

We also use tables to summarize information in a handy, concise way:

Table 1: Three Delicious Kinds of Cheese

Name	Country of Origin	Hardness
Parmesan	Italy	hard
Cheddar	England	semi-soft
Raclette	Switzerland/France	semi-hard

1 The Ultimate Django Setup

This is how we like to set things up on our computers, as of 2020. Daniel uses a MacBook Air, and Audrey uses a MacBook Pro. We also share a Microsoft Surface Pro for Windows development and testing.

We've worked through Django setup countless times, both for ourselves and for students. Over the years our preferences have evolved. This is the latest iteration of how we like to set up our computers (and those of our students and readers) for Django development.



This chapter is a work in progress!

We've put a lot of work into this chapter, yet we know from experience that some people will run into challenges, or bugs, and errors. In that case, please let us know at our issue tracker at <https://github.com/feldroy/django-crash-course/issues>.

1.1 Goal: A Professional-Quality Development Environment

The goal of this chapter is to get our computer fully set up for optimal Django development on Mac or Windows. This isn't just a toy set up for educational purposes; it's the real setup used by professional web developers and data scientists, and one which we can use to develop real-world Django projects.

Make sure we:

- Are comfortable using the command line. If not, work through a command line tutorial such as TODO.

- Have a computer with at least a gigabyte (1 GB) of hard drive space.
- Have a fast internet connection. We're going to be here for a little while.

1.2 Core Concepts

1.2.1 Keep Tooling Updated

This book encourages us to use the latest versions of all available tools. If we have an outdated version of any particular tool, upgrade it whenever possible. Don't worry, this guide shows how to make those updates.

1.2.2 Perfection Is Impossible

When installing developer tools, it's extremely common for an install to fail partway, leaving crumbs on our system. While it can be frustrating, it's part of life as a developer. The more experience we gain as a developer, the more we learn to live with an imperfect system full of crumbs from half-installed tools all over our operating system's nooks and crannies. It's alright, though. If it's any consolation, as we gain more experience with Django and related tooling, we'll gain an intuition for when we can delete these crumbs.

We don't need a pristine, untouched operating system to set up Django and all its dependencies properly. We've had students purchase expensive new computers before our training, then panic when they accidentally install something the wrong way. Please don't buy a new laptop just to work with Django. Try installing these tools on whatever computer that's available at home, school, or work.

Some may think their setup is too broken and unrecoverable to work with. There's a 99% chance that's not true. Just work with it and let's give it our best try.

1.2.3 Take Detailed Notes

We highly recommend keeping a journal of:

- All the commands typed in at the command line, and their results
- What is installed via GUI installers

This can be as simple as a text file in a `notes` directory named `2020-02-01.txt`.

Detailed notes are our best guard against things going wrong. Even if our notes are mostly just copy-pasted commands and output from our terminal that we don't understand, that's alright. The important thing is that we maintain a record of changes.

With that, let's get started!

1.3 Step 1: Install Visual Studio Code

Visual Studio Code (VSCode) is a source code editor. Developed by Microsoft as an open-source project ([github.com/Microsoft/vscode²](https://github.com/Microsoft/vscode)), according to Stack Overflow's 2019 Developer Survey it is the most popular developer environment tool in the world. (reference: [insights.stackoverflow.com/survey/2019³](https://insights.stackoverflow.com/survey/2019)).

We like VSCode because it is open source, features built-in source control management, and has a huge number of extensions.

²<https://github.com/Microsoft/vscode>

³<https://insights.stackoverflow.com/survey/2019>



If VSCode is already installed. Then skip to section on Step 2: Installing Git.

1.3.1 Installing VSCode on Windows

1. Go to <https://code.visualstudio.com/download>.
2. Click the Windows download button.
3. On the computer double-click the .exe file.
4. Follow the instructions on the screen.
5. On the select Additional Tasks step of the installer, mark the options:
 - Add “Open with Code” action to Windows Explorer file context menu.
 - Add “Open with Code” action to Windows Explorer directory context menu.
 - Register Code as an editor for supported file types.
6. Restart Windows after the installation is finished.
7. From the Start menu, open Visual Studio Code.



If we do not restart Windows.

If Windows is not restarted, the option to select Visual Studio Code as the default editor for Git may not be available when installing [Git for Windows](#)

1.3.2 Installing VSCode on Mac

1. Go to <https://code.visualstudio.com/download>.
2. Click the Mac download button.

3. On the computer double-click the .zip file.
4. Move the file inside to the Applications folder.
5. Launch Visual Studio Code from the /Applications directory.
If a dialog box appears that says, “*Visual Studio Code*” is an app downloaded from the Internet. Are you sure you want to open it?, click on the open button.
6. On View menu, click into *Command Palette* (Shift + Command + P) and type ‘shell command’ to find the shell Command: Install ‘code’ command in PATH command.



Note about Safari Browser.

On step 3, after downloading the zip file with Visual Studio Code, it may not be possible to find the zip file after downloading it. If that is the case, look for a directory or an unzipped file. This is because by default Safari will automatically open some file types.

Users of Safari can change this behavior by unmarking the option Open "safe" files after downloading on *Safari -> Preferences* menu.

1.3.3 Installing VSCode on Linux

1. Open a terminal, and run

```
wget --quiet -O- https://feld.to/vscode-ubuntu-installer | bash
```

We will need to enter our Linux user's password, and after that, the installation will take place automatically.



To easily open a terminal on Ubuntu press the keyboard shortcut: CTRL + ALT + T

1.4 Step 2: Installing Git

Git⁴ is the predominant version control system used by the professional software development community.



If Git is already installed and configured.

Then skip to [Step 3: Installing Conda](#).

1.4.1 Installing Git on Windows

1. Go to <https://gitforwindows.org/>
2. Click on the download button.
3. On the computer double-click the .exe file.
4. Follow the instructions on the screen.
5. On the choosing the default editor used by Git step of the installer, select the option use Visual Studio Code as Git's default editor and continue the installation.
6. To confirm that the git was installed successfully, Open a terminal (CMD) and type `git --version` and press ENTER, then we should get an output like:

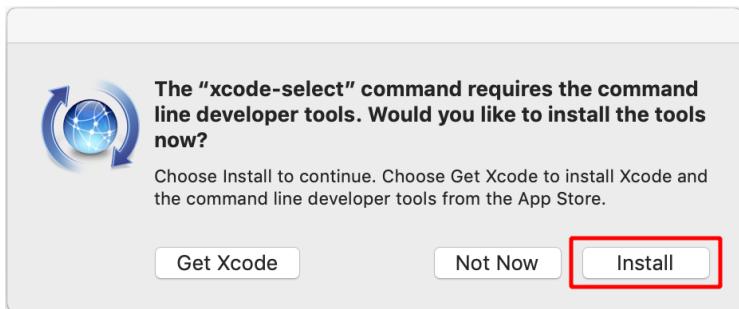
⁴<https://git-scm.com/>

```
git version 2.xx.x
```

1.4.2 Installing Git on Mac

To install git on Mac we need to install the Apple Command-line tools for Xcode.

1. Open a terminal.
2. Type `xcode-select --install` and press ENTER.
3. Click on the `install` button.



4. Accept the license agreement.
5. Depending on our internet speed, installation may take some time. When the installation is finished, click on the `Done` button.
6. To confirm that the git was installed successfully, type `git --version` and press ENTER, then we should get an output like:

```
git version 2.xx.x
```

1.4.3 Installing Git on Linux

1. Open a terminal.
2. Type `sudo apt-get update` and press ENTER. Insert the password of your Linux user if it was asked.
The `sudo apt-get update` will update the local packages information database to the latest version.
3. Type `sudo apt-get install git --yes` and press ENTER to install `git`.
4. To confirm that the `git` was installed successfully, type `git --version` and press ENTER, then we should get an output like:

```
git version 2.xx.x
```

1.4.4 Configuring Git

To use `git`, it is also necessary to inform `git` which `name` and `email` address it will use to identify who is the author of a certain change.

To configure `git`, first, we'll need access to the command line:

- Windows: Open the Start Menu and choose Anaconda Prompt.
- Mac/Linux: Open a terminal window.

```
git config --global user.name "replace this with your full name"  
git config --global user.email "replace this with your email address"
```

To confirm that the Git was configured successfully, type `git config --list` and press ENTER, then we should get an output that contains `user.name` and `user.email`, like

```
user.name=Your full name here  
user.email=your email address here
```

1.5 Step 3: Installing Conda

Conda is the tool we use for virtual environments.

Virtual environments allow us to do things like run one project with Django 3.0 and another with Django 2.2 on the same machine.



Is Conda already installed?

Here's how to check:

- Windows: Open the Start Menu and choose the Anaconda Prompt. If we find it, that means Conda is installed.
- Mac: Open a terminal and type `conda -v`.
 - * If the response says something like `conda 4.8.1`, Conda is installed and now we know its version.
 - * If that doesn't work, type `~/.bash_profile` and hit return. Once that's done, try `conda -v` again.

If any of these are true, skip forward to [Updating Existing Conda Installation](#).



Want to use pip, virtualenv, venv, or Poetry instead of Conda?

More advanced readers might already be proficient with tools like **virtualenv**, **poetry**, **docker**, or other environmental control tools. If that's the case, they can use those tools with small adjustments to the instructions we provide. Do note that we cannot provide any dependency-related support for people using the book with a tool that isn't Conda.

1.5.1 Installing Conda on Windows

1. Go to <https://docs.conda.io/en/latest/miniconda.html#windows-installers>
2. Find the Python 3.7 versions.
3. Click the link with 64-bit in the name and download the executable file.
4. On the computer double-click the .exe file. If we are unsure about any setting, accept the defaults. We can change them later.
5. Follow the instructions on the screen.
6. When installation is finished, from the Start menu, open the Anaconda Prompt.
7. In the Anaconda prompt, type `conda list` and press enter.

1.5.2 Installing Conda on Mac

1. Go to <https://docs.conda.io/en/latest/miniconda.html#macosx-installers>
2. Find the Python 3.7 versions.
3. Click the link with 64-bit pkg in the name and download.
4. On the computer double-click the .pkg file.

5. Follow the instructions on the screen. If unsure about any setting, accept the defaults. We can change them later.
6. When the installation is finished, open a terminal window.
7. Type `conda list` and press enter.

If there is a problem, depending on the Mac go to:

- [Troubleshooting Conda Installations on Pre-Catalina OSX](#)
- [Troubleshooting Conda Installations on Catalina or higher OSX](#)

1.5.3 Installing Conda on Linux

1. Go to <https://docs.conda.io/en/latest/miniconda.html#linux-installers>
2. Find the Python 3.7 versions.
3. Click the link with 64-bit in the name and download.
4. On the computer, open a terminal. Go to the directory where you saved the file: `cd ~/Downloads` Make the file executable: `chmod a+x Miniconda3-latest-Linux-x86_64.sh` Execute the file: `./Miniconda3-latest-Linux-x86_64.sh`.
5. Follow the instructions on the screen. If unsure about any setting, accept the defaults. We can change them later.
6. When the installation is finished, close the current terminal window and open a new one.
7. Type `conda list` and press enter.

1.5.4 Updating Existing Conda Installation

To update a Conda installation, enter this command:

```
conda update conda
```

1.6 Step 4: Installing PostgreSQL

1.6.1 Installing PostgreSQL on Windows

For the time being, we can't support installations of PostgreSQL on Windows. Fortunately, the Sqlite engine is part of the Python installation of Windows. That is what Windows users should use in this course.

1.6.2 Installing PostgreSQL on Mac

The best way to install PostgreSQL on the Mac is by following these steps:

1. Go to <https://postgresapp.com>
2. Click on the “Downloads” tab
3. Choose the most recent release and download it. This should be the first download option on the page
4. Once downloaded, open the `dmg` file locally
5. Move the **Postgres** file in the opened `dmg` to our `/Applications` folder like we would any other application

Once that's done, we need to configure our `$PATH` so that we can use PostgreSQL easily on the command-line. To do that, execute this in the terminal:

```
sudo mkdir -p /etc/paths.d && \
echo /Applications/Postgres.app/Contents/Versions/latest/bin | \
sudo tee /etc/paths.d/postgresapp
```

We need to close the terminal window and open a new one for the changes to take effect.

1.6.3 Installing PostgreSQL on Linux

1. Open a terminal, and run

```
wget --quiet -O- https://feld.to/pg12-ubuntu-installer | bash
```

We will need to enter our Linux user's password, and after that, the installation will take place automatically.

1.7 Summary

Getting a computer setup for development is a bit of work, but worth the effort. Now that we're done, let's move on and crash into coding some Django!

Part I

Hello, World in Django



Figure 2: Let's start with the basics.

2 Hello, World in Django

When most people learn how to ride a bicycle, they are given the simplest model. Only one gear, simple brakes, and nothing more. Yet the skills we learn on that bicycle stay with us for the rest of our life.

Think of this project as our first bicycle. It's not fancy, it won't do much. Yet it's going to provide us with the skills needed to start truly understanding Django.

In programming terms, minimal projects like this are called “Hello, World” programs⁵.

2.1 The “Hello, World” of Python

For example, this is a “Hello, World” program in Python.

```
print("Hello, world!")
```

We would save it as `hello.py` and then run it by typing `python hello.py` at the command line. Then it would print out:

```
Hello, world!
```

As we can see, this program is not a very useful program. It doesn't do anything except show us how to print a string. But it's useful if we're a programmer new to Python, trying to understand what a Python program looks like. It teaches us:

- How a very simple Python program is run

⁵https://en.wikipedia.org/wiki/%22Hello,_World!%22_program

- The basic Python syntax for printing the string “Hello, world!”
- Whether Python is available to run Python programs, or if we have a problem with our setup

Likewise, a “Hello, World” Django project would teach us how a very simple Django project works and is run, and it can help us make sure that we have Django set up correctly.

2.2 “Hello, World” of Django: Simple on Purpose

The project will be simple, but it will expose the foundations needed to begin your Django journey. We’ll want to keep it on hand as a reference project, one that we go back to on later projects to remind ourselves how the basics are done.

What we won’t be doing is expanding this `Hello, World` project to become a real-world project that does anything meaningful. Just like we wouldn’t use our first bicycle to enter a serious race, this project isn’t meant for serious use. The foundations just aren’t there in the boilerplate code.

Later in this book, we’ll show us how to develop a realistic, fully-featured Django project. Be patient. Study the foundations, and we’ll be equipped to get even more out of the later projects in this book. Onward and upward!

2.3 Projects Goals

- Get a taste of working with Conda, pip, and Django together
- Understand the minimum Django project
- Understand a minimal Django app

- Use a minimal Django template
- Understand the minimal template components: context data and method calls

2.4 Prerequisites

We will need to have our computer ready for software development. If we don't have it ready, go to [The Ultimate Django Setup](#) chapter.

2.4.1 Still Learning to Code?

This book is best once we already know at least a little programming. If we are still learning to code, we will benefit from going through at least one intro to programming tutorial before this one.

It's fine if we don't know everything about Python or HTML when we start this project. Just having a taste of writing simple Python and HTML is fine. We will learn a lot just by following along and doing the exercises.

3 Preparation: Install Dependencies

3.1 What's a Dependency?

A **dependency** is a package that a project requires in order to run. In our case, the only dependency we will need to install is Django.

3.2 Set Up a New Conda Environment

Create and activate a **hellodjango** conda environment. First, we'll need access to the command line:

- Windows: Open the Start Menu and choose Anaconda Prompt.
- Mac: Open a terminal window.

In the terminal window, type the following:

```
conda create -n hellodjango python=3.8
```

The screen will then display a message that should look similar to this:

```
The following NEW packages will be INSTALLED:  
<snip for brevity>  
Proceed ([y]/n)?
```

Type y and hit return.

Depending on our computer, internet speed, and if we have done this before, the computer will process for 5 seconds to 5 minutes,

then return us to the command-line. Once that's done, we type this at the command-line:

```
conda activate hellodjango
```

After that, our command-line should look like something like:

```
(helloworldjango) $
```

If it's not exactly what we see above, that's okay. Just so long as it's prefixed with `(helloworldjango)`, then it's been done correctly.

For the rest of this course, we should always keep the `helloworldjango` conda environment active.



If We Lose the `helloworldjango` Terminal

Don't worry. We can reactivate the conda environment with these simple instructions:

- Windows: Open the Start Menu and choose Anaconda Prompt.
- Mac: Open a terminal window.

In the terminal window, type the following:

```
conda activate helloworldjango
```

3.3 Install Django

Install the latest version of Django into our conda env:

```
pip install django
```

We should see something like this happen:

```
Collecting django
  Downloading https://files.pythonhosted.org/packages/55/d1/8ade70e65fa157e1903f...
    |████████████████████████████████| 7.4MB 4.4MB/s
Collecting sqlparse>=0.2.2
  Downloading https://files.pythonhosted.org/packages/ef/53/900f7d2a54557c6a3788...
Collecting pytz
  Downloading https://files.pythonhosted.org/packages/e7/f9/f0b53f88060247251bf4...
    |████████████████████████████████| 512kB 15.6MB/s
Collecting asgiref~=3.2
  Downloading https://files.pythonhosted.org/packages/a5/cb/5a235b605a9753ebcb27...
Installing collected packages: sqlparse, pytz, asgiref, django
Successfully installed asgiref-3.2.3 django-3.0.2 pytz-2019.3 sqlparse-0.3.0
```

3.4 Summary

We just created the `hellodjango` conda environment. While it doesn't seem like much, this is a big deal. As we make more and more projects, isolating versions of libraries like Django from project to project becomes very important.

We also installed Django and its dependencies. This gave us a tool called `django-admin`, which lets us run management commands. We'll be using that in the chapters ahead.

4 Generate a Starter Django Project

First, let's make certain we are within the `hellodjango` conda environment. To do this, check that the command-line is prefixed with `hellodjango`. Once we've done that, type the following:

```
django-admin startproject hellodjango
```

This creates a minimal Django project called `hellodjango`. Type `ls` on Mac or `dir` on Windows to check that there's now a `hellodjango` directory in our current working directory.

4.1 Anatomy of a Bare-Bones Django Project

Open the newly-created project in Visual Studio Code. At the command-line, type:

```
code hellodjango
```

Take a look at the files that were created. We should see a file structure that looks like this:

```
hellodjango
├── hellodjango
│   ├── __init__.py
│   ├── asgi.py
│   ├── settings.py
│   ├── urls.py
│   └── wsgi.py
└── manage.py
```

This is the minimal Django project that `startproject` creates by default.

Let's look at a few modules.

4.2 manage.py

This `manage.py` module is something we call to run various Django commands that we'll be teaching during this project and other projects to follow.

```
#!/usr/bin/env Python
"""
Django's command-line utility for administrative tasks.
"""

import os
import sys


def main():
    os.environ.setdefault('DJANGO_SETTINGS_MODULE',
                          'hellodjango.settings')
    try:
        from django.core.management import execute_from_command_line
    except ImportError as exc:
        raise ImportError(
            "Couldn't import Django. Are you sure it's installed?"
            "and available on your PYTHONPATH environment variable?"
            "Did you forget to activate a virtual environment?")
    execute_from_command_line(sys.argv)

if __name__ == '__main__':
    main()
```

Don't worry if this code doesn't make any sense at this time. In fact, for most Django projects this code is never touched by developers.

4.3 settings.py

The `settings.py` module is much larger than the `manage.py` module. It's where we can globally change Django's behavior via settings. These settings are special variables identified by their **UPPERCASE** nature. In Django this is more than just a convention, all formally defined settings must be **UPPERCASE** and are considered to be **constants**.



How Django Settings Are Constants

While Python normally doesn't allow for constant-style variables, this is a special case. The way that the `django.conf.settings` module works, Django needs to restart for their value to be picked up by the rest of a project. In local development this can happen so fast we barely notice, which is convenient there.

Deployment into QA and production is a different story, but that topic is outside the scope of this book. We'll cover it in our forthcoming deployment extensions.

Here's an important setting, `SECRET_KEY`:

```
# SECURITY WARNING: Keep the Secret Key Used
#                   in Production Secret!
SECRET_KEY = '39) b-_laga9eauydaBB((b^4+1hmao'
```

Every time a new Django project is created, a new `SECRET_KEY` is generated as well. This is part of the security system of Django,

and this value is critical for keeping a Django project secure and unhacked. If that sounds like a heavy responsibility, that's because it is. In later projects we'll cover how to safely manage `SECRET_KEY` and other security related settings.

In fact, let's cover another important setting, `DEBUG`:

```
# SECURITY WARNING: Don't Run With Debug
#                         Turned on in Production!
DEBUG = True
```

When `DEBUG` is set to `True`, we get very sophisticated and very understandable debug messages while we are developing. In production, however, it must be set to `False`.



Any Django setting with a `SECURITY WARNING` must be taken seriously. Doing so ensures that our projects are much safer from evil people who want to do bad things.

4.4 Other Settings

One thing to note is that many sections inside `settings.py` have comments with links to the official documentation. As we get more familiar with Django, we'll find these links invaluable. Example:

```
# Internationalization
# https://docs.djangoproject.com/en/3.1/topics/i18n/

LANGUAGE_CODE = 'en-us'
```

```
TIME_ZONE = 'UTC'

USE_I18N = True

USE_L10N = True

USE_TZ = True
```

If a setting or group of settings doesn't have a reference to the Django documentation, it's still possible to look it up. In many cases we can enter the word "Django" and the name of the setting into Google or other search engines and get a result.

Try this with `ALLOWED_HOSTS`.

4.5 Exercise

Look up each setting from `settings.py` in the following docs:

- Settings topic overview⁶
- Settings reference docs⁷

For now, don't change anything. Instead, take a few minutes to jot down notes on the ones we think are interesting or important.

In the future we'll modify these settings to empower our projects to do great things.

⁶<https://docs.djangoproject.com/en/stable/topics/settings/>

⁷<https://docs.djangoproject.com/en/stable/ref/settings/>

5 Create a Database and Run the Project

All Django projects use databases to store persistent data supplied by users. Even this “hello, world” project follows this pattern.

5.1 Ensure We Are in the `hellodjango` project

If not done so yet, `cd` into the outer `hellodjango` folder:

```
cd hellodjango
```

List the contents of the directory, using `ls` on Mac/Linux or `dir` on Windows, to ensure we are in the same directory as `manage.py`. We should see this output:

```
hellodjango manage.py
```

The current directory should contain an inner `hellodjango` directory and a `manage.py` file.

5.2 Creating the Database

When we run the `migrate` command for the first time, a database gets created, and some starter tables in the database are set up.

At the command line, type:

```
python manage.py migrate
```

We will see output that looks something like this:

```
Operations to perform:
  Apply all migrations: admin, auth,
    contenttypes, sessions
Running migrations:
  Applying contenttypes.0001_initial... OK
  Applying auth.0001_initial... OK
  Applying admin.0001_initial... OK
  Applying admin.0002_logentry_remove_a... OK
  Applying admin.0003_logentry_add_acti... OK
  Applying contenttypes.0002_remove_con... OK
  Applying auth.0002_alter_permission_n... OK
  Applying auth.0003_alter_user_email_m... OK
  Applying auth.0004_alter_user_usernam... OK
  Applying auth.0005_alter_user_last_lo... OK
  Applying auth.0006_require_contenttyp... OK
  Applying auth.0007_alter_validators_a... OK
  Applying auth.0008_alter_user_usernam... OK
  Applying auth.0009_alter_user_last_na... OK
  Applying auth.0010_alter_group_name_m... OK
  Applying auth.0011_update_proxy_permi... OK
  Applying sessions.0001_initial... OK
```

Now if we type `ls` on Mac/Linux or `dir` on Windows, we will see this output:

```
db.sqlite3  helldjango manage.py
```

What's that new file? `db.sqlite3` is the database that got created.

5.3 Start Up Runserver

At the command line, type this to start up Django's development server:

```
python manage.py runserver
```

We should see something like this:

```
Watching for file changes with StatReloader
Performing system checks...

System check identified no issues
    (0 silenced).
January 25, 2020 - 19:34:39
Django version 3.x
using settings 'hellodjango.settings'
Starting development server at:
    http://127.0.0.1:8000/
Quit the server with CONTROL-C.
```

This means that the development server is now running on our computer.

5.4 Runserver Has Started Up

To go to our Django site, visit 127.0.0.1:8000⁸ in a browser.

⁸<http://127.0.0.1:8000>

5.5 Success!

If we see this, our Django project is now running on runserver (the local development server).

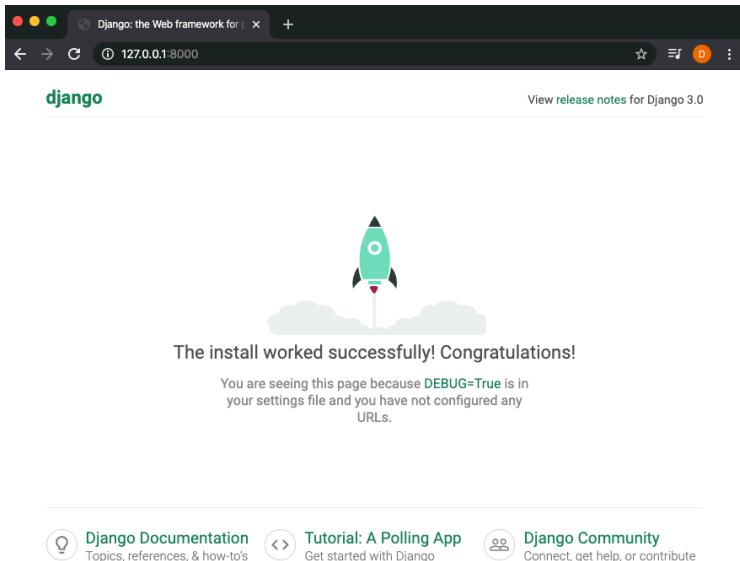


Figure 3: It worked! Hooray!

6 Create a Django-Superuser

In order to log into the Django admin, we need to create a Django superuser. Ordinary users will not be able to access the admin.

6.1 Stop `runserver` if It Is Still Running

Go to your terminal window. If runserver is still running, use CTRL-c to stop it.

Note: Make sure to press *Control-c*, not *Command-c*.

6.2 Run `createsuperuser`

Enter a username, email, and password for our Django superuser. For this minimal project, use the values of `admin` for the username, `admin@example.com` for the email, and create an eight (8) or more character password.

```
python manage.py createsuperuser
Username (leave blank to use 'scoopy'): admin
Email address: admin@example.com
Password:
Password (again):
Superuser created successfully.
```



Copy this password into a password manager!

It's bad practice to use simplistic passwords, even for local development. We want to promote strong security habits and this is one of them. Also, don't stick passwords into

plaintext or spreadsheet files. Instead, lean on secure password managers like 1Password or open source options.

6.3 Summary

We just created a superuser for a Django project. Out of the box this superuser has access to Django's admin tool. This allows them to make changes to database records, including the user list. As one might imagine, this is a very powerful role and not to be taken lightly.

7 Practice Using the Admin

7.1 Restart `runserver`

If `runserver` isn't on, restart it in the shell:

```
python manage.py runserver
```

7.2 Visit the Admin

In our browser, go to `127.0.0.1:8000/admin/`⁹ (the previous URL + `/admin/`).

We should see the admin login page:

Since we are not logged in, the Django admin redirects us to its login screen.

7.3 Log in as Our Superuser

Enter the Django superuser's username “`admin`” and password now. Then click “Log In”.

7.4 Explore the Admin

In a barebones Django project, the admin is empty except for the Authentication and Authorization tools:

⁹ <http://127.0.0.1:8000/admin/>

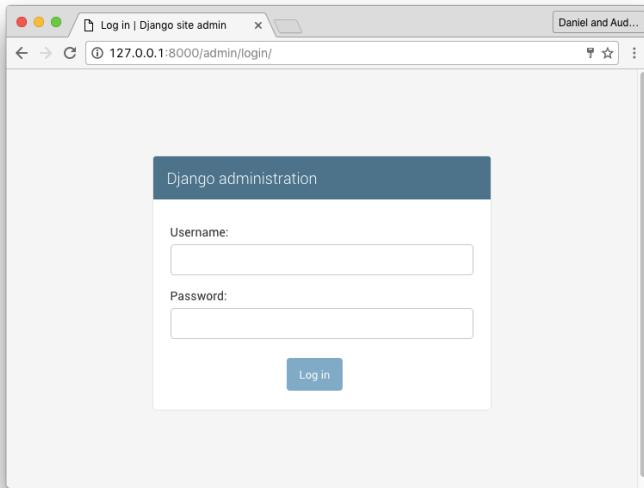
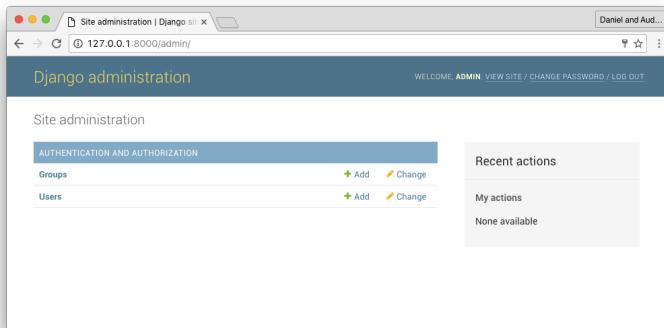


Figure 4: Admin login screen



Explore everything in the Admin. Click on various things, try

entering data, and get a feel for what the Django admin has provided so far. Don't worry if things break, we can and will quickly recreate the database. In fact, we cover that in the next section.

7.5 Recreating the Hello, World in Django Database

Let's recreate the database.

7.5.1 Step 1: Stop Runserver

At the command-line, type `ctrl-c`. This should stop the server.

7.5.2 Step 2: Delete the Database

In Visual Studio Code, find and right-click on the `db.sqlite3` database file. Choose the `Delete` option.

7.5.3 Step 3: Recreate the Database and Superuser

At the command-line, run `migrate` again:

```
python manage.py migrate
```

Once the database is created, we can recreate the superuser:

```
python manage.py createsuperuser
```

7.6 Summary

In this chapter we familiarized ourselves with not just the Django admin, but also creating the superuser. We even deleted the database and recreated the Django admin user. This should give us confidence about exploring systems in the future. Part of being a good developer is knowing that if we can restore a system easily, that gives us the luxury of being able to explore how to break it.

8 Generate a Homepage App

8.1 Stop `runserver` if Needed

If we still have the Django development server running, stop it with **CTRL+c**.

8.2 Generate a Starter Django App

Use the `startapp` management command to create a new Django app called `homepage`:

```
python manage.py startapp homepage
```



If something goes wrong

If this doesn't work, double-check that we're still inside the outer `hellodjango` project directory, at the same level as `manage.py`.

8.3 Anatomy of a Simple 1-App Django Project

The `startapp` command created a new directory in our project called `homepage`.

Switch back to Visual Studio Code. Expand the `homepage` directory to see what files it contains.

We should see this directory/file structure:

```
hellodjango
├── db.sqlite3
└── hellodjango
    ├── __init__.py
    ├── asgi.py
    ├── settings.py
    ├── urls.py
    └── wsgi.py
└── homepage
    ├── __init__.py
    ├── admin.py
    ├── apps.py
    ├── migrations
    │   └── __init__.py
    ├── models.py
    ├── tests.py
    └── views.py
└── manage.py
```

8.4 Exercise

What files are in the new Django app created by startapp? Study the files of our new `homepage` app. Don't touch them yet, just get familiar with the code inside each one.

8.5 Main Django Project vs Django Apps

- A Django project is a folder containing all the code (Python, templates, etc.) needed to run a website.
- A Django app is a folder within a Django project.
- Django apps are isolated components that do one specific thing in a Django project.

- Combining Django apps is one of the primary things we do when we build a Django project.

9 Prepping the Project for Templates

Before we can start writing views that use templates, we need to modify our project's settings.

9.1 Configure Your Templates

Search the `settings.py` module for the `TEMPLATES` setting. It's a list of dictionaries that looks like this:

```
TEMPLATES = [
{
    'BACKEND': 'django.template.backends.django.DjangoTemplates',
    'DIRS': [],
    'APP_DIRS': True,
    'OPTIONS': {
        'context_processors': [
            'django.template.context_processors.debug',
            'django.template.context_processors.request',
            'django.contrib.auth.context_processors.auth',
            'django.contrib.messages.context_processors.messages',
        ],
    },
},
]
```

Notice how `DIRS` is an empty list. As of now, Django doesn't know where to look for templates. We'll change that.

Go ahead and modify that slightly, by adding `os.path.join(BASE_DIR, "templates")` to the `DIRS` list on the fourth line. Here's how it should look:

```
TEMPLATES = [
{
    'BACKEND': 'django.template.backends.django.DjangoTemplates',
    'DIRS': [os.path.join(BASE_DIR, "templates")],
    'APP_DIRS': True,
    'OPTIONS': {
        'context_processors': [
            'django.template.context_processors.debug',
            'django.template.context_processors.request',
            'django.contrib.auth.context_processors.auth',
            'django.contrib.messages.context_processors.messages',
        ],
    },
},
]
```

This change tells Django to look inside a `templates` directory within the base directory of our project, which we'll create later in this book.

9.2 Save!

As always, let's not forget to save our work! Save `settings.py` so that Django's development server picks up the change we made.

9.3 Lists? Dictionaries?

We mentioned some Python terms in this lesson. While we assume in this book that readers already know the basics of Python, here's a recap in case we forgot what these terms mean.

9.3.1 What's a Python List?

In Python, a list consists of comma-separated values wrapped in square brackets. For example:

```
['Ice cream!', 2, 'cones', 3, 4]
```

Lists are one of the most important and frequently-used data types in Python. If we're new to lists, we'll greatly benefit from going through the Lists section of the official Python tutorial¹⁰. The rest of that tutorial is highly recommended.

9.3.2 What's a Python Dictionary?

A set of **key: value** pairs.

For example, here's a dict of ice cream flavors, where the keys are the flavors in English and the values are the corresponding flavors in Spanish:

```
{
    'vanilla': 'vainilla',
    'chocolate mint': 'choco menta',
    'coffee': 'café',
}
```

If we're not familiar with dicts in Python, we strongly recommend going through the Dictionaries section of the official Python tutorial¹¹. Type the examples into the Python shell and get comfortable adding and retrieving values.

¹⁰ <https://docs.python.org/3/tutorial/introduction.html#lists>

¹¹ <https://docs.python.org/3.8/tutorial/datastructures.html#dictionaries>

10 Add a Simple Homepage View

Open the `views.py` file of the `homepage` app. Remove the code that is there and replace it with the following:

```
from django.views.generic import TemplateView

class HomepageView(TemplateView):
    template_name = 'index.html'
```

Congrats, we've written our first Django view! What we've done:

- We created the Python class `HomepageView`
- `HomepageView` subclassed `TemplateView`. Django comes with a number of built-in views, which we can inherit from. We use these built-in views throughout the rest of this book
- Associated the `index.html` template with the class

10.1 Get to Know URL Routing

In the same inner `helldjango` directory containing `settings.py`, there's also a file called `urls.py`. Let's open it up in the text editor.

Notice that it defines a list of `urlpatterns`:

```
"""helldjango URL Configuration
```

The `urlpatterns` list routes URLs to views. For more information please see:

<https://docs.djangoproject.com/en/3.1/topics/http/urls/>

Examples:

```
Function views
1. Add an import: from my_app import views
2. Add a URL to urlpatterns: path('', views.home, name='home')

Class-based views
1. Add an import: from other_app.views import Home
2. Add a URL to urlpatterns: path('', Home.as_view(), name='home')

Including another URLconf
1. Import the include() function: from django.urls import include, path
2. Add a URL to urlpatterns: path('blog/', include('blog.urls'))

"""
from django.contrib import admin
from django.urls import path

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

Right now, there's only one item in the `urlpatterns` list: a URL pattern for `admin/`. That corresponds to the Django admin UI, which we saw earlier. When a browser requests a page starting with `admin/` (i.e. matching the regular expression '`admin/`'), it gets routed by the server to `admin.site.urls`.

In a typical Django project, this file will be full of URL routes. But it starts almost empty.

10.2 Add a URL Pattern for the Homepage

First, import a new `HomepageView` into `urls.py`. Right below the Django imports in `urls.py`, add this line:

```
from homepage.views import HomepageView
```

Then add this URL pattern to the `urlpatterns` list, right after the one for the Django admin:

```
path('', HomepageView.as_view(), name='home'),
```

What we've done thus far:

- When a browser requests a page matching the blank value of `'/'` (that is, the root at `http://127.0.0.1:8000`)
- Route it to `HomepageView.as_view()`.
- And name this route `home`

Remember how we defined a `HomepageView` class in the `views.py` of our `homepage` app? That's what we're importing here.



HomepageView.as_view() generates a callable object

The callable object is analogous to a function. Django calls this object by passing in an `HttpRequest` generated by the user, and then the object returns an `HttpResponse`. Django supplies the `HttpResponse` back to the user.

Don't worry if this doesn't make sense yet. Much later in this book we go over this explicitly in the testing chapters.

10.3 Double-Check the Code

Putting it all together, the code part of `urls.py` should now look like this:

```
from django.contrib import admin
from django.urls import path

from homepage.views import HomepageView

urlpatterns = [
    path('admin/', admin.site.urls),
    path('', HomepageView.as_view(), name='home'),
]
```



10.4 Terminology: “Wire in the URL”

Sometimes we refer casually to defining a URL pattern as wiring in a URL for a view. When we say “Wire in the URL”, that means to associate the Django view we just wrote with a web location on our site.

10.4.1 Start Up `runserver` Again

If Django isn’t running `runserver`, start it up:

```
python manage.py runserver
```

10.5 Refresh the Page and Trigger an Error

We’re going to purposefully trigger an error. That’s okay. We’re doing it intentionally.

Go back to the browser, and refresh <http://127.0.0.1:8000>. If we did things right, we should see an error page with a header that says:

```
TemplateDoesNotExist at /
```

If we see that above error, we are doing it right! Specifically, our view is correctly wired into the `urls.py` module, but its template, `index.html`, doesn't exist yet. Don't worry, we'll demonstrate how to do that in the next chapter.

11 Create Our First Django Template

Templates are what Django uses to generate the HTML that is shown in browsers.

11.1 Create a Templates Directory

At the same level as `manage.py`, create a `templates` directory:

```
mkdir templates
```

We can do this through the text editor GUI if we prefer.

Our project file structure should now look like this:

```
hellodjango/
├── hellodjango/
├── homepage/
└── templates/
└── manage.py
```

11.2 Add Index Template

Inside of `templates/`, create a file called `index.html` containing the following:

```
<h1>Greetings</h1>
<p>Hello, world!</p>
```

As of now, this is just plain HTML.

11.3 Start Up Runserver

If `runserver` isn't running, go ahead and start it now:

```
python manage.py runserver
```

11.4 View the First Page

Open the browser and go to `127.0.0.1:8000`¹². What we see should look something like the image below.

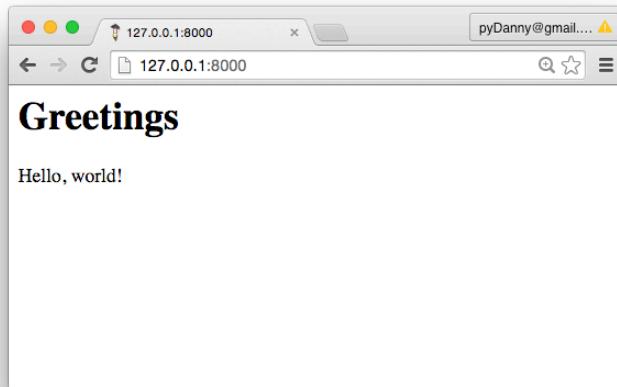


Figure 5: Greetings, Hello World

The error went away because we created the template that `HomePageView` was looking for.

¹²<http://127.0.0.1:8000>

11.5 Recap

We now have a homepage. Here's how it works:

- Our browser requests 127.0.0.1:8000¹³
- Django's development server looks up where to route the request
- Since the index was requested, it matches the path of ''
- Therefore the matching URL pattern is:

```
path('', HomepageView.as_view(), name='home'),
```

- `HomepageView` is the view corresponding to that URL:

```
class HomepageView(TemplateView):  
    template_name = 'index.html'
```

- It's a `TemplateView`, so it renders its template and returns the result
- We see the page in the browser!

11.6 Understanding Views and the Template-View Class

- Views are how a Django project communicates with the user. They send out web pages, JSON, spreadsheets, PDFs, and so much more.

¹³<http://127.0.0.1:8000>

- Templates are often used by views to render HTML for web pages.
- A `TemplateView` renders a Django template and sends it to a browser.

12 Working With Variables in Templates

Without variables we would not have a dynamic web application, there would be no way to interact with the data in the database, essentially we would have a standard static website. For example, we couldn't log in to a website to get results for just the things we care about. By using variables, web pages can display content specific to each user.

12.1 Our First Templated Value

Right now, `templates/index.html` is a Django template that only contains static HTML. But it can also contain variables that get populated dynamically from Python code.

Open up `templates/index.html` and add the following line at the end:

```
<p>{{ my_statement }}</p>
```

The curly braces around `my_statement` mean that it won't be displayed on the page as-is. Instead, it'll be evaluated on the Python side and then the result will be displayed.

12.2 What Is `my_statement`?

At this point we haven't defined `my_statement` yet in our Python code. It can be any of the following:

- A Python expression, such as a string, number, or instantiated object
- A function or method call

12.3 Extend HomepageView

Open up the homepage app's `views.py` again. So far, the `HomepageView` is this:

```
class HomepageView(TemplateView):
    template_name = 'index.html'
```

We're now going to show you how to define a view method called `get_context_data()`. This is a special method that lets you pass variables to your template.

Right below `template_name = 'index.html'`, add a blank line. Then below it, add this method to your `HomepageView` class:

```
def get_context_data(self, **kwargs):
    context = super().get_context_data(**kwargs)
    context['my_statement'] = 'Nice to see you!'
    return context
```

Look carefully at the line involving `my_statement`. There, you defined a **context variable** called `my_statement`. You assigned it the value of `Nice to see you!`.

Note that `context` is a Python dictionary. `my_statement` is a key, and `Nice to see you!` is its corresponding value.

12.4 Refresh the Homepage

Go back to the browser, and refresh `127.0.0.1:8000`¹⁴. (If run-server isn't still running from before, start it up again.)

The value of `{{ my_statement }}` should now be replaced with `Nice to see you!`

¹⁴<http://127.0.0.1:8000>

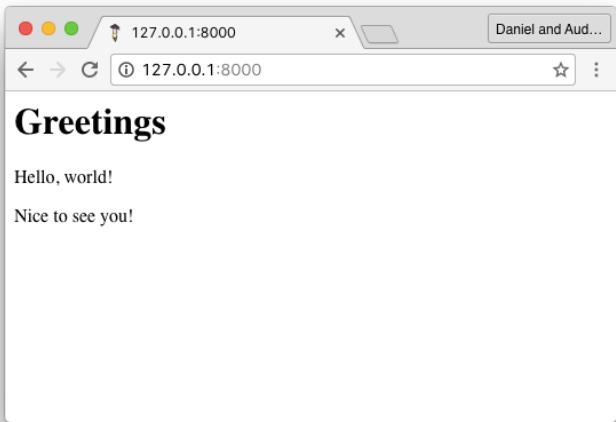


Figure 6: Greetings

12.5 Exercise: Play Around!

Go ahead and modify the context data, either by changing the value of `my_statement` or adding new keys and values. This practice is important. Django developers working with templates get very experienced working with `get_context_data`.

12.6 Common Questions

12.6.1 What Is a Method?

A method is a Python function that's a member of a class. In our example, `get_context_data()` is a function that's a member of the `HomepageView` class.

Further reading:

- stackoverflow.com/questions/3786881/what-is-a-method-in-python¹⁵

¹⁵<https://stackoverflow.com/questions/3786881/what-is-a-method-in-python>

13 Calling View Methods From Templates

The standard Django way to add data to a template's context is via `get_context_data()`. Here's an alternative approach.

Here, we're going to add data by calling a method and displaying the result.

13.1 Define a View Method

Add the following `say_bye` method to the `HomepageView` class:

```
class HomepageView(TemplateView): # Don't add this line!
    ... # Don't add this line!
    def say_bye(self): # add this line
        return 'Goodbye' # and this line too!
```

13.2 Call the View Method From index.html

Add this to the bottom of our `index` template:

```
<p>{{ view.say_bye }}</p>
```

Notice something strange: in the template, we call the `say_bye()` method, but there are no parentheses after it. That's because Django templates intelligently check to see if something can be called as a method.

13.3 Reload the Homepage

Go back to the browser, and refresh 127.0.0.1:8000¹⁶.

We should now see the return value of `say_bye()` displayed on our homepage.

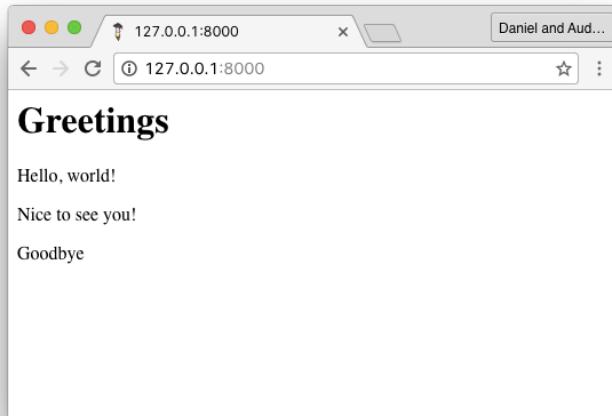


Figure 7: Greeting with view method



How Is a View Method Different From Context Data?

It's the difference between evaluating a variable and evaluating a function call.

Context data Variables used in the template.

¹⁶<http://127.0.0.1:8000>

View methods Functions that we can call from the template.

For now it's a small distinction. Typically projects rely on Context Data, but there are advanced use cases for using view methods instead.

14 Our First Project is Complete!

Congratulations! By now we understand what makes up a very minimal Django project.

We recommend keeping the `helldjango` project we created as a reference project, so we can refer back to it when we need to revisit how Django views, templates, and URL patterns work together.

14.1 Summary

We started off with a barebones Django project that we generated with `django-admin startproject`. We created a database and started up Django's development server.

Then we created a Django superuser so that we could access the Django admin. We explored the admin UI.

Next, we added a simple Django app to the project. We called it "homepage" and explored what files it gave us to start with.

After that, we learned about views and templates in Django. We created our first view by subclassing `TemplateView`. We connected it to a URL pattern and a simple static HTML template.

Finally, we turned the static HTML template into a dynamic one. We learned how to put variables into the template and populate them in our Python code. We also learned how to call view methods from our template.

14.2 Next Steps

Now that we've finished the Hello, World in Django project, let's move on to the EveryCheese on the next page. It's a much

deeper dive into Django development and is based on real-world project development.

Part II

EveryCheese

15 The EveryCheese Project

We're your friendly hosts, Daniel and Audrey, and we love cheese. This tutorial is based on real-world project development, teaching the fundamentals needed to build professional projects. It includes:

- Type-along lesson plans to cover core concepts
- Code examples for each section
- Tutorial project code that prepares students for more advanced techniques

15.1 Prerequisites

We will need to have our computer ready for software development. If it isn't ready, follow the instructions in the chapter called [The Ultimate Django Setup](#).

We'll want to have basic Django experience before starting. If the reader hasn't ever touched Django before, we recommend the previous project in this book, Hello World in Django.

15.2 Prepare the EveryCheese Programming Environment

As mentioned earlier in this book, **Conda** is a tool for creating isolated Python environments. We use it with pip in this lesson.

If this is starting to feel familiar, that's a good thing. Being practiced at isolating programming environments is a critical skill for any serious developer.

15.3 Create a New Virtual Environment

Create and activate a new Conda environment called `everycheese`:

```
conda create -n everycheese python=3.8  
conda activate everycheese
```

After that, our command-line should look like something like:

```
(everycheese) $
```



Don't reuse pre-existing Conda envs for new projects!

It's always good to start fresh with a new Conda env. This way old and new projects won't collide. We'll still be able to maintain successful but older projects and experiment with the latest and greatest pieces of technology.

15.4 Reactivating Conda Environments

Sometimes we need to reactivate our conda environment. There's lots of reasons to do this, including:

- Our computer needed to restart for any reason
- We just bought a new computer
- Sometimes a second (or third) terminal window is very useful

To do this, in the terminal type:

```
conda activate everycheese
```

15.5 Summary

If this feels like a repetition of what we did in the Hello, World in Django tutorial, that's intentional on our part. We can't reinforce enough the importance of knowing how to easily move from one programming environment to another. It's a foundation every software developer should know, be they coding with Django, Python, JavaScript, or pretty much anything else.

16 Using Cookiecutter and Template

The first tool we install into our projects is **Cookiecutter**, which we'll be using in future extensions and books.

16.1 Install the Cookiecutter Library

Installing it the first time may take up to 30 seconds, as you might not have Cookiecutter's dependencies already cached on your system.

At the command line, type:

```
conda install -c conda-forge cookiecutter
```

There will be output along these lines:

```
Collecting package metadata (current_repodata.json): done
Solving environment: done
<snip for brevity>
Proceed ([y]/n)?
```

Type **y** and then press the return button. We should see something like:

```
Downloading and Extracting Packages
requests-2.22.0      | 84 KB      | ##### | 100%
certifi-2019.11.28   | 148 KB     | ##### | 100%
future-0.18.2        | 715 KB     | ##### | 100%
python-dateutil-2.8. | 220 KB     | ##### | 100%
```

cffi-1.13.2	214 KB	#####	100%
markupsafe-1.1.1	32 KB	#####	100%
cryptography-2.8	591 KB	#####	100%
poyo-0.5.0	14 KB	#####	100%
chardet-3.0.4	170 KB	#####	100%
click-7.0	61 KB	#####	100%
pycparser-2.19	172 KB	#####	100%
ca-certificates-2019	145 KB	#####	100%
jinja2-2.10.3	91 KB	#####	100%
whichcraft-0.6.1	8 KB	#####	100%
idna-2.8	102 KB	#####	100%
binaryornot-0.4.4	370 KB	#####	100%
openssl-1.1.1d	1.9 MB	#####	100%
pyopenssl-19.1.0	83 KB	#####	100%
urllib3-1.25.7	160 KB	#####	100%
jinja2-time-0.2.0	10 KB	#####	100%
six-1.14.0	23 KB	#####	100%
cookiecutter-1.7.0	83 KB	#####	100%
arrow-0.15.5	97 KB	#####	100%
pysocks-1.7.1	27 KB	#####	100%

At this time, when we install Cookiecutter, 23 other packages are also installed. These are Cookiecutter's dependencies and are necessary for Cookiecutter to do its magic.

These are the beginning of the tools we'll be using to create the Everycheese project.

Now that we have Cookiecutter installed, let's use it! This lesson is all about using Cookiecutter with **django-crash-starter** to create a project skeleton.

16.2 Cookiecutter Project Templates

A Cookiecutter project template is a version control repository containing a bunch of files. Those files are used to generate a starter project of some sort. In Cookiecutter parlance, these templates are called *Cookiecutters*.

The `django-crash-starter` project template is at: <https://github.com/feldroy/django-crash-starter>. It provides the foundation for this project and the various Crash Course Extensions.

16.3 Using django-crash-starter

Let's go!

16.3.1 Go to Our Projects Directory

Using the command line, navigate to the place on the computer our coding projects are kept.

For example, we keep ours in a directory called `projects` inside our home directory. We would go into `~/projects`:

```
cd ~/projects/
```

On Windows:

```
cd c:\projects
```

Change directories as needed now, so that we are in the right place to create a new Django project.

16.3.2 Run the Cookiecutter Command

Here, use the `django-crash-starter` template to power Cookiecutter. Type this at our command line:

```
cookiecutter gh:feldroy/django-crash-starter
```

This means:

- Run the command called `cookiecutter` now.
- Use <https://github.com/feldroy/django-crash-starter> as the Cookiecutter project template.

When we first run this command, the result should look like:

```
Cloning into 'django-crash-starter'...
remote: Counting objects: 3955, done.
remote: Compressing objects: 100% (142/142), done.
remote: Total 3955 (delta 85), reused 0 (delta 0), pack-reused 3811
Receiving objects: 100% (3955/3955), 722.02 KiB | 0 bytes/s, done.
Resolving deltas: 100% (2425/2425), done.
Checking connectivity... done.
project_name [EveryCheese]:
```

That last line is a prompt asking for the name of the project. Default values are in the brackets. For example, by default, our project is going to be called “EveryCheese”. Go ahead and hit enter for each value. If you are on Windows, choose ‘y’ when you come to `windows [n]`:

```
project_name [EveryCheese]:  
project_slug [everycheese]:  
description [The Ultimate Cheese Index!]:  
author_name [Your name here]:  
domain_name [everycheese.com]:  
email [your-name-here@example.com]:  
timezone [UTC]:  
windows [n]: # On Windows change to 'y'  
Select database:  
1 - PostgreSQL  
2 - SQLite  
Choose from 1, 2 [1]:
```

Let's not worry if we don't understand what every single value means. We'll learn more as we progress through this book.

16.4 What Happened?

We've now used `django-crash-starter` to generate boilerplate code for our Django project!

A directory called `everycheese/` should have been generated in our current working directory. Check that it exists by typing `ls` on Mac or `dir` on Windows at the command-line. We should see the following:

```
everycheese/
```

If it's there, you're ready to move on to the next lesson.

16.5 Tips and Troubleshooting

16.5.1 Delete and Re-Clone!

If you have used `django-crash-starter` before, we may see this message when we run `cookiecutter`:

```
You've cloned /Users/audreyr/.cookiecutters/
django-crash-starter before. Is it okay to
delete and re-clone it? [yes]:
```

We can hit Return to accept the default of `[yes]`.

(Note: The only time we wouldn't want to pick `[yes]` is if we manually edited the files in that directory for some strange reason and didn't want them to be overwritten. It's best not to edit files in `~/.cookiecutters/`, though.)

16.5.2 Unfamiliar Options

If `djangocrash-starter` offers us an option that we haven't listed above, go with the defaults for that option. (It may change after the printing of this book! We'll try not to change it too much.)

16.5.3 Fear of Making a Mistake

Don't worry about accidentally generating our project with the wrong `djangocrash-starter` options.

That's because we can always look through the `djangocrash-starter` source tree to see what code would have been generated if we had picked a different option. The next lesson will give us some insight into this.

16.6 A Little Cookiecutter Background



Figure 8: The Tasty Cookiecutter Logo

Cookiecutter is a popular cross-platform project template generator created by author Audrey Feldroy in the summer of 2013. The simplicity of the UI hides a sophisticated framework that can be extended easily for use in frameworks and other tools.

Because of this combination of simple UI and extendability, there are approximately 3500 project templates powered by Cookiecutter on GitHub, and an unknown number of private ones. In the past six years, we've yet to work for an employer or consulting client who wasn't using Cookiecutter.

17 Exploring the Generated Boilerplate

Now we're going to explore the boilerplate that Cookiecutter generated from the following components:

- The `django-crash-starter` project template.
- The values you entered.

17.1 Some Basic Components

Open `everycheese/` in your text editor.

If you're using VS Code, you can do this by typing:

```
code everycheese/
```

17.1.1 Readme

If we go into `README.md`, we'll see that the header, EveryCheese, comes from what we entered as `project_name`.

Every Django project that we work on has a `README` which provides an overview of the project. You'll want to add more to the starter file. Typically it will also include a list of features of the project.

17.1.2 Settings

Notice that a `config/` directory got generated. Among other things, inside is a `settings/` directory with a bunch of settings files for different purposes:

base.py Any settings that are used identically in all places
local.py Local development on our computers
production.py Live production server settings

If we go into `everycheese/config/settings/base.py`, we can see that a value was set for `TIME_ZONE`:

```
TIME_ZONE = 'UTC'
```

This value came from what we entered as `timezone` during the `django-crash-starter` prompts.

For everything that Cookiecutter asked questions about, it has filled out the values throughout the project.

17.1.3 Contributors

If we go into `config/settings/base.py`, we can see that this got placed in there:

```
ADMINS = [("Your name here", "your-name-here@example.com")]
```

Whoa, that's not quite right! Or is it?

When we created our project using Cookiecutter, we accepted the default values. Those are the ones now seen in the `base.py` settings file. Go ahead and change those values to match your name.

17.2 Summary

`django-crash-starter` is more than just README and configuration. It comes with a `users/` app for account management in-

cluding django-allauth preconfigured, templates that work with Bootstrap right out of the box.

This kind of boilerplate normally takes forever to get right. Fortunately, `django-crash-starter` gets it out of the way.

There's a lot to cover. We'll get to explaining more of it in the next chapter and the rest of this book.

18 Starting Up Our New Django Project

The code in `everycheese/` is a real Django project with tons of working features.

18.1 Let's Run the Project

We can run EveryCheese, just like any other Django project.

Let's make that happen!

18.2 Go Into the EveryCheese Directory

Navigate into the main `everycheese/` directory:

```
cd everycheese
```

Generally, this is where we'll be working.

Now, if we type `ls`, we should see a bunch of files and directories. One of these should be `manage.py`.

18.3 Start PostgreSQL if Needed

This only applies to Mac and Linux. If on Windows, please ignore this section.

Different PostgreSQL installers make different decisions about whether PostgreSQL automatically runs as a service upon system startup.

To check if PostgreSQL is running, try typing this:

```
createdb
```

If PostgreSQL isn't running, we'll see an error message along the lines of this:

```
createdb: could not connect to database postgres:  
could not connect to server: No such file or directory  
Is the server running locally and accepting  
connections on Unix domain socket "/tmp/.s.PGSQL.5432"?
```

And if PostgreSQL is not already running, we'll need to start PostgreSQL:

- On Mac: Open up Applications > Postgres.app¹⁷
- On Windows: PostgreSQL is most likely running as a service that automatically starts when Windows starts. If not, start it manually by choosing it from the Start Menu.
- On Linux: Start the service if it's not already running with
`sudo service postgresql start`

We'll need PostgreSQL running to create a PostgreSQL database.

¹⁷ <http://postgresapp.com/>

18.4 What to name the database?

Let's look at the common settings file, inside of `config/settings/`. If we open up `base.py` and look for the `DATABASES` setting, we can see that the database is called `everycheese`:

```
DATABASES = {  
    # Raises ImproperlyConfigured Exception  
    # if DATABASE_URL Not in os.environ  
    "default": env.db(  
        "DATABASE_URL", default="postgres://everycheese"  
    )  
}
```

Windows users will see:

```
DATABASES = {  
    'default': {  
        'ENGINE': 'django.db.backends.sqlite3',  
        'NAME': os.path.join(BASE_DIR, 'everycheese.db'),  
    }  
}
```

This are the defaults, which is used by `local.py` for local development. If we open up `local.py`, we'll see that there is no `DATABASES` setting in there, and so it defaults to the above.

In production, we do not provide a default, as we can see in `production.py`. We have to handle that ourselves. We'll explain more about that when we get around to deployment.

18.5 How to Create It

This only applies to Mac and Linux. If on Windows, please ignore this section.

To create a database called `everycheese`, we can type this at the command line:

```
createdb everycheese
```

If there are any problems, one of the following troubleshooting segments might prove useful:

- [Troubleshooting PostgreSQL: Role Does Not Exist](#)
- [Troubleshooting PostgreSQL: Cannot Create Database](#)

18.6 Install the Dependencies

Inside of the `requirements/` directory are the environment-specific requirement files for our project:

- `base.txt` for any packages that are used in all places.
- `local.txt` for packages required for local development on our computer. Also used in testing.
- `production.txt` for our live production server packages.

Make sure our `everycheese` Conda environment is active. If it isn't active, follow the instructions in [Reactivating Conda Environments](#). Then install the local requirements:

```
pip install -r requirements/local.txt
```

If there are problems installing the dependencies, we may cover the solutions in our [Troubleshooting](#) appendix:

- [Troubleshooting PsycoPG2](#)
- [Troubleshooting GCC Errors on the Mac](#)
- [Troubleshooting the MS Visual Studio Build Tools Error](#)

18.7 Run the Migrations

Whenever we set up a Django project, we want to run `migrate` in case any migrations need to be run. Type this at the command line:

```
python manage.py migrate
```

18.8 Start Up Runserver

Finally, start Django's local development server so we can see the project in action:

```
python manage.py runserver
```

Open a web browser to `127.0.0.1:8000`¹⁸. We should see a bare-bones EveryCheese website running.

¹⁸<http://127.0.0.1:8000>

19 Cheese Boilers

When cheese is melted in industrial processing, it goes into cheese boilers.

Cheese boilers have boilerplates. Do not remove the boilerplate while a cheese boiler is in operation, or else the cheese will flow out of the boiler.

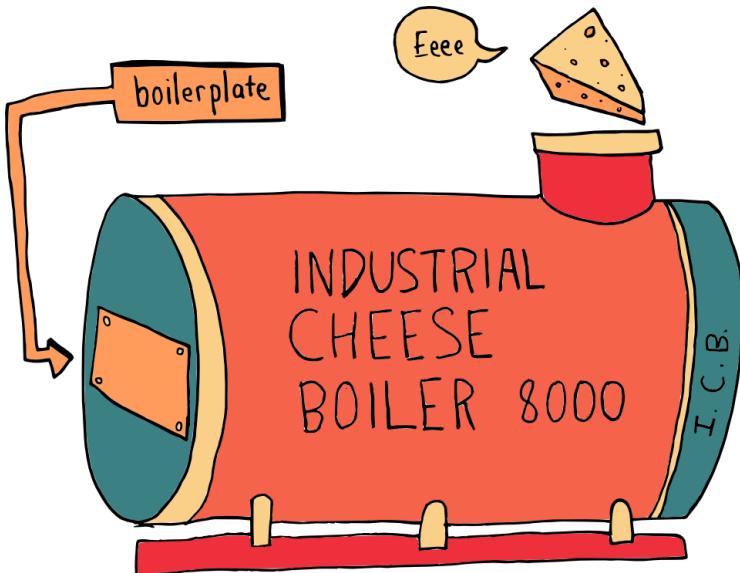


Figure 9: Illustration of cheese boiler, and the location of its boilerplate

20 Initializing the Git Repo Committing and Pushing

We've generated a bunch of starting Django project boilerplate and seen the barebones site running on the development server.

Before we move on, we'll walk us through creating a repo so we can start saving our changes periodically.

20.1 Why?

We're going to be building upon this code and changing a lot of files.

The problem is that it's easy to break things and lose our work. That's where version control comes in.

20.2 We'll Use GitHub

We're going to create a private repo for the project on GitHub.

- Sign up for a GitHub¹⁹ account if we don't have one yet.
- Add an SSH key²⁰ to our GitHub profile, so that we can push code changes to our repo.

20.3 Create the GitHub Project

Then go to <https://github.com/new> and fill it out with:

- Project name: **everycheese**

¹⁹ <https://github.com>

²⁰ <https://github.com/settings/keys>

- Description: **The ultimate cheese index.**
- Visibility Level: **Private**

Click the *Create repository* button.

The screenshot shows the GitHub interface for creating a new repository. At the top, there's a navigation bar with links for 'Pull requests', 'Issues', 'Marketplace', and 'Explore'. Below this, a search bar has 'mp to...' entered. The main section is titled 'Create a new repository'. It asks for the 'Owner' (set to 'pydanny') and 'Repository name' ('everycheese'). A note says 'Great repository names are short and memorable. Need inspiration? How about bug-free-pancake?' Below this, there's a 'Description (optional)' field containing 'The Ultimate Cheese Index'. There are two radio button options for visibility: 'Public' (selected) and 'Private'. Under 'Public', it says 'Anyone can see this repository. You choose who can commit.' Under 'Private', it says 'You choose who can see and commit to this repository.' A note below says 'Skip this step if you're importing an existing repository.' There are checkboxes for 'Initialize this repository with a README' (unchecked) and 'This will let you immediately clone the repository to your computer.' At the bottom, there are buttons for 'Add .gitignore: None' and 'Add a license: None' with a help icon. The final button is a large green 'Create repository' button.

Figure 10: Create repository on GitHub

20.4 Examine the GitHub Instructions

GitHub provides instructions for adding files from an “Existing folder or Git repository.” We have an existing folder of code.

We’re going to skip changing directory into our folder, since we’re already in there.

We’re going to walk us through what these instructions actually mean.

20.4.1 Initialize the Local Repo

If we still have `runserver` running, we can stop it and type these commands in the same terminal. Or we can open a new terminal if preferred. It doesn’t matter.

Initialize the current folder as a Git repo:

```
git init
```

Add the GitHub remote to the repo as the origin. Replace `ourusername` with our actual GitHub username:

```
git remote add origin git@github.com:ourusername/everycheese.git
```

20.4.2 Add Our Files

Add all our files to the first commit to the project:

```
git add .
```



Before the next step

The next step hopes that we've already configured `git` (by following the [Configuring Git](#) instructions)

Commit the first commit with a brief, descriptive message:

```
git commit \  
-m "Boilerplate files generated from the django-crash-starter project template."
```

Push our changes:

```
git push -u origin master
```

20.5 Verify That the Files Got Committed

In our browser, refresh our project page. Click on Files in the right sidebar and make sure that all our files are there.

Go back to our terminal and check the git log as well:

```
git log
```

Now we are free to code without worrying about losing our work if we accidentally break something and can't fix it.

21 Git Is Not for Stinky Cheeses

You know what really, absolutely doesn't belong in a git repo?
Stinky cheese!

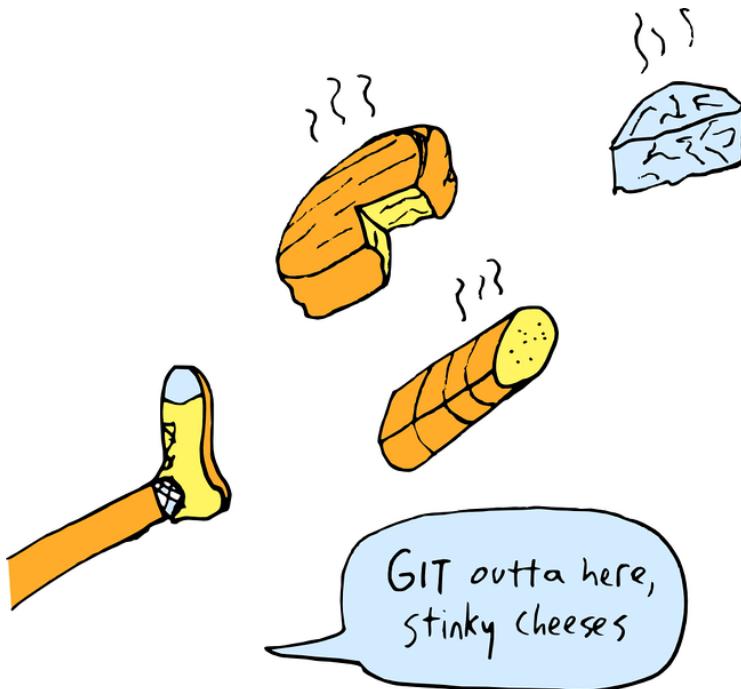


Figure 11: Stinky cheeses getting kicked out by a foot.

Don't even try to put it in there! That's because other files may leave a repo due to the pungent odor. No file wants to be in a stinky cheese-filled repo.

22 What We Get From The Users App

`django-crash-starter` provided us with a simple `users` app, preconfigured right out of the box. Let's explore what it gives us.

22.1 Register a Normal User

Start up `runserver` again:

```
python manage.py runserver
```

Go to <http://127.0.0.1:8000> to see the starter EveryCheese website.

Click on the “Sign Up” link in the navbar. This will bring us to a registration form. This is where the visitors to our website will create their own user accounts.

A screenshot of a web browser window titled "Signup". The address bar shows the URL "127.0.0.1:8000/accounts/signup/". The page content is for a site called "EveryCheese". It features a navigation bar with links for "Home", "About", "Sign Up", and "Sign In". A "DDT" logo is visible in the top right corner. The main content is a "Sign Up" form. It includes fields for "E-mail*", "Username*", "Password*", and "Password (again)*". The "Password" field contains a lock icon indicating it is encrypted. A "Sign Up »" button is at the bottom.

EveryCheese Home About Sign Up Sign In

Sign Up

Already have an account? Then please [sign in](#).

E-mail*

Username*

Password*

Password (again)*

The screenshot shows a web browser window with the title "Signup". The address bar displays "127.0.0.1:8000/accounts/signup/". The page header includes the logo "EveryCheese", a "Home" link, and navigation links for "Sign Up" and "Sign In". On the right side of the header, there is a small "DDT" icon. The main content area is titled "Sign Up". It contains instructions: "Already have an account? Then please [sign in](#)". Below this are four input fields with validation asterisks: "Username*" (value: cheesehead), "E-mail*" (value: cheesehead@example.com), "Password*" (value: *****), and "Password (again)*" (value: *****). At the bottom is a blue "Sign Up »" button.

We're going to try out the website's registration system now. Enter these values:

- email: cheesehead@example.com
- username: cheesehead
- password: *QjkXCPUm8iuaeP



Copy this password into a password manager!

It's bad practice to use simplistic passwords, even for local development. We want to promote strong security habits and this is one of them. Also, don't stick passwords into plaintext or spreadsheet files. Instead, lean on secure password managers like 1Password or open source options.

22.2 Verify Our Email

When we submit the form, we'll be asked to verify our email address before we can continue on the website:

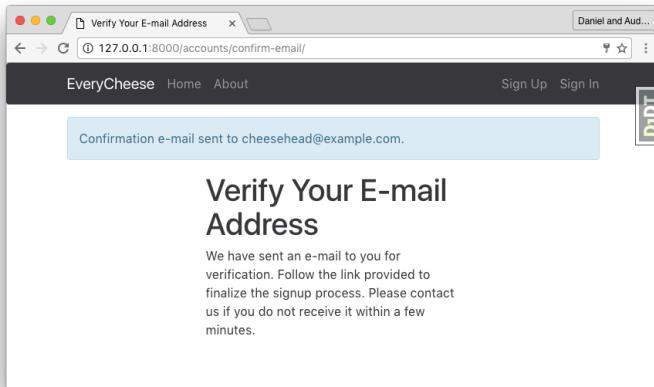


Figure 12: Verify email page

22.2.1 Grab the Email Confirmation Link

We're not going to get an email confirmation by regular email. `django-crash-starter` isn't set up to send out real emails during local development, and for good reason. We wouldn't want to accidentally send out emails to real people during local development.

However, `django-crash-starter` has configured our project to display all outgoing emails in the console, where `runserver` is running.

Go to the console window, the one where we started up `runserver`. We should see the confirmation email there.

Copy/paste the email confirmation link into the browser. We will then be taken to a page with a *Confirm* button.

Then click *Confirm* to confirm the user account.

22.3 Why Are Emails Printed in the Console?

Open `settings/local.py` in a text editor. Find the `EMAIL_BACKEND` setting.

```
EMAIL_BACKEND = env(
    "DJANGO_EMAIL_BACKEND",
    default="django.core.mail.backends.console.EmailBackend",
)
```

Now open `settings/production.py` and find the `EMAIL_BACKEND` setting. Compare it.

(everycheese) everycheese\$./manage.py runserver — 95x50

Performing system checks...

System check identified no issues (0 silenced).

August 18, 2016 - 13:41:33

Django version 1.9.9, using settings 'config.settings.local'

Starting development server at <http://127.0.0.1:8000/>

Quit the server with CONTROL-C.

```
[18/Aug/2016 13:42:14] "GET / HTTP/1.1" 200 13053
[18/Aug/2016 13:42:14] "GET /static/css/project.css HTTP/1.1" 304 0
[18/Aug/2016 13:42:14] "GET /static/js/project.js HTTP/1.1" 304 0
[18/Aug/2016 13:42:14] "GET /static/debug_toolbar/css/toolbar.css HTTP/1.1" 304 0
[18/Aug/2016 13:42:14] "GET /static/debug_toolbar/js/jquery.print.js HTTP/1.1" 304 0
[18/Aug/2016 13:42:14] "GET /static/debug_toolbar/js/jquery_post.js HTTP/1.1" 304 0
[18/Aug/2016 13:42:14] "GET /static/debug_toolbar/img/ajax-loader.gif HTTP/1.1" 304 0
[18/Aug/2016 13:42:14] "GET /static/debug_toolbar/js/toolbar.js HTTP/1.1" 304 0
[18/Aug/2016 13:42:14] "GET /static/debug_toolbar/css/print.css HTTP/1.1" 304 0
[18/Aug/2016 13:44:27] "GET /accounts/signup/ HTTP/1.1" 200 14838
MIME-Version: 1.0
Content-Type: text/plain; charset=utf-8"
Content-Transfer-Encoding: 7bit
Subject: [EveryCheese] Please Confirm Your E-mail Address
From: webmaster@localhost
To: cheesehead@example.com
Date: Fri, 19 Aug 2016 00:37:31 -0000
Message-ID: <20160819003731.46250.35439@audreyr.local>

Hello from EveryCheese!

You're receiving this e-mail because user cheesehead at everycheese.com has given yours as an e-mail address to connect their account.

To confirm this is correct, go to http://127.0.0.1:8000/accounts/confirm-email/MQ:1baXoR:6b7WEncZzoeH10cgGDcWgnUGDR4

Thank you from EveryCheese!
```

```
[18/Aug/2016 17:37:32] "POST /accounts/signup/ HTTP/1.1" 302 0
[18/Aug/2016 17:37:32] "GET /accounts/confirm-email/ HTTP/1.1" 200 13441
[18/Aug/2016 17:37:33] "GET /static/css/project.css HTTP/1.1" 304 0
[18/Aug/2016 17:37:33] "GET /static/debug_toolbar/js/toolbar.js HTTP/1.1" 304 0
[18/Aug/2016 17:37:33] "GET /static/debug_toolbar/css/toolbar.css HTTP/1.1" 304 0
[18/Aug/2016 17:37:33] "GET /static/debug_toolbar/js/jquery.print.js HTTP/1.1" 304 0
[18/Aug/2016 17:37:33] "GET /static/js/project.js HTTP/1.1" 304 0
[18/Aug/2016 17:37:33] "GET /static/debug_toolbar/img/ajax-loader.gif HTTP/1.1" 304 0
[18/Aug/2016 17:37:33] "GET /static/debug_toolbar/js/jquery_post.js HTTP/1.1" 304 0
[18/Aug/2016 17:37:33] "GET /static/debug_toolbar/js/toolbar.js HTTP/1.1" 304 0
[18/Aug/2016 17:37:33] "GET /static/debug_toolbar/css/print.css HTTP/1.1" 304 0
[18/Aug/2016 17:40:50] "GET /accounts/signup/ HTTP/1.1" 200 14834
```

Figure 13: Verification email in console window

```
EMAIL_BACKEND = "anymail.backends.mailgun.EmailBackend"
```

For local development, we use Django's console email backend, which prints all emails to the console. But in production we switch to the Mailgun backend, which sends out emails to users.

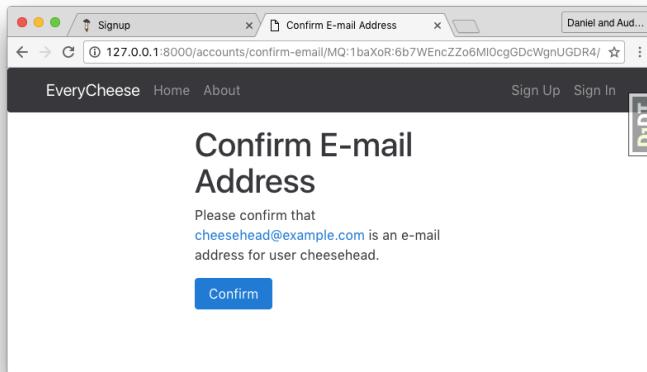


Figure 14: Page with Confirm button

22.4 Explore the User Profile

If needed, sign in with the new account.

Click through to the user profile. We might not recognize it as a user profile because of how minimal it is to start. It looks like this:

22.5 Edit User Data

Let's see what user info is editable:

1. Click on *My Info*.
2. Try giving the user a full name.
3. Click *Update* and see where the data is displayed in the user profile.

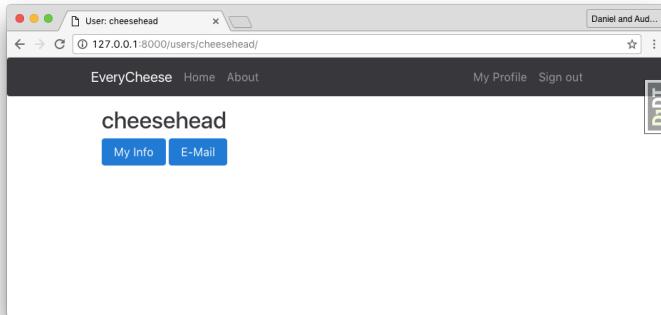


Figure 15: Minimal user profile

22.6 Introducing `UserUpdateView`

Remember where we entered a value for *Name of User*?

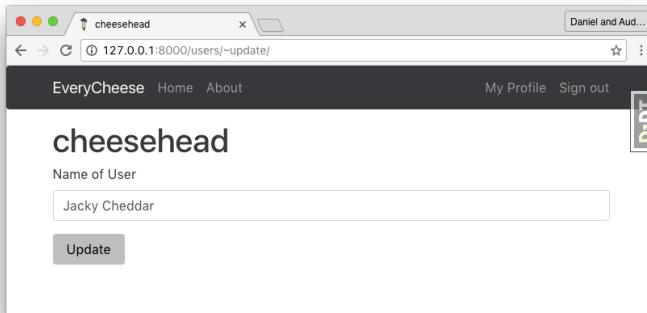


Figure 16: UserUpdateView

That page corresponds to `UserUpdateView`. An `UpdateView` is a view

for editing an existing object. In this case, the object edited is the `User` object.

We'll show us the code for this shortly. But first, let's look at a simpler view together.

22.7 Introducing `UserDetailView`

After entering `Name of User`, we were redirected back to the user profile. This view is the `UserDetailView`.

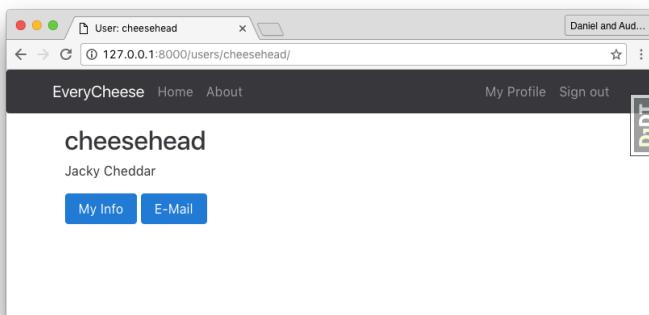


Figure 17: UserDetailView

A `DetailView` displays detailed data for a particular object. Here, it displays info about our `User` object.

Open up `views.py` of the `users` app and find `UserDetailView`:

```
class UserDetailView(LoginRequiredMixin, DetailView):
    model = User
    # These Next Two Lines Tell the View to Index
```

```
#   Lookups by Username
slug_field = 'username'
slug_url_kwarg = 'username'
```

Some things to notice:

- `UserDetailView` is a subclass of Django's generic `DetailView`.
- The view can only be accessed by logged-in users because of `LoginRequiredMixin`.
- We have to explicitly specify the model with `model = User`.
- Note the URL `/users/cheesehead/` and how `username` is used as a slug in the URL.

22.8 Understand the Name Field

Where is this *Name of User* field coming from? Let's find out.

In the text editor, open the `models.py` of the `users` app. Note these lines:

```
class User(AbstractUser):

    # First Name and Last Name Do Not Cover Name Patterns
    # Around the Globe.
    name = models.CharField(
        _("Name of User"), blank=True, max_length=255
    )
```

The `name` field looks like it corresponds to *Name of User*. But we have to look at the views to see what's really going on.

22.9 Understand the Code for `UserUpdateView`

Open the `views.py` of the users app now and look for the `UserUpdateView`. It looks like this:

```
class UserUpdateView(LoginRequiredMixin, UpdateView):
    fields = [
        "name",
    ]

    # We already imported user in the View code above,
    #   remember?
    model = User

    # Send the User Back to Their Own Page after a
    #   successful Update
    def get_success_url(self):
        return reverse(
            "users:detail",
            kwargs={'username': self.request.user.username},
        )

    def get_object(self):
        # Only Get the User Record for the
        #   User Making the Request
        return User.objects.get(
            username=self.request.user.username
        )
```

This view corresponds to the page where we entered in the name of our user. Note the following:

- The `fields` list contains the fields that are part of the form. The one field that exists, `name`, is in this list.

- Even though it's obvious from `UserUpdateView` that this view affects the `user` model, we still have to set the view's model explicitly with `model = User`.

Study the rest of the views in the `users` app. Figure out which view corresponds to each page.

22.10 Add Email Addresses

What else can we do?

1. Click on *E-Mail*.
2. Try adding an email address. Remember, it doesn't have to be a real email, since the confirmation email will be printed to the console anyway.
3. Check for a confirmation email in the terminal window where `runserver` is running.
4. Copy and paste the email verification link into our browser.

Feel free to play around with the other email address management buttons as well. It's good to see what they do.

22.11 What About the Code?

Where is the code for this email functionality? We may have looked through the `users` app to try and find it, but it's not there. That's because the code is in `django-allauth`.

Let's look at the template that is used with `UserDetailView`. The templates for the `users` app are in `templates/users/`. Open `user_detail.html` in our text editor.

Find the HTML for the two buttons:

```
<a class="btn btn-primary" href="{% url 'users:update' %}">  
    My Info</a>  
<a class="btn btn-primary" href="{% url 'account_email' %}">  
    E-Mail</a>
```

Both buttons are actually just HTML links that are styled to look like buttons. The `url` tag is a built-in template tag that converts a URL name to an absolute path URL.

The *My Info* button points to a URL named `update` within the `users` namespace, which is wired up with `UserUpdateView` in the `users/urls.py` module. We saw how that wiring is done at a fundamental level back in [Get to Know URL Routing](#).

The *E-Mail* button link points to a URL named `account_email`. That URL is defined in allauth's `urls.py` file, which we can find at <https://github.com/pennersr/django-allauth/blob/master/allauth/account/urls.py>. Search for the `path()` declaration with a `name` argument of `account_email`.

`django-crash-starter` came with `django-allauth` pre-configured with its `users` app. Since it's a dependency of the `everycheese` project that we generated, links in `users` app templates can go to URLs defined by allauth.

23 Adding User Bios

Out of the box, user profiles are pretty minimal. We're going to give the `User` model a `bio` field to make it a little more interesting.

23.1 Add a Bio Field

Add this to the `User` model in the `users` app `models.py`:

```
bio = models.TextField("Bio", blank=True)
```

We can put that line right below the `name` field.

23.2 Create and Run Migrations

To do this, we can either:

- Stop `runserver` and use the same terminal, or
- Open up a new command line tab or window where we run `makemigrations` and `migrate`

Then make and apply our migrations as usual:

```
python manage.py makemigrations users
python manage.py migrate users
```

Now the `User` model has a `bio` field, and the field exists in the database.

However, the `bio` still isn't on the user update form, and we have no way to edit it. That's because we still have to update `UserUpdateView` and `UserDetailView`.

23.3 Update UserUpdateView

In the `views.py` of the users app, update `fields` by adding `bio` to the list:

```
class UserUpdateView(LoginRequiredMixin, UpdateView):
    fields = [
        "name",
        "bio",
    ]
```

Now the form should allow us to modify our user's bio.

23.4 Try It Out

Start up `runserver` so that we can try out our new bio field on our site.

```
python manage.py runserver
```

Go back to the EveryCheese website in our browser and refresh our user profile page:

- <http://127.0.0.1:8000/users/cheesehead/>

Click on the *My Info* button again. We should see the new bio field. Fill in some text, then click *Update* to save our bio as shown in the image:

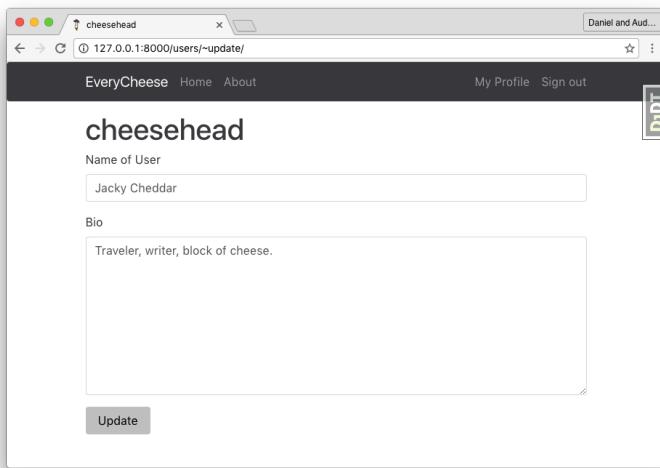


Figure 18: UserUpdateView With Bio

As we can see, now users can add and edit their bios. But the bios **field** still **doesn't** show up on user profiles. Notice that `UserDetailView` still looks like this:

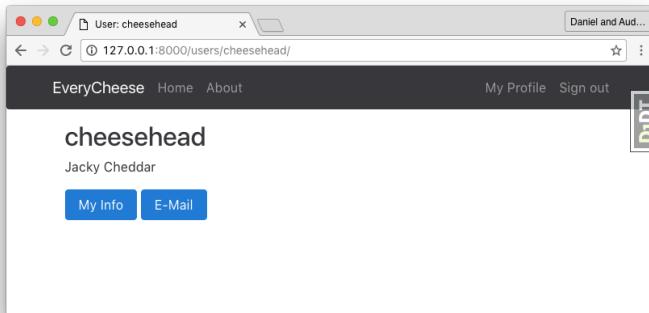


Figure 19: UserDetailView Without Bio

But if we try clicking on *My Info* again, we'll see that the bio we wrote earlier is there. It has in fact been saved to the `User` object; it's just not being shown in `UserDetailView` yet.

We'll fix that in the next lesson.

24 Adding Bio to User Detail Template

Let's allow users to provide some general information about themselves.

24.1 Update the User Detail Template

Go back to our text editor. Open up `user_detail.html` again (find it with the templates for the users app).

Find the place where the user's name is displayed if it exists. It looks like this:

```
{% if object.name %}  
  <p>{{ object.name }}</p>  
{% endif %}
```

Below it, add a similar block to display the user's bio:

```
{% if object.bio %}  
  <p>{{ object.bio }}</p>  
{% endif %}
```

Make sure that the bio is in the same place, before the closing divs.

This code says to only display that line if the bio exists. We do this because we don't want an empty paragraph element if the user has not filled in a bio.

Go back to our profile page in the browser. Reload it if necessary. We should now see our bio:

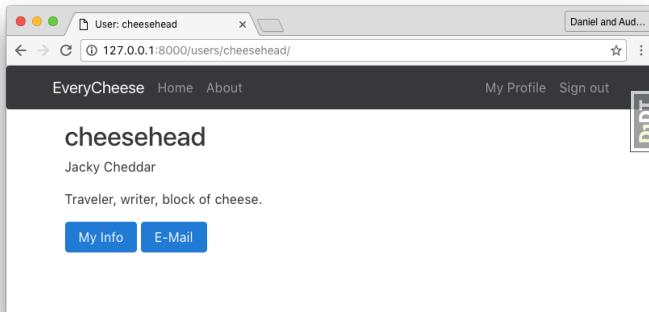


Figure 20: UserDetailView With Bio

Looks good so far. But what happens when a user bio has more than one paragraph?

24.2 Add Line Breaks

Now try adding line breaks and a second paragraph to our bio:

```
Traveler, writer, block of cheese.  
  
What is life without cheese?  
Nothing.
```

Save it and look at the user detail page. Notice how the line breaks aren't preserved. Our poetic multiline bio is all on one line. That's a problem because a lot of people will probably enter line breaks, expecting them to be preserved.

To fix that, change the line displaying the bio to:

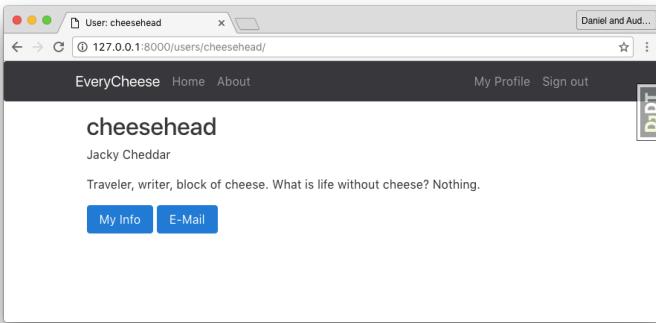


Figure 21: No line breaks in UserDetailView

```
<p>{{ object.bio|linebreaksbr }}</p>
```

Now when we reload our profile page in the browser, we should see that the line breaks are displayed properly. If you see line breaks then it's time for a save point.

24.3 Commit Our Work

We've done a lot. Let's save our work thus far:

```
git status  
git add -A  
git commit -m "Add bio field to User model, views, templates"  
git push origin master
```

The `-A` in `git add -A` tells git to add all changes, including new files and deletions.

25 Introducing Tests

In this lesson we're going to learn the basics of writing tests against changes we've made in our code. Then we're going to show a few tricks to help ensure we have healthy test writing habits.

25.1 Why Test?

Why are we spending our time writing tests? What's the point? Well, tests help ensure that our project is more stable in the long run.

Specifically:

Fixing bugs on existing projects. Minimize the chances of our bug fix breaking other things.

Upgrading our software, operating system, even hardware
Formal tests help identify where things are going to break

There are many more reasons why testing is important, but those are two of our favorites.

25.2 Running Tests

To run the test suite in Django is just a management command away.

At the command line, type:

```
coverage run -m pytest
```

As the tests are run, we'll see text printed out that looks something like:

```
Test session starts
<snip various coverage warnings>
platform: darwin, Python 3.8.1, pytest 5.3.4, pytest-sugar 0.9.2
django: settings: config.settings.test (from option)
rootdir: /Users/drg/projects/everycheese, ini file: pytest.ini
plugins: sugar-0.9.2, django-3.8.0
collecting ...
everycheese/users/tests/test_forms.py ✓    12% [■]
everycheese/users/tests/test_models.py ✓    25% [■■]
everycheese/users/tests/test_urls.py ✓✓    62% [■■■■■■]
everycheese/users/tests/test_views.py ✓✓✓✓ 100% [■■■■■■■■■■]

Results (1.94s):
    9 passed
```

Let's go over what happened step-by-step:

1. Django created a test database, so there's no chance of it hurting our real data.
2. Django ran 8 tests in 1.94 seconds, then reported 'OK'. That means all the tests pass.
3. Django finally destroyed the test database, making it possible to run the tests again with a clean slate.

If any of those 8 tests had failed, Django would have reported the failures to us via error messages. These failure messages indicate where the problem has occurred.

25.2.1 If We Get a LOT of Deprecation Warnings

Should the tests pass but there are dozens of warnings about `django.utils.translation.ugettext_lazy()`, that's okay.

One of the dependencies we're relying on may not be updated yet to run on Django 3.0. If these warnings appear, go into the root of the project and find the `pytest.ini` file. Add this value to the second line, with a space between it and the text that comes before it:

```
-p no:warnings
```

25.3 What Does a Test Look Like?

In our text editor or IDE, go to `everycheese > users > tests > test_models.py`. Inside there is a single function, `test_user_get_absolute_url`:

```
import pytest

from everycheese.users.models import User

pytestmark = pytest.mark.django_db


def test_user_get_absolute_url(user: User):
    assert user.get_absolute_url() == f"/users/{user.username}/"
```

Next, let's look at each part of this code in detail.

25.4 The Test Foundations

```
import pytest

from everycheese.users.models import User

pytestmark = pytest.mark.django_db
```

- We import pytest²¹, our favorite testing framework. Think of it as the Django of testing.
- We import the `User` model from our `users` models.
- We define `pytestmark` in our module, which drives the test database system.

25.5 The Actual Test

The function in the module is a test. We know it is tests because it is prefixed with “`test_`”.

```
def test_user_get_absolute_url(user: User):
    assert user.get_absolute_url() == f"/users/{user.username}/"
```

`test_user_get_absolute_url` is a validation against the `everycheese.users.models.User` model’s `get_absolute_url()` method.



Every model method should have a test

If we add another model method, for example, `__str__`, we would write a test for that as well. In fact, any time we add any method or function to the project, we write tests for them. Doing it upfront is a good way to ensure improved code stability.

²¹<https://docs.pytest.org/>

25.6 Using the `assert` KeyWord

Assert is a Python built-in that lets us run little tests. Let's go into the Python shell and try it out. Start it by typing `python` at the command-line:

```
python
Python 3.8.1 (default, Jan  8 2020, 16:15:59)
[Clang 4.0.1 (tags/RELEASE_401/final)] :: Anaconda
Type "help", "copyright", "credits" or "license"
>>>
```

Once inside the Python shell, we can try out the `assert` keyword:

```
>>> assert 1 == 1
>>> assert 1 == 2
Traceback (most recent call last):
  File "<stdin>", line 1, in <module>
AssertionError
>>>
```

By writing functions that use the `assert` key, we are able to write simple yet effective tests for anything we need in our projects.

This tests ensure that if we make any breaking changes to the `get_absolute_url()` method of our `User` model, these changes are caught quickly. This is a simple, clear example, which is a *good thing*. In our experience clarity in testing goes a long way towards preserving the stability of a website. If we have to write tests for our tests because our tests are too complex, we're probably making a mistake.

Now that we've seen how tests are constructed, let's write some more.

But how do we know where to begin writing tests?



Python shell or Python REPL?

Technically speaking, the Python shell is a REPL²². Indeed, a REPL can be a programming shell, but not necessarily.

If that sounds confusing (or seems pedantic), just stick with the term “shell”. It’s what most people are familiar with anyway.

25.7 Introducing coverage.py

The `coverage.py` library is a tool that examines our project for code not covered by tests. This allows us to quickly determine places where we can add meaningful tests.

Do keep in mind that `coverage.py` isn’t perfect and test coverage doesn’t equate to bug free. Nevertheless, test-covered code is always more stable in the long run.

25.8 Using coverage.py

Normally there is a bit of setup, but fortunately for us `django-crash-starter` has taken care of all the work in advance. All we have to do is run the following at the command line:

```
coverage report
```

It should display the percentage of test coverage per module and the overall total as shown below:

Name	Stmts	Miss	Cover
<hr/>			
everycheese/__init__.py	2	0	100%
everycheese/conftest.py	13	0	100%
everycheese/contrib/__init__.py	0	0	100%
everycheese/contrib/sites/__init__.py	0	0	100%
everycheese/users/__init__.py	0	0	100%
everycheese/users/admin.py	12	0	100%
everycheese/users/apps.py	10	0	100%
everycheese/users/forms.py	18	0	100%
everycheese/users/models.py	9	0	100%
everycheese/users/urls.py	4	0	100%
everycheese/users/views.py	28	0	100%
<hr/>			
TOTAL	96	0	100%

25.9 Generate an HTML Coverage Report

In addition to the broad coverage report that we just saw, we can generate a more detailed interactive HTML coverage report. Type this:

```
coverage html
```

Now open `htmlcov/index.html` in a browser. Notice how we can click on any particular module to see exactly which lines are missing test coverage. Not that there are any missing lines, but as we add code in future chapters this will display code we've added that doesn't have tests yet.

25.10 More Users App Tests

There are 3 other modules of tests generated for our starter users app:

- `test_forms.py`
- `test_urls.py`
- `test_views.py`

Study the comments in those tests to learn how those tests work.

25.11 Summary

In this lesson, we covered:

1. Reasons to write tests for our project
2. How to run tests
3. The starter tests that come with the users app
4. How to determine how much of a project is covered by tests

26 User Profile Cheese

What if, instead of using a computer or tablet, we could browse the internet with a block of cheese?

Our device would technically be a cheese computer, or a “cheeseputer” for short. It would be the ideal device for browsing EveryCheese.

On our cheeseputer, here is what the user profile (user detail) page would look like.

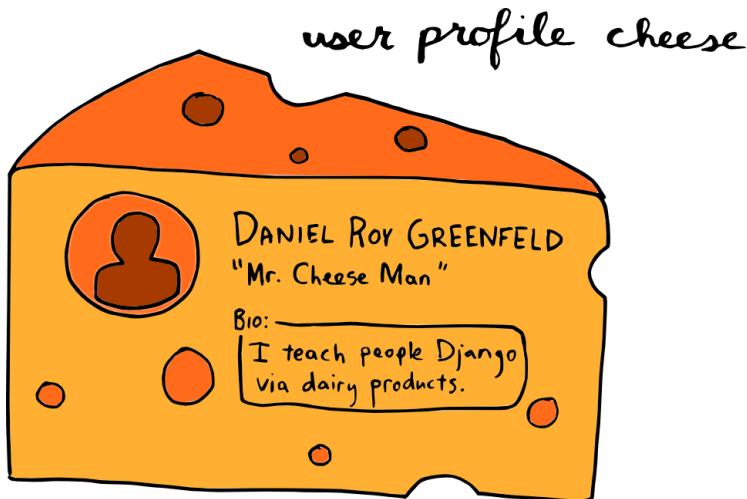


Figure 22: A block of user profile cheese

26.1 Avatars Will Fit Into Cheese Holes

We haven't implemented avatars yet, but when we do in an upcoming Django Crash Course extension, they'll fit into the holes of our cheeseputer, as shown.

27 The Cheeses App and Model

EveryCheese is still missing one thing: cheese! We're going to start building out the cheese-related functionality by creating a `cheeses` app. We'll then create a `Cheese` model, and we'll make and apply migrations.

Remember, a Django app is a directory within our Django project containing code focused on doing one thing well. A typical Django project contains many Django apps.

27.1 Make Sure We're at the Project Root

At the command line, let's check that we are still in the root of the project. If we type `ls`, we should see a file called `manage.py` among many others.

27.2 Create an App Called Cheeses

Use `startapp` to create a new app called `cheeses`:

```
python manage.py startapp cheeses
```

The `startapp` command creates starting boilerplate for a Django app. After it runs, we'll see that an app directory called `cheeses` has been created. Inside, all the familiar Django app files are there, such as `models.py`.

27.3 Move It Into the Project

The `cheeses` app was created in the current directory, but the other Django apps aren't in the current directory. They're all in an inner `everycheese/` directory.

It's a common practice in the Django world to keep all our Django apps inside one directory. In the `django-crash-starter` project layout, the `apps` directory has the same name as the outer project directory.

Move `cheeses/` to the inner `everycheese/` directory:

```
mv cheeses everycheese/
```

We should now have it at the same level as our `users` app, with all our other Django apps.

27.4 Set the Cheese Config

In the `everycheese/cheeses/apps.py` module, change the value of `name` to be “`everycheese.cheeses`”. It should look like this:

```
name = 'everycheese.cheeses'
```

27.5 Add It to the List of Installed Apps

Open up the common settings file `base.py`. We can see here that `django-crash-starter` breaks up the `INSTALLED_APPS` tuple into `DJANGO_APPS`, `THIRD_PARTY_APPS`, and `LOCAL_APPS`:

```
INSTALLED_APPS = DJANGO_APPS + THIRD_PARTY_APPS + LOCAL_APPS
```

This is to help keep our apps organized. The naming convention here is:

- `DJANGO_APPS`: Apps that are part of the core Django code-base.
- `THIRD_PARTY_APPS`: Reusable Django apps available from the Python Package Index. *Third-party* means not part of Django core.
- `LOCAL_APPS`: Django apps that are internal to our Django project, such as the `users` app.

Add `everycheese.cheeses` to `LOCAL_APPS`:

```
LOCAL_APPS = (
    'everycheese.users.apps.UsersConfig', # custom users app
    'everycheese.cheeses.apps.CheesesConfig', # cheese info app
)
```

Now the `cheeses` app is installed into the project.

27.6 Add the Cheese Model

Open up `cheeses/models.py`.

Delete the placeholder comment saying `# Create your models here.`. It's fine to delete comments like this – there's no reason to keep it around. In the Django world, a `models.py` is obviously where we create our models.

27.6.1 Start the Cheese Model Like Any Other Model

Define a `Cheese` model which subclasses the `TimeStampedModel` from `django-model-utils`. Give it a standard `name` field.

```
from django.db import models

from model_utils.models import TimeStampedModel


class Cheese(TimeStampedModel):
    name = models.CharField("Name of Cheese", max_length=255)
```

`TimeStampedModel` automatically gives the model `created` and `modified` fields, which automatically track when the object is created or modified. We like to define all our models as subclasses of `TimeStampedModel`.

27.6.2 Add an Autopopulating Cheese Slug

Add a slug field. The `slug` will populate automatically from the `name` field, rather than requiring the user to enter it.

```
from django.db import models

from autoslug import AutoSlugField
from model_utils.models import TimeStampedModel


class Cheese(TimeStampedModel):
    name = models.CharField("Name of Cheese", max_length=255)
    slug = AutoSlugField("Cheese Address",
        unique=True, always_update=False, populate_from="name")
```



Illustration © Audrey Roy Greenfeld

Figure 23: Slugs are awesome!

27.6.3 Add Description Field

Continuing from above, we'll give cheeses a description. Add this to the `cheese` model:

```
description = models.TextField("Description", blank=True)
```

This is a `TextField` because there's a good chance that users might enter long descriptive text. A good rule of thumb is to use `TextField` rather than `CharField` whenever there might be a need for more than 255 characters.

27.6.4 Add Firmness Field

Finally, add a `firmness` field to the same `cheese` model. Give it enum-powered choices ranging from soft to hard.

```
class Cheese(TimeStampedModel):

    class Firmness(models.TextChoices):
        UNSPECIFIED = "unspecified", "Unspecified"
        SOFT = "soft", "Soft"
        SEMI_SOFT = "semi-soft", "Semi-Soft"
        SEMI_HARD = "semi-hard", "Semi-Hard"
        HARD = "hard", "Hard"

    # Other Fields Here...

    firmness = models.CharField("Firmness", max_length=20,
        choices=Firmness.choices, default=Firmness.UNSPECIFIED)
```

Note that we defined the firmness constants as variables within the scope of the `cheese` model. This allows us to do things like this comparison:

```
if cheese.firmness == Cheese.Firmness.SOFT:
    # Do Something
```

No need to type the above comparison. It's here just to show what we can do.



About Django 3+ `choice` Classes

For those with pre-3.0 Django experience, `models.TextChoices` and `models.IntegerChoices` are new features of the framework. Built as an extension of Python 3.4+ `Enum`, it makes choice field documentation easier on the coder, hence projects more maintainable. We just scratch the surface here, and more information can be found at:

- Django docs on Choice classes: <http://bit.ly/django-3-choice-classes>
- <https://docs.python.org/3/library/enum.html>

27.7 Create and Run the Initial Cheese Migration

Run `makemigrations` and `migrate`:

```
python manage.py makemigrations cheeses
python manage.py migrate cheeses
```

This migration should have created a table for the `cheese` model.

28 Trying Out the Cheese Model

We're going to experiment with our `Cheese` model via `shell_plus`, an enhanced version of the interactive Django shell.

28.1 Let's Try It Out!

At the command line, start up `shell_plus`:

```
python manage.py shell_plus
```

28.2 Django Shell vs. Shell Plus

The regular Django shell (`python manage.py shell`) is the same as starting the Python REPL, but when we run it, it preloads the appropriate Django settings file as specified in `manage.py`.

`shell_plus` takes this a step further by autoloading all our Django model classes. In the plain Django shell, we would have to type this in order to import the `Cheese` model class:

```
>>> from everycheese.cheeses.models import Cheese
```

However, in `shell_plus`, the above import is already done for us as a convenience.

28.3 Create a Cheese

Let's instantiate a `Cheese` object. Type this now:

```
in [1]: cheese = Cheese.objects.create(  
... name='Colby',  
... description='Similar to Cheddar but without undergoing the cheddaring process'  
... firmness=Cheese.Firmness.SEMI_HARD)
```

Behind the scenes, the above code created a new record in the `cheeses_cheese` table in the database.

28.4 Evaluate and Print the Cheese

If we evaluate the object that we just instantiated, we get:

```
in [2]: cheese  
<Cheese: Cheese object>
```

Printing the string representation of our object gives us:

```
in [3]: print(cheese)  
Cheese object
```

Cheese object? That's not very descriptive. How do we know which cheese object this refers to? We don't. It's also rather insulting to Colby cheese.

28.5 View the Cheese's Name

To see the actual name of the cheese, type:

```
in [4]: cheese.name  
'Colby'
```

We can make cheese objects print out better. Exit the command line.

28.6 Add a String Method

When Python classes have a `__str__()` method, that method is called and the result is printed whenever we try to print an instance object. We're about to see this in action.

Open up `models.py` of our `cheeses` app again.

Add a `__str__()` method to our `Cheese` model. This goes at the bottom, after all the fields:

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

28.7 Try It Again

Let's get that cheese object and try to print it again:

```
python manage.py shell_plus  
in [1]: cheese = Cheese.objects.last()  
in [2]: print(cheese)  
Colby
```

Great! Now when we printed `cheese`, we got `Colby` as the string representation of the `Cheese` object.

Exit `shell_plus` again. We're done using it for now.

28.8 Commit Our Work

We've made some major changes to EveryCheese, so it's time to back up our work in version control.

Check which files have changed, then add them to a commit.

```
git status  
git add everycheese/cheeses/  
git add config/settings/base.py
```

Commit the changes and push:

```
git commit -m "Add cheeses app"  
git push origin master
```

29 Tests and Test Coverage

29.1 Check Test Coverage

Now's a good time to recheck test coverage. At the command line:

```
coverage run -m pytest
coverage report
coverage html
```

Open `htmlcov/index.html` in a browser:

Module ↓	statements	missing	excluded	coverage
everycheese/__init__.py	2	0	0	100%
everycheese/cheeses/__init__.py	0	0	0	100%
everycheese/cheeses/admin.py	1	0	0	100%
everycheese/cheeses/models.py	16	1	0	94%
everycheese/conftest.py	13	0	0	100%
everycheese/contrib/__init__.py	0	0	0	100%
everycheese/contrib/sites/__init__.py	0	0	0	100%
everycheese/users/__init__.py	0	0	0	100%
everycheese/users/admin.py	12	0	0	100%
everycheese/users/apps.py	10	0	0	100%
everycheese/users/forms.py	18	0	0	100%
everycheese/users/models.py	9	0	0	100%
everycheese/users/urls.py	4	0	0	100%
everycheese/users/views.py	25	0	0	100%
Total	110	1	0	99%

`coverage.py` v5.0.3, created at 2020-01-29 13:53

Figure 24: 94% coverage

Why isn't our test coverage at 100%? Well, `django-crash-starter` provided us with 100% test coverage, but adding the cheeses app dropped us to its current score.

Click around the coverage report to find exactly what dropped our score. In this case, look at the coverage for `everycheese.cheeses.models`.

Coverage for **everycheese/cheeses/models.py** : 94%

16 statements 15 run 1 missing 0 excluded

```
1 | from django.db import models
2 |
3 | from autoslug import AutoSlugField
4 | from model_utils.models import TimeStampedModel
5 |
6 |
7 | class Cheese(TimeStampedModel):
8 |     FIRMNESS_UNSPECIFIED = "unspecified"
9 |     FIRMNESS_SOFT = "soft"
10 |    FIRMNESS_SEMI_SOFT = "semi-soft"
11 |    FIRMNESS_SEMI_HARD = "semi-hard"
12 |    FIRMNESS_HARD = "hard"
13 |    FIRMNESS_CHOICES = (
14 |        (FIRMNESS_UNSPECIFIED, "Unspecified"),
15 |        (FIRMNESS_SOFT, "Soft"),
16 |        (FIRMNESS_SEMI_SOFT, "Semi-Soft"),
17 |        (FIRMNESS_SEMI_HARD, "Semi-Hard"),
18 |        (FIRMNESS_HARD, "Hard"),
19 |    )
20 |
21 |    name = models.CharField("Name of Cheese", max_length=255)
22 |    slug = AutoSlugField("Cheese Address",
23 |        unique=True, always_update=False, populate_from="name")
24 |    description = models.TextField("Description", blank=True)
25 |
26 |    firmness = models.CharField("Firmness", max_length=20,
27 |        choices=FIRMNESS_CHOICES, default=FIRMNESS_UNSPECIFIED)
28 |
29 |    def __str__(self):
30 |        return self.name
```

Figure 25: Cheese model coverage

The line that dropped our test coverage was this line inside of

the `__str__()` function beginning with `return`:

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

You see, coverage assumes that imported code like `models.CharField` just works. There's no need to test the `Cheese` model's fields, because the usage of those fields has already been tested in Django's codebase.

However, the `__str__()` function that we defined is specific to our code. Coverage.py didn't find any test coverage for it, so it marked it as uncovered.

29.2 Create a Module for Cheese Model Tests

Django's `startapp` command gave our `cheeses` app a `tests.py` file by default. However, a single `tests` module is going to get crowded with code. Let's turn our `tests` module into a `tests` package.

In `everycheese/cheeses/`, let's now:

- Delete `tests.py`
- Create a directory in its place called `tests/`
- Inside of `tests`, create `__init__.py` and `test_models.py`.

Common practice is to delete `tests.py` and create individual test modules for each file of the app. (Later, the `cheeses` app may have a `test_views.py`, `test_admin.py`, etc.)

Note: even though `__init__.py` is technically optional on Python 3, create it anyway. By including the `__init__.py`, it empowers us to use relative imports in our tests.

29.3 Let's Test the `__str__()` Method.

One might say, this is silly! But it's actually important because we never know, there could one day be code in EveryCheese that relies on the value of `__str__()` behaving a certain way. If that behavior changes and we don't catch it in time, it will cause us to be embarrassed in front of our users.

Before we can write a test for this, we need to import the `pytest` library and link it to our database. Start off `cheeses/tests/test_models.py` with this:

```
import pytest

# Connects our tests with our database
pytestmark = pytest.mark.djangoproject_db
```

Import the `Cheese` model class, since it's what's being tested in this module:

```
from ..models import Cheese
```

Here we use a relative import to get `Cheese` from `models.py` of the `cheeses` app. This pattern is the same as that of the `users` app's `test_models.py`.

Then add our test function:

```
def test__str__():
    cheese = Cheese.objects.create(
        name="Stracchino",
        description="Semi-sweet cheese that goes well with starches.",
```

```
    firmness=Cheese.Firmness.SOFT,  
)  
assert cheese.__str__() == "Stracchino"  
assert str(cheese) == "Stracchino"
```

This is a good starter example of how to write tests on model methods. (In a later lesson we'll improve upon this by using a factory, but for now this is a good place to start.)

Run coverage.py again:

```
coverage run -m pytest  
coverage report  
coverage html
```

Open the `htmlcov/index.html` file again. The test coverage of `everycheese.cheeses.models` should have increased to 100%. If we click through to see the file in detail, we should see that no lines are highlighted for lacking test coverage.

29.4 Enter “The Game of Test Coverage”

Since test coverage is a measure of how much of our project is covered by tests, we can use this value as part of a game. The goal of the game is simple:

Get our test coverage score to 100% and keep it there.

29.5 Rules of the Game

Any time we add new code, we'll be running a coverage report.

- If the number drops, then we are losing.
- If the number is maintained, we draw.
- And if the number goes up (even after a drop), then we are on our way to victory.

The way to maintain our score is by adding more tests to cover things that aren't covered. That's the challenge. Every time we add or modify existing code we risk dropping our score, so we're playing constantly.

As for what's a good coverage percentage, there's no one correct answer. Read more: What is a reasonable code coverage % for unit tests (and why)?²³

29.6 What's the Point of All This Anyway?

Primarily, it's a chance to justify eating more cheese.

Other, less important things to think about are:

1. Do we want to be able to easily upgrade our site whenever Django or any of the dependencies of our site put out new releases?
2. Do we want our deployments to go smoothly?
3. Are people's health or finances dependent on our project?

If we answered yes to any of the above, then maximizing our test coverage is in our best interest.

²³ <https://stackoverflow.com/questions/90002/what-is-a-reasonable-code-coverage-for-unit-tests-and-why>

29.7 Commit the Cheese Model Tests

```
git add -A  
git commit -m "Add Cheese model tests"  
git push origin master
```

29.8 Summary

We've now covered:

1. Testing the `cheese` model
2. The game of test coverage
3. Committing our new cheeses app tests

30 The Cheeserator

With Django, we can build absolutely anything imaginable.

Now imagine that we wanted to build a contraption called The Cheeserator, a machine for doing whatever we want to do to cheese.



Figure 26: The Cheeserator device for manipulating cheese.

Yes, we can build this with Django. We can do anything.

31 Adding Cheeses to the Admin

31.1 We Need a Superuser

Create a Django superuser to get full admin access.

```
python manage.py createsuperuser
```

Enter these values:

- username: `admin`
- email: `admin@example.com`
- password: `Peau!8mUPCXkjQ*`



Copy this password into a password manager!

It's bad practice to use simplistic passwords, even for local development. We want to promote strong security habits and this is one of them. Also, don't stick passwords into plaintext or spreadsheet files. Instead, lean on secure password managers like 1Password.

31.2 Go to the Admin

Start up `runserver` if it's not already running.

Go to <http://127.0.0.1:8000/admin>. Log in with our superuser account.

31.3 Explore the Admin So Far

Look around to see what's currently available in the Django admin. We'll notice some functionality that comes with Django by default, and some that comes with django-crash-starter.

31.4 Register Cheese Model With the Admin

Open `admin.py` of our cheeses app in our text editor. Replace the code in the file with the following:

```
from django.contrib import admin
from .models import Cheese

admin.site.register(Cheese)
```

Save the file and go back to the Django admin in our browser. Refresh the page. We should now have an admin UI for entering cheeses, accessible from the *Cheeses* section:

31.5 Find Colby

Earlier, we created a cheese by calling `Cheese.objects.create()` in `shell_plus`. The end result was that a new cheese record was created.

In the admin, find the list of cheeses. **Colby**, the cheese we added earlier, should be the only cheese in the list.

As of now, there are 2 ways to create new cheeses in EveryCheese:
1. By writing code that creates cheeses, as we did earlier. 2. By creating cheeses in the Django admin.

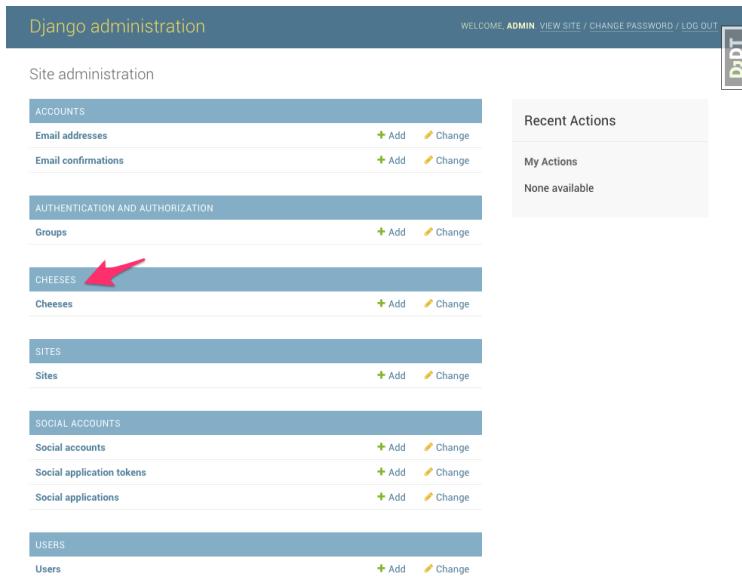


Figure 27: Cheeses on the Django admin index page

We've already created a cheese programmatically; next, we'll create 3 more via the Django admin.

31.6 Enter More Cheeses via the Admin

Under *Cheeses*, click on *Add*. We will be taken to the **Add cheese** form:

Add the following cheeses via the Django admin UI:

1. Camembert
- (a) Description: A French cheese with a white, powdery rind and a soft, delicately salty interior.

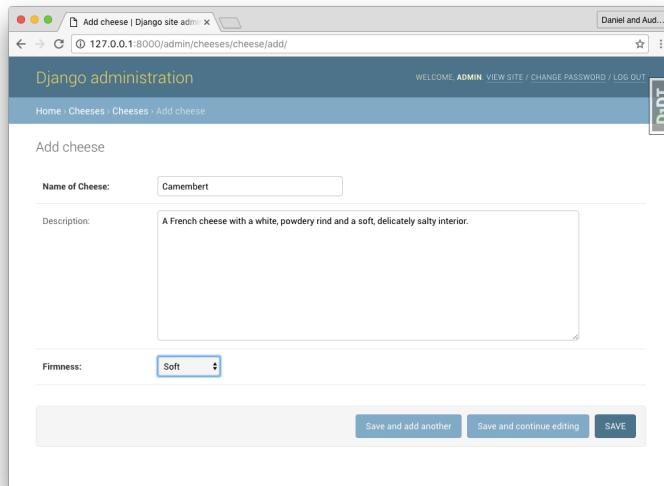


Figure 28: Add cheese in the Django admin

- (b) Firmness: soft
 - 2. Gouda
 - (a) Description: A Dutch yellow cheese that develops a slight crunchiness and a complex salty toffee-like flavor as it ages.
 - (b) Firmness: hard
 - 3. Cheddar
 - (a) Description: A relatively hard, pale yellow to off-white, and sometimes sharp-tasting cheese.
 - (b) Firmness: hard

Don't skip this step. We'll need these cheeses later in this course.

31.7 Some Notes About the Django Admin

31.7.1 Keep People Who Use It to a Small Number.

1. Must be power-users, understanding how models work
2. Not optimized for scaling
3. The Django admin can do a lot of amazing things for a little amount of work. But then we run out of options and are stuck



Don't Use `list_editable`. Ever!

As records are tracked not by primary keys but by their position in a displayed list, this is a serious risk. On multi-user projects:

1. Cheeses are created in descending order.
2. Daniel brings up the list field for cheeses and begins making changes
3. Audrey decides to add the cheese *Brie*. Since it's the last item added, it's the first Cheese returned on a query.
4. Daniel finally saves his cheese changes, but the records he saw all receive the data from the next record, corrupting at least 50 records (Django's default admin display number).

31.8 Commit Changes

```
git commit -am "Register Cheese model with the admin"  
git push origin master
```

31.9 Summary

In this lesson we:

1. Created a superuser
2. Learned how to use the Django admin to **rapidly** create a barebones cheese management system.
3. Admonished us to keep the volume of users of the admin system to a small number.
4. Warned against use of `list_editable`.

32 Behind the Curtain

Having access to the Django admin is like having access to the Wizard of Oz's control panels. It makes us more powerful than we actually are.

Imagine if a wedge of cheese had access to the Django admin controls of the EveryCheese site. Who knows what might happen. It could be rather dangerous.

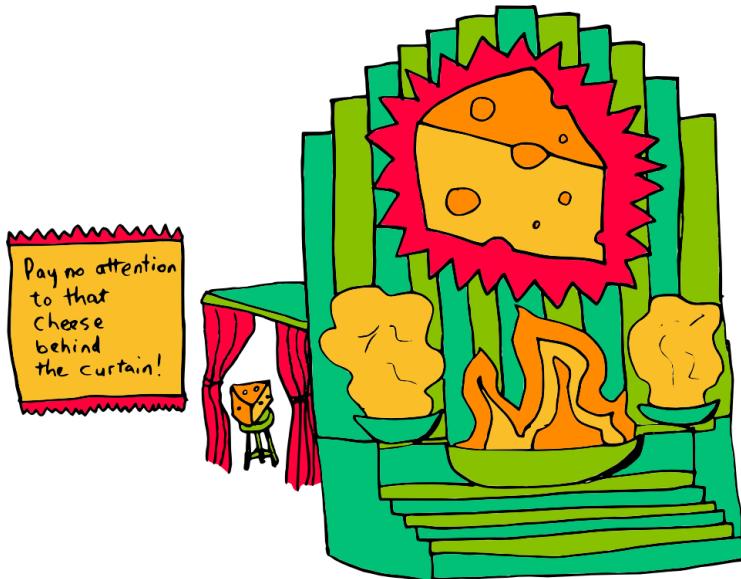


Figure 29: The cheese behind the curtain

32.1 We Are in Control

Fortunately for us, we don't have to create superuser accounts for cheeses if we don't feel like it. Just say no. If they ask, tell

them to follow the yellow brick road back to the refrigerator.

33 Class Based View Fundamentals

This lesson will cover:

- The Simplest Class-Based View
- Advantages of Class-Based Views
- Tips for Writing Class-Based Views

There's no need to type out the examples in this lesson. Just sit back and learn the concepts.

33.1 The Simplest Class-Based View

Here, study the code and observe that:

- We create a very simple view by subclassing the base `view` class.
- It returns an HTTP response consisting of a simple text string.

```
# No need to type this out, just study it!
from django.http import HttpResponseRedirect
from django.views.generic import View

class MyView(View):

    def get(self, request, *args, **kwargs):
        return HttpResponseRedirect('Response to GET request')
```

The above is analogous to this function-based view (or FBV for short):

```
# No need to type this out, just study it!
def my_view(request, *args, **kwargs):
    return HttpResponse('Response GET request!')
```

33.2 Adding More HTTP Methods

Just as we can define a `get()` method to handle GET requests, we can also do the same with other HTTP methods such as POST and DELETE.

```
# No need to type this out, just study it!
class MyView(View):

    def get(self, request, *args, **kwargs):
        return HttpResponse('Response to GET request')

    def post(self, request, *args, **kwargs):
        return HttpResponse('Response to POST request')

    def delete(self, request, *args, **kwargs):
        return HttpResponse('Response to DELETE request')
```

The above CBV code is analogous to this FBV approach:

```
# No need to type this out, just study it!
def my_view(request, *args, **kwargs):
    if request.method == 'POST':
        return HttpResponse('Response POST request!')
    elif request.method == 'DELETE':
        return HttpResponse('Response DELETE request!')
    return HttpResponse('Response GET request!')
```

Or this FBV approach:

```
# No need to type this out, just study it!
def my_view(request, *args, **kwargs):
    METHOD_DISPATCH = {
        'POST': HttpResponse('Response POST request!'),
        'DELETE': HttpResponse('Response DELETE request!'),
    }
    DEFAULT = HttpResponse('Response GET request!')
    return METHOD_DISPATCH.get(request.method, DEFAULT)
```

Or any number of other FBV approaches. Which makes us wonder, what is the correct FBV approach?

Hint: There isn't a 'correct' or 'standard' FBV approach. It's every coder for themselves.

33.3 Advantages of Class Based Views

- Composition
- Intelligent Defaults
- Standardized HTTP method handling
- Every action generally has a place to be
- Easier than Writing Decorators

33.4 Composition

Here's an example mixin:

```
# No need to type this out, just study it!
class BaseProjectMixin(object):
    def complex_data(self, request):
        # Sophisticated Logic Here
        return 'sophisticated result'
```

Every view inheriting from `BaseProjectMixin` gets a `complex_data()` method as a result:

```
# No need to type this out, just study it!
from django.shortcuts import render
from django.views.generic import View
from .mixins import BaseProjectMixin

class ItemDetailView(BaseProjectMixin, View):
    def get(self, request, *args, **kwargs):
        value = self.complex_data(request)
        return render(request, 'details.html', {'value': value})

class ThingDetailView(BaseProjectMixin, View):
    def get(self, request, *args, **kwargs):
        value = self.complex_data(request)
        return render(request, 'things.html', {'value': value})
```

[http://ccbv.co.uk/projects/Django/3.0/django.views.generic.base/
View/](http://ccbv.co.uk/projects/Django/3.0/django.views.generic.base/View/)

33.5 Composition Part II

Various open-source packages expect you to extend the default views they provide. Django REST Framework is the most notable project to take this approach.

33.6 Intelligent Defaults

A CBV-based update view

```
# No need to type this out, just study it!
from django.views.generic import UpdateView
from .models import Item

class ItemUpdateView(UpdateView):
    model = Item
    fields = ['name', 'description', 'price']
```

- Auto-creates form based off `Item` and `fields`, called `form` in template.
- Default template name of `items/item_form.html`.
- Item record can be accessed in template as `item` or `object`.

[https://ccbv.co.uk/projects/Django/3.0/django.views.generic.edit/
UpdateView/](https://ccbv.co.uk/projects/Django/3.0/django.views.generic.edit/UpdateView/)

33.7 Standardized HTTP Method Handling

```
# No need to type this out, just study it!
from django.http import HttpResponseRedirect
from django.views.generic import View

class SpecialView(View):

    def delete(self, request, *args, **kwargs):
```

```
    return HttpResponse('HTTP deletes!')

def post(self, request, *args, **kwargs):
    return HttpResponse('HTTP posts!')
```

- Returns HTTP 405 for these HTTP methods:
 - GET
 - PUT
 - OPTIONS

33.8 Tips for Writing Class-Based Views

- Stick with the defaults
- Don't go crazy with multiple inheritance
- For authentication and other behaviors: django-braces
- For quick reference documentation: <https://ccbv.co.uk>
- If doing something crazy-sophisticated, drop down to a basic `django.views.generic.View`.
- For more advanced views:
 - GET/POST arguments are inside of `self.kwargs`
 - You can access the request at `self.request`

34 Writing the Cheese List View

In our text editor, open `cheeses/views.py`. There will be some stub code in there. Replace it with the following:

```
from django.views.generic import ListView, DetailView

from .models import Cheese

class CheeseListView(ListView):
    model = Cheese
```

This is a simple view that lists all the cheeses on a single page.

When we import the `Cheese` model, we use a relative import because we're importing it from within the same app.

35 Wiring in the List View Url

35.1 Define Cheese URL Patterns

In our cheeses app, create a new file called `urls.py`. Open it in our text editor and add the following code:

```
# everycheese/cheeses/urls.py
from django.urls import path
from . import views

app_name = "cheeses"
urlpatterns = [
    path(
        route='',
        view=views.CheeseListView.as_view(),
        name='list'
    ),
]
```

35.2 Include Cheese URLs in Root URLConf

In order to make the cheeses app's URLConf work, we still have to include it in our root URLConf. Open `config/urls.py` and add this line right after the comment “`# Your stuff: custom urls includes go here`”:

```
# Your stuff: custom urls includes go here
path(
    'cheeses/',

```

```
    include('everycheese.cheeses.urls', namespace='cheeses'),
),
```

35.3 See the View in Action

We're about to trigger an error, but that's okay!

In our web browser let's navigate to 127.0.0.1:8000/cheeses/²⁴

We should see a `TemplateDoesNotExist` error:

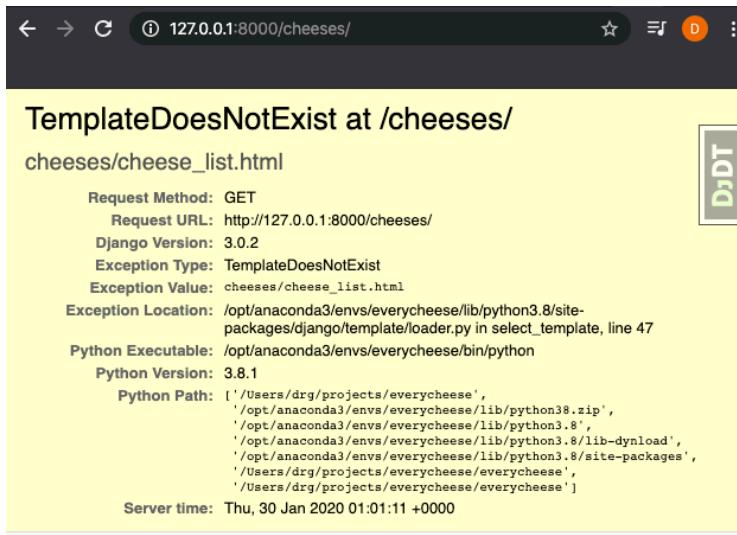


Figure 30: TemplateDoesNotExist

This is good news! It means:

²⁴<http://127.0.0.1:8000/cheeses/>

1. Django's URL dispatcher found match for 'cheeses/' and sent the rest of the URL to `everycheese.cheeses.urls`.
2. The remainder of the URL is a match for '', so `CheeseListView.as_view()` was called.
3. The `CheeseListView` looked for a template to display, found nothing, so returned a `TemplateDoesNotExist` error.

We'll add that template in the next chapter.

36 The Cheese List Template

We love looking at lists of cheeses. So much taste and flavor!

36.1 Create the List Template

Let's create a blank template for `CheeseListView`:

1. In `templates/`, create a `cheeses/` directory. This will hold all the templates for our `cheeses` app.
2. In `templates/cheeses/`, create a file called `cheese_list.html`

Make sure we have `runserver` still running.

Go to <http://127.0.0.1:8000/cheeses/> again. When we load the page, it shows up blank as expected.

36.2 Fill in the Template

Fill `cheese_list.html` with the following code:

```
{% extends "base.html" %}

{% block title %}Cheese List{% endblock title %}

{% block content %}
<h2>Cheese List</h2>

<ul>
    {% for cheese in cheese_list %}
        <li><a href="#TODO">{{ cheese.name }}</a></li>
    {% endfor %}

```

```
</ul>  
{%- endblock content %}
```

In this template, we display all the cheeses in a bulleted list. We iterate over `cheese_list`, which `CheeseListView` automatically provides to the template. This is a built-in copy of the default `object_list` value that `ListView` provides by default. If our model was `Butter` instead of `Cheese`, then we would access `butter_list` instead.

The `#todo` links will go to the detail pages for each cheese. We'll implement them very soon.

36.3 See the List in Action

Refresh <http://127.0.0.1:8000/cheeses/> again. We should see the cheese list in action:

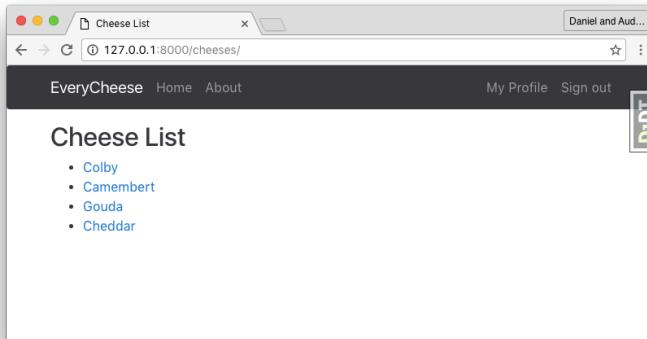


Figure 31: Cheese list

- All the cheeses we entered earlier via the Django admin or shell should be in the list.
- The links should be `#TODOs`. We haven't implemented them yet.

36.4 Add a Nav Link to the Cheese List

Open up `templates/base.html` in our text editor. This is the project's main sitewide base template.

Find the code for the navbar:

```
<ul class="navbar-nav mr-auto">
  <li class="nav-item active">
    <a class="nav-link" href="{% url 'home' %}">Home</a>
    <span class="sr-only">(current)</span>
  </li>
  <li class="nav-item">
    <a class="nav-link" href="{% url 'about' %}">About</a>
  </li>
</ul>
```

Insert a link to the Cheese List page:

```
<li class="nav-item">
  <a class="nav-link" href="{% url 'cheeses:list' %}">Cheeses</a>
</li>
```

Here we use the `{% url %}` template tag to generate the absolute URL. This is better than linking to the absolute URL directly. The reason is that no matter what we change the link to, the `base.html` template will pick it up. For example, if we decided

to switch the URL from `cheeses` to `les-fromages` (French for “cheeses”) in `urls.py`, we wouldn’t have to go into templates to accomodate that change. Instead, `{% url 'cheeses:list' %}` would automagically link to `127.0.0.1:8000/les-fromages/`.

In any case, now when we go back to the browser and refresh the Cheese List page, we should see the *Cheeses* link in the navbar:

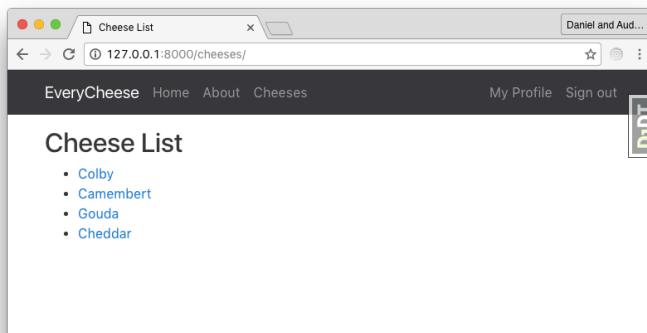


Figure 32: Cheese List With Nav Link

Click around the site and then click on *cheeses* to make sure the link works as expected.

36.5 Explaining the `cheeses:list` Name

In the previous chapter, inside the `cheeses/urls.py` module we set two important values, the `app_name` and the `path name` for the `CheeseListView`. The specific values we set are seen below:

```
# Code inside cheeses/urls.py
app_name = "cheeses"
urlpatterns = [
    path(
        route='',
        view=views.CheeseListView.as_view(),
        name='list'
    ),
]
```

app_name This is how we set the `cheeses` app name in an explicit manner. Amongst other things, setting this here makes it easy for us as developers to identify which file we are working in.

path name The `CheeseListView` is given a URL name of `list`. We do this because it allows us greater flexibility in naming views across a project. Specifically, a too-simple naming approach starts to be uncomfortable on even medium-sized projects.

36.6 Commit Our Work

As always, commit the work!

```
git add -A
git commit -m "Implement cheese list page, add navbar link"
git push origin master
```

37 Add the CheeseDetailView

So far we can see the list of cheeses at <http://127.0.0.1:8000/cheeses/>. Next, let's make it possible for users to click through to see the detail page for any cheese.

Add this to the bottom of `cheeses/views.py`:

```
class CheeseDetailView(DetailView):
    model = Cheese
```

Now we have the view that will power each of the cheese detail pages.

37.1 Add the CheeseDetailView URL Pattern

As usual, after defining a view, the next step is to wire in its corresponding URL pattern.

Add this to the `urlpatterns` list in `cheeses/urls.py`:

```
# URL Pattern for the CheeseDetailView
path(
    route='<slug:slug>',
    view=views.CheeseDetailView.as_view(),
    name='detail'
),
```

Our `urlpatterns` in `cheeses/urls.py` should look like this now:

```
urlpatterns = [
    path(
        route='',
        view=views.CheeseListView.as_view(),
        name='list'
    ),
    path(
        route='<slug:slug>',
        view=views.CheeseDetailView.as_view(),
        name='detail'
    ),
]
```

Now when we visit <http://127.0.0.1:8000/cheeses/colby/>, the requested URL will match '`<slug:slug>`' where `slug` is `colby`.

37.2 Link List Items to Detail Pages

In `cheeses/cheese_list.html` change:

```
<a href="#TODO">
```

To:

```
<a href="{% url 'cheeses:detail' cheese.slug %}">
```

Here we are using the `url` template tag to generate the absolute URL to each cheese's detail page.

If we refresh <http://127.0.0.1:8000/cheeses/> and click on **Colby** we'll go to the CheeseDetailView results. However, as we haven't added a template yet, what we get is the following:

The screenshot shows a browser window with the URL `127.0.0.1:8000/cheeses/colby/`. The title bar says `TemplateDoesNotExist at /cheeses/colby/`. The main content area displays the following error information:

```
Request Method: GET
Request URL: http://127.0.0.1:8000/cheeses/colby/
Django Version: 3.0.2
Exception Type: TemplateDoesNotExist
Exception Value: cheeses/cheese_detail.html
Exception Location: /opt/anaconda3/envs/everycheese/lib/python3.8/site-packages/django/te
Python Executable: /opt/anaconda3/envs/everycheese/bin/python
Python Version: 3.8.1
Python Path: ['/Users/drg/projects/everycheese',
              '/opt/anaconda3/envs/everycheese/lib/python38.zip',
              '/opt/anaconda3/envs/everycheese/lib/python3.8',
              '/opt/anaconda3/envs/everycheese/lib/python3.8/lib-dynload',
              '/opt/anaconda3/envs/everycheese/lib/python3.8/site-packages',
              '/Users/drg/projects/everycheese/everycheese',
              '/Users/drg/projects/everycheese/everycheese']
Server time: Thu, 6 Feb 2020 06:32:28 +0000
```

Figure 33: Missing cheese_detail.html TemplateDoesNotExist exception

If we see the image above, then we are doing it right. Go to the next chapter where we add the `cheese_detail.html` html template.

38 The Cheese Detail Template

38.1 Add a Cheese Detail Template

In `templates/cheeses/`, create a file called `cheese_detail.html`.

Fill in the detail template with this code:

```
{% extends "base.html" %}

{% block title %}Cheeses: {{ cheese.name }}{% endblock title %}

{% block content %}

<h2>{{ cheese.name }}</h2>

{% if cheese.firmness %}
    <p>Firmness: {{ cheese.get_firmness_display }}</p>
{% endif %}

{% if cheese.description %}
    <p>{{ cheese.description }}</p>
{% endif %}

{% endblock content %}
```

Some things to note:

- In a `DetailView`'s template, the object is accessible as the lowercased model name. In this case, the object is `cheese`.
- Before displaying any optional field, we first check if a value exists.
- `get_firmness_display` shows the cheese's firmness attribute in an attractive format. `get_FOO_display()` is a utility

method created automatically for any Django model field. So where we had a `firmness` choice field defined on our `Cheese` model, Django adds a `get_firmness_display()` method which we can call in templates or any place the instantiated model is available.

38.2 Visit Cheese Detail

Go back to the cheese list page in our browser. Refresh the page. Click on a cheese in the list. This will take us to the cheese detail page:

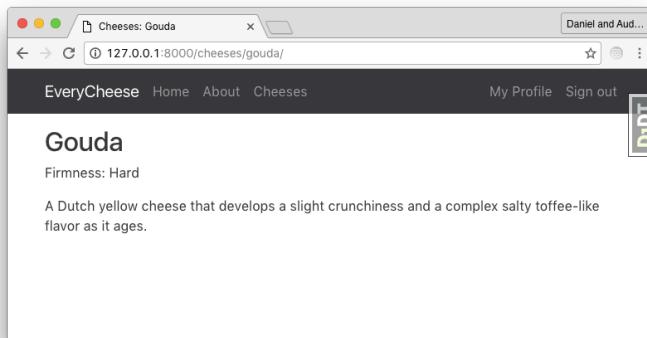


Figure 34: Cheese detail

Compare it to the template that we just filled in.

38.3 Commit Our Work

```
git add -A  
git commit -m "Implement cheese detail page"  
git push origin master
```

39 Where to Dip Class Based Views

Class-based views are great. But there's something about them that is very difficult to understand.

That is, most people don't know where to dip them. Fortunately, we're about to explain where CBVs should be dipped. Grab a large fondue pot and make some cheese-based fondue. Any cheese will do.

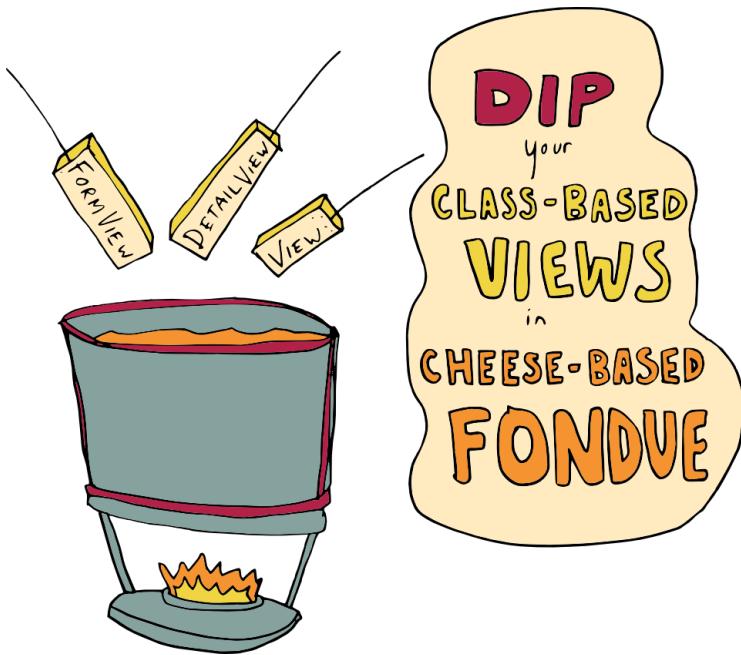


Figure 35: Dipping CBVs in fondue.

40 Writing Factories for Tests

It's fun to describe lots of cheeses. We've done it in tests, in the admin, and we'll be doing it through the course.

40.1 Produce Cheese Test Data From Factories

However, since we're building a real site, we're going to need real amounts of data. Hand coding cheeses and other things into our site works to some degree, but it doesn't let us test things in quantities of tens, hundred, or thousands.

What we're going to do instead is use a factory. One powered by `Factory Boy`, a third-party library included in the `django-crash-starter` library.

40.2 Define a `CheeseFactory`

Create a new module in our cheeses app's test directory for factories: `cheeses/tests/factories.py`

Place the following code inside:

```
from django.template.defaultfilters import slugify

import factory
import factory.fuzzy

from ..models import Cheese

class CheeseFactory(factory.django.DjangoModelFactory):
```

```
name = factory.fuzzy.FuzzyText()
slug = factory.LazyAttribute(lambda obj: slugify(obj.name))
description = factory.Faker(
    'paragraph', nb_sentences=3, variable_nb_sentences=True
)
firmness = factory.fuzzy.FuzzyChoice(
    [x[0] for x in Cheese.Firmness.choices]
)

class Meta:
    model = Cheese
```

CheeseFactory generates cheese objects (model instances). Think of it like `Cheese.objects.create()`, but where the cheese data is autogenerated.

Observe that:

- The `name` of the cheese is autogenerated using `FuzzyText()`.
- The `slug` of the cheese is the slugified version of the name.
- The cheese's `description` is a randomly-generated paragraph.
- The cheese's `firmness` is randomly selected from all possible firmness choices.

40.3 Try Out `CheeseFactory`

Let's go to `shell_plus` and try it out:

```
python manage.py shell_plus
```

In the shell, type this:

```
>>> from everycheese.cheeses.tests.factories import CheeseFactory  
>>> cheese = CheeseFactory()  
>>> cheese  
<Cheese: sGwDovpLpggc>
```

What's going on here:

1. We import the `CheeseFactory` class that we just defined.
2. We instantiate a `cheese` object named `cheese` using `CheeseFactory`.
3. We evaluate the `cheese` object.

When we evaluate that cheese, we get a funny result. That's no cheese title!

That's because what `CheeseFactory` did was create a cheese with random data. While that's no good for looking at, it's great for testing. We'll see shortly how to use factories in unit tests.

40.4 Delete the Bogus Cheese

Because we just created a random cheese with `CheeseFactory`, it now exists in the database. We can see that it's there by looking at the list of cheeses in the Django admin:

Go to the admin and delete the one bogus cheese from the list:

1. Select the checkbox to the left of the cheese.
2. Choose Action > **Delete selected cheeses**.
3. Click **Go**.

Now our database should only contain good cheeses.

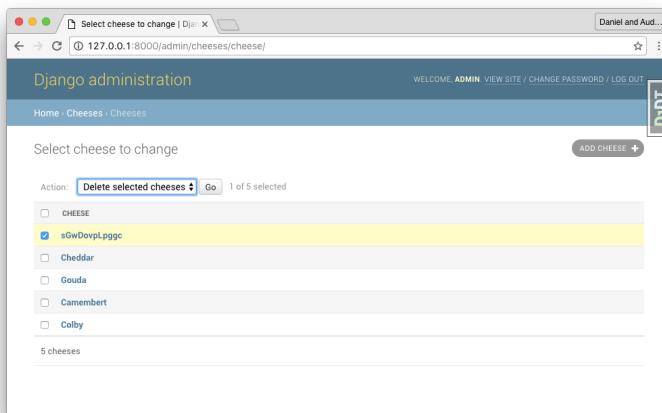


Figure 36: Django admin list of cheeses, including bogus cheese

40.5 Commit the Changes



All cheese is made in cheese factories

It is our understanding that in English, the term “Cheese Factory” means any place where cheese is made for non-personal use. In other words, cheese factories can mean giant mechanized facilities and small family-run kitchens. It’s important to remember that the word “factory” for making things predates the industrial revolution and has its roots in the Latin *facio*, and before that the *fakiō* of Proto-Italic and before that *θakjō* from Proto-Indo-European.

Let’s save our changes:

```
git status  
git add -A  
git commit -m "Add a cheese factory"  
git push origin master
```

41 Why Use Factories

Why are factories so great for unit testing?

41.1 Factories and Unit Testing

Well, suppose that for test purposes we wanted to create a new cheese record containing data for the following fields:

- `name`
- `slug`
- `description`
- `firmness`

For unit-testing purposes, we don't actually care if `name` is the name of a real cheese. Likewise, `description` can just be any random paragraph, and `firmness` can be any of the firmness choices that we defined in our `Cheese` model.

Here are 2 ways of creating our test cheese: 1. Call `Cheese.objects.create()` and pass in values for `name`, `description`, and `firmness` (`slug` will be autogenerated). 2. Call `CheeseFactory()` without passing in values (since they will all be autogenerated).

Let's compare both approaches.

41.2 Approach 1: Calling `create()`

First we'll create a Cheese via `Cheese.objects.create()`:

```
>>> cheese = Cheese.objects.create(  
... name="Stracchino",  
... description="Semi-sweet cheese that goes well with starches.",  
... firmness=Cheese.Firmness.SOFT,)  
>>> cheese  
<Cheese: Stracchino>
```

Here, we had to type out values for `name`, `description`, and `firmness` and pass them into `create()`. It took a few lines of code to define a cheese.

41.3 Approach 2: Calling `CheeseFactory()`

Now let's generate a cheese from the `CheeseFactory`. One... two... three...

```
>>> cheese = CheeseFactory()  
>>> cheese  
<Cheese: dEiwndWjefsq>
```

Here, we didn't have to explicitly pass values for `name`, `description`, or `firmness` into `CheeseFactory()`. That means:

1. We didn't have to look up the `Cheese` model definition to figure out how the fields were defined. That's a lot of mental overhead that we saved. We also reduced the risk of making mistakes during cheese creation.
2. Creating a cheese took 1 line of code instead of 4.

Factories like `CheeseFactory` are much more efficient and less error-prone to create test data with.

`CheeseFactory` doesn't create real cheeses unless you explicitly give it real values. For unit testing purposes, that's fine. For example, if you're testing that `cheese.__str__()` returns `cheese.name`, the test checks for equality only. It doesn't care whether `cheese.name` is a real cheese.

41.4 Other Uses

Besides unit testing, factories can be used in place of fixtures. For example, suppose you need to generate 5000 cheeses for local development purposes, to see how the site's UI behaves when it's well-populated with cheese data. You can call `CheeseFactory()` in a loop.

41.5 Learn More About Factory Boy

Our preference for testing factories, `Factory Boy` is a mature library used around the world in tens of thousands of projects. Here's more information about it:

- <https://factoryboy.readthedocs.io/>
- https://github.com/FactoryBoy/factory_boy

42 Using Factories in Tests

Let's apply what we covered in the previous chapter.

42.1 Passing in Field Values Explicitly

When using a factory, we can optionally specify the value of one of the fields. For example, try typing this in `shell_plus`:

```
>>> cheese = CheeseFactory(name="Sample Cheese From Factory")
>>> cheese
<Sample Cheese from Factory>
```

Here, we specify that we want the name of our new cheese to be *Sample Cheese From Factory*. But it could be any name we want. We pass the `name` argument into `CheeseFactory()` the same way we would normally pass it into `create()`.

42.2 Bulk Generation

Let's use this feature to generate a whole bunch of sample cheeses at once. Here we only create 10 cheeses, but it could be hundreds or more if we needed that many.

In `shell_plus`, type this:

```
>>> for x in range(10):
...     CheeseFactory(name=f"Sample Cheese {x}")
```

The names of the cheeses we created will be *Sample Cheese 1*, *Sample Cheese 2*, *Sample Cheese 3*, etc.

42.3 Reviewing Our Cheeses

In `shell_plus`, type this:

```
>>> Cheese.objects.all()
```

If we do this query on cheeses we get some interesting results:

- See all those new test cheeses? Ten more of them, all created by our `CheeseFactory`.
- Since we specified the `name` in the `CheeseFactory()` call, the cheeses have our desired names instead of being random characters.

42.4 Cheese Cleanup

Okay, it's time to clean up our database so we can move on to the next lesson. Let's delete the fake sample cheeses we just made.

```
>>> Cheese.objects.filter(name__startswith='Sample').delete()
```

If we prefer, we could delete the fake cheeses via the Django admin, as we did before. But if we had hundreds of cheeses, we'd see why deleting via the REPL can be nice. It would save us from clicking on pages and pages of cheese.

In this case, we created the cheeses manually by calling `CheeseFactory()` from the REPL. However, if we had called `CheeseFactory()` from a unit test, we wouldn't need to do this cleanup, as tests clean up the database for themselves. We'll now see how factories are used in unit tests.

42.5 Replacing the Direct Cheese Model Call in Our Existing Test

One of the tenets of good programming is that we're not supposed to repeat ourselves. If we have to describe building cheeses again and again, that's going to be a lot of repetition. And that's where factories come into play. They build test data for us.

Let's change up our test data set of cheese.

In `cheeses/tests/test_models.py` add this import right after where we imported the Cheese model (`from ..models import Cheese`):

```
from .factories import CheeseFactory
```

Then change this part where we created a cheese via `create()`:

```
cheese = Cheese.objects.create(  
    name="Stracchino",  
    description="Semi-sweet cheese that goes well with starches.",  
    firmness=Cheese.Firmness.SOFT,  
)
```

to this, where we now create a cheese via `CheeseFactory()`:

```
cheese = CheeseFactory(name="Stracchino")
```

Putting it all together, the test should look like this:

```
def test__str__():
    cheese = CheeseFactory(name="Stracchino")
    assert cheese.__str__() == "Stracchino"
    assert str(cheese) == "Stracchino"
```

Run the test and make sure it passes:

```
coverage run -m pytest
```

We should see this output:

```
coverage run -m pytest
<snip for brevity>
Test session starts
(platform: darwin, Python 3.8.1, pytest 5.3.4, pytest-sugar 0.9.2)
django: settings: config.settings.test (from option)
rootdir: /Users/drg/projects/everycheese, inifile: pytest.ini
plugins: sugar-0.9.2, django-3.8.0
collecting ...
everycheese/cheeses/tests/test_models.py √
everycheese/users/tests/test_forms.py √
everycheese/users/tests/test_models.py √
everycheese/users/tests/test_urls.py √√√
everycheese/users/tests/test_views.py √√√
```

42.6 Removing the Name Entirely

There's no need to specify the cheese's name. Replace the test with this:

```
def test__str__():
    cheese = CheeseFactory()
    assert cheese.__str__() == cheese.name
    assert str(cheese) == cheese.name
```

This is even better than what we had before because:

1. The code is even shorter.
2. Now we are validating that the value of `cheese.__str__()` and `str(cheese)` is equal to `cheese.name` rather than a hard-coded string.
3. The value of `cheese.name` is randomly generated every time we run the test. While in this example it doesn't matter too much, if we were testing a more complex method, we might discover occasional test failures due to improper Unicode or special character handling.

Run the test again and make sure it passes:

```
coverage run -m pytest
```

42.7 Commit Our Work

```
git add -A
git commit -m "Use CheeseFactory in a test"
git push origin master
```

42.8 Summary

A running theme of our course is finding safe ways to accelerate how fast we do things. Generating test data is one of the more time consuming parts of writing tests, and factories simply accelerate the process.

If we are uncomfortable with values the `CheeseFactory` stores in particular fields, we can change that by specifying field values during instantiation.

43 How Our Cheese Objects Feel About Your Tests

It's easy to think of our tests' cheese objects as merely testing data. But remember, even cheese objects have feelings. When a cheese object passes its tests, it beams proudly with joy and satisfaction.

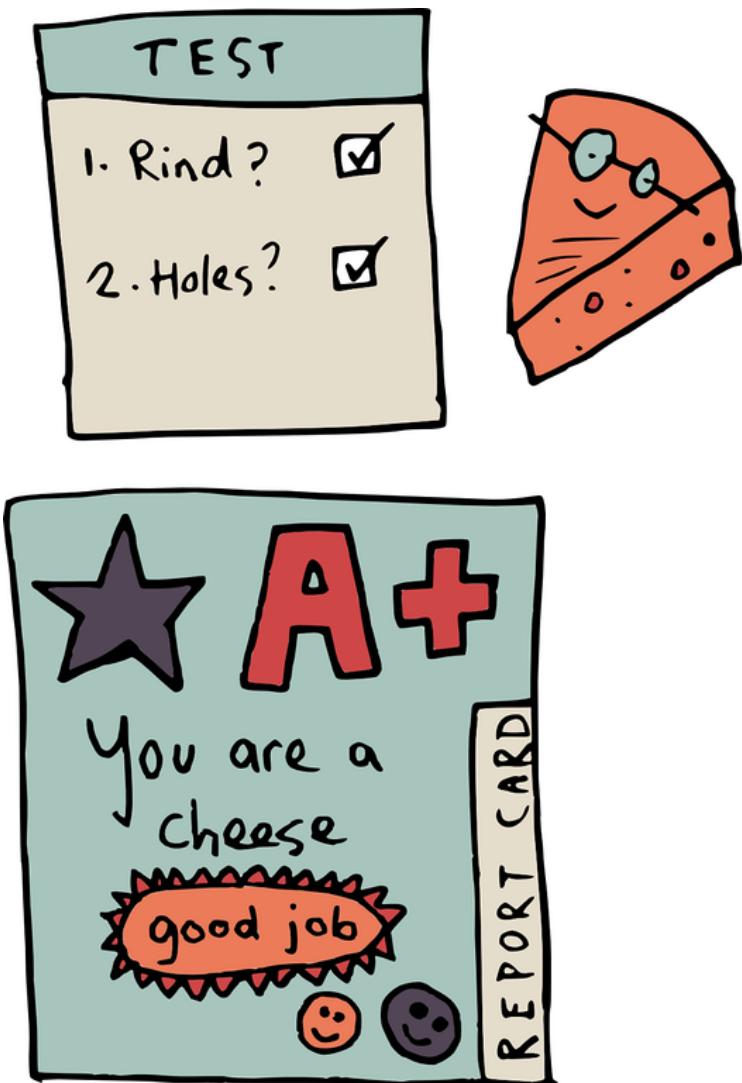


Figure 37: A good cheese that passed its test.

44 Finding and Adding a Third Party Countries App

We're going to make changes to our Cheese model.

It would be interesting to track where a cheese is from. There are different approaches we could take: tracking the country, region, city, etc. What makes this even more complicated is the fact that a cheese's country can be ambiguous: is it the country where the cheese originally was created, where the cheese is now produced, or where the cheese is available for purchase?

It's always good to limit scope and aim for simplicity, so we'll do the following:

- Add some sort of country field to the `Cheese` model.
- Limit it to the country where the cheese originally came from. That is, the cheese's country of origin.

44.1 Country of Origin

To be more explicit, let's call this field `country_of_origin`.

Let's now talk about the implementation.

To represent a cheese's `country_of_origin` value, here are some possible ways we could implement the field:

44.1.1 Option 1: Use a Plain `CharField`

The easiest way to implement the `country_of_origin` field would be to define it as a `CharField` like this:

```
country_of_origin = models.CharField(  
    "Country of Origin", max_length=255  
)
```

There's a big problem with this implementation, though. With a plain `CharField`, there are no constraints on what text we enter. We might accidentally enter `us` for one cheese and `USA` for another cheese. `us` is different from `USA` or `United States` in the database, making it challenging if we later decide to filter cheeses by country.

44.1.2 Option 2: Use a `CharField` With Choices

Another option would be to specify choices for the country like this:

```
country_of_origin = models.CharField(  
    "Country of Origin",  
    max_length=20,  
    choices=COUNTRY_CHOICES,  
    default=COUNTRY_UNSPECIFIED,  
)
```

Here, `COUNTRY_CHOICES` would be a list of all possible countries.

While this resolves the problem of having different strings representing the same country, there's still a big problem. It takes substantial work to create and maintain a list of countries. Every now and then, new countries form, countries that were split unite, and more.

We could reduce our burden by sticking to the ISO 3166-1²⁵ standard list of country names, but then we would still have to

²⁵ https://en.wikipedia.org/wiki/ISO_3166-1

keep the EveryCheese country list in sync with the ISO 3166-1 country list. We'd have to check it frequently and keep updating our code.

44.2 Benefiting From Open Source

Option 2 seems the best, but it's a substantial amount of work. Providing a list of country choices seems like such a common problem. For common problems like this, it's good to search for an open source solution before attempting to implement anything. Open source to the rescue!

44.3 Check Django Packages

First step, go to <https://djangopackages.org> and enter *countries* in the search bar. The top thing that comes up is a *grid*. Let's go there:

Scanning the list, we can see Django Countries, a popular package that might fit what we need. Let's do some analysis off the data Django Packages provides:

- Says it's **Production/Stable**.
- Has a good number of stars. This is a tricky value because popular does not always equate to quality.
- It's maintained and has a history of such.
- SmileyChris, aka Chris Beaven, a Django core team member, maintains it.

Yeah! Let's dive in!

44.4 Review Django Countries on GitHub

The instructions look nice and clear:

PACKAGE	DJANGO-CITIES	DJANGO-COUNTRIES	DJANGO-CITIES-LIGHT	DJANGO-AIRPORTS	DJANGO-GEO	NANO APPS	DJANGO-COUNTRIES	DJANGO-WORLD-BEGINS
Description	Countries and cities of the world for Django projects		A simple app providing three models: Country, Region and City model. Also provides a command to insert or update data ...	It's like django-cities, but django-airports	django application to manage administrative geographical info (country, city, region)	Does less! Loosely coupled mini-apps for django.		Simple Django app to group countries in world's regions.
Category	App	App	App	App	App	Framework	App	App

Figure 38: Django Packages' countries grid

44.5 Look for the Release Number on PyPI

Let's grab the version number so we can pin the dependency.

We prefix the name of the project with <https://pypi.org/project/> and check it in our browser thus: <https://pypi.org/project/django-countries>.

44.6 Install It

As usual, add the package and its version number to `requirements/base.txt`:

```
django-countries==6.0
```

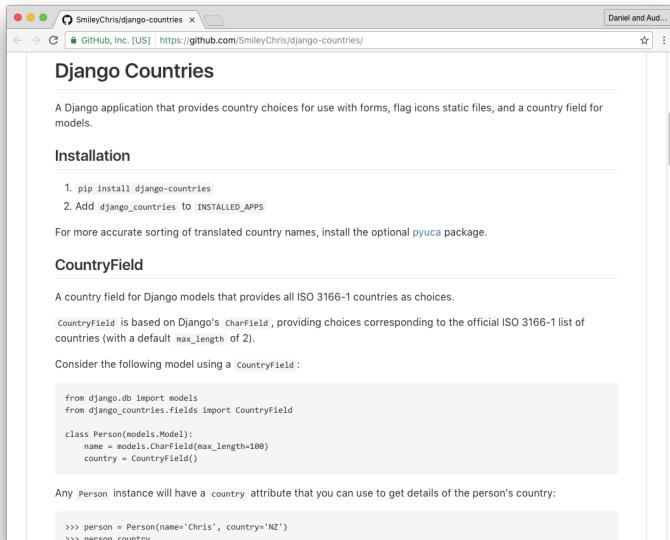


Figure 39: Django Countries README on GitHub

The reason we choose to add to the common `base.txt` is that we want the package installed in all environments: local, test, and production.

Then pip install the local requirements into our local virtualenv:

```
pip install -r requirements/local.txt
```

This does the same as if we had typed:

```
pip install django-countries==6.0
```

44.6.1 Don't Do This: Copy/Paste Installation

This is bad. Really bad. Don't do it!

1. git clone git@github.com:SmileyChris/django-countries.git
2. cd django-countries
3. mv django_countries > everycheese/everycheese

Don't do the above! Why this is bad:

- We've just lost ALL the advantages of open source. This is what's called a HARD fork.
- Getting code updates is MUCH harder
- Quick testing/reversion is MUCH harder
- Changes we make to our own Django Countries can/will cause breaking differences between implementations
- Makes handling upgrades or installing security patches MUCH harder

In summary, by cloning instead of extending we are hurting ourselves and whoever follows us in maintaining our projects. Be a good coder and stick to using package installers like `pip` instead of hard forks.

And now back to our normally scheduled EveryCheese lesson...

44.7 Implement in cheeses/models.py

Confident that we pip installed our `django-countries` requirement, we follow the instructions in <https://github.com/SmileyChris/django-countries>.

44.7.1 Installation

Add `django_countries` to `settings/base.py`'s `THIRD_PARTY_APPS` setting:

```
THIRD_PARTY_APPS = [
    ...
    "django_countries", # CountryField
]
```

44.7.2 Adding the Country Field to the Cheese Model

In `cheeses/models.py`, import `CountryField` and define `country_of_origin` like this:

```
from django_countries.fields import CountryField

class Cheese(TimeStampedModel):
    ...
    country_of_origin = CountryField(
        "Country of Origin", blank=True
    )
```

Since `CountryField` is an extension of `CharField`, we treat it similarly. We want `country_of_origin` to be optional, since it might be unknown for some cheeses, and so we set `blank=True`. But we don't set `null=True` because Django's convention is to store empty values as the empty string, and to retrieve NULL/empty values as the empty string. (See Two Scoops of Django for a more detailed explanation.)

44.8 Migrations!

The next stage is creating a database migration. From the command line:

```
python manage.py makemigrations cheeses
```

Apply the migration:

```
python manage.py migrate
```

45 Display Cheese Country Data

45.1 Add Cheese Countries in the Admin

Startup `runserver` if it's not already running.

Then go the Django admin. For each cheese, choose a **Country of Origin** and save our changes.

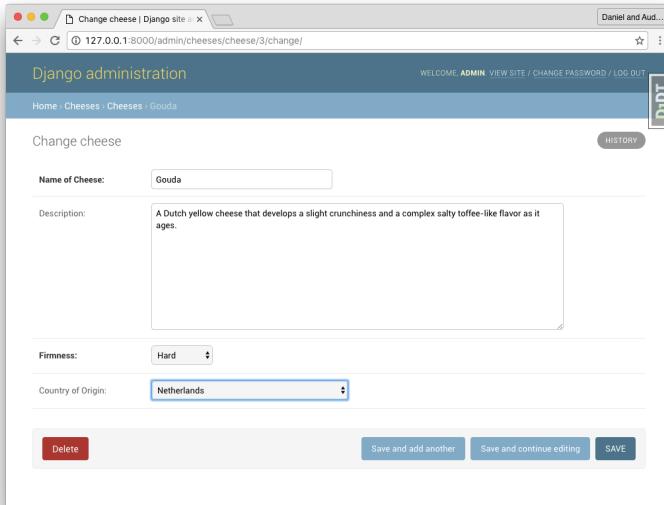


Figure 40: Cheese country data in the admin

The countries of origin are:

Cheese	Country of Origin
Cheddar	United Kingdom
Gouda	Netherlands

Cheese	Country of Origin
Camembert	France
Colby	United States of America

Now each cheese should have country data.

45.2 Display Country in Cheese Detail

At this point, the only place on the site where we can see Country of Origin data is in the Django admin. Let's change that by showing country data on the cheese detail pages.

Put this code into `templates/cheeses/cheese_detail.html` after the part where the cheese description is shown:

```
{% if cheese.country_of_origin %}  
    <p>Country of Origin: {{ cheese.country_of_origin.name }}  
      
    </p>  
{% endif %}
```

How this works:

1. As we did before with other fields, we check if the cheese has any value set for `country_of_origin` before even trying to display it.
2. Then we display the name of the country with `cheese.country_of_origin.name`. How did we know this would work? We found this usage example in the Django Countries documentation²⁶:

²⁶<https://github.com/SmileyChris/django-countries#countryfield>

```
>>> person.country.name  
'New Zealand'
```

Let's start up the server and see what we get. Voilà, we have cheese Country of Origin displayed.

45.3 Run the Tests

Let's run the tests in case anything broke:

```
coverage run -m pytest
```

The tests still pass:

```
Test session starts  
(platform: darwin, Python 3.8.1, pytest 5.3.4, pytest-sugar 0.9.2)  
django: settings: config.settings.test (from option)  
rootdir: /Users/drg/projects/everycheese, ini file: pytest.ini  
plugins: sugar-0.9.2, django-3.8.0  
everycheese/cheeses/tests/test_models.py ✓  
everycheese/users/tests/test_forms.py ✓  
everycheese/users/tests/test_models.py ✓  
everycheese/users/tests/test_urls.py ✓✓✓  
everycheese/users/tests/test_views.py ✓✓✓
```

45.4 Update `CheeseFactory`

Open the cheeses app's `factories.py`. Add this field to `CheeseFactory`:

```
country_of_origin = factory.Faker('country_code')
```

The Faker documentation for `faker.providers.address`²⁷ says that we can generate a fake country code like this:

```
>>> from faker import Faker  
>>> fake = Faker({'en-US': 1})  
>>> fake.country_code()  
# 'NI'
```

Translating that to actual usage on our project, we pass the function name string of `country_code` into `factory.Faker()` to get a randomly-selected country code. In future Django Crash Course extensions, we'll go over even more testing tricks that can be used with factories and the faker library.

45.5 Verify That `CheeseFactory` Works

Make sure that `CheeseFactory` still can generate cheeses, and that it sets `country_of_origin` to random countries correctly. Open `shell_plus` and type:

```
from everycheese.cheeses.tests.factories import CheeseFactory  
for i in range(5):  
    cheese = CheeseFactory()
```

Then go to the cheese list in the Django admin. Click on each random new cheese and make sure that it has a random country of origin.

When we're done, delete the new cheeses via the Django admin.

²⁷ <https://faker.readthedocs.io/en/master/providers/faker.providers.address.html>

45.6 Commit Our Work

```
git status  
git add -A  
git commit -m "Implement cheese country of origin"  
git push origin master
```

46 Implement Cheese Creation by Users

Right now only admins can add, edit, and delete cheese data.

But wouldn't it be nice if users who aren't admins could enter cheese data too? That would mean EveryCheese could gather content much faster.

That's the whole point of a user-generated content site: the admins don't have to write all the content themselves. User-generated content means trusting users to enter in real cheeses.

46.1 Add a Cheese Creation View

Open `cheeses/views.py` in our text editor. Remember, this is where we'll put all our cheese-related views.

We'll be using a `CreateView` to display a cheese creation form on the EveryCheese website. First, import the `CreateView` class at the top of the `views.py` module:

```
from django.views.generic import CreateView
```

Define a `CheeseCreateView` by subclassing `CreateView`:

```
class CheeseCreateView(CreateView):
    model = Cheese
```

Here we specify its model as `Cheese` because it will be used for creating `Cheese` objects.

46.2 Add the Corresponding URL Pattern

We want the URL of the cheese form page to be `/cheeses/add/`.

Therefore, add this URL pattern to `cheeses/urls.py` in the `urlpatterns` list:

```
path(
    route='add/',
    view=views.CheeseCreateView.as_view(),
    name='add'
),
```

Where should we add it? Well, let's first try adding it to the bottom, after `cheeseDetailView`. Put it there, start up `runserver` if needed, and then open our browser <http://127.0.0.1:8000/cheeses/add/>. We will see this:

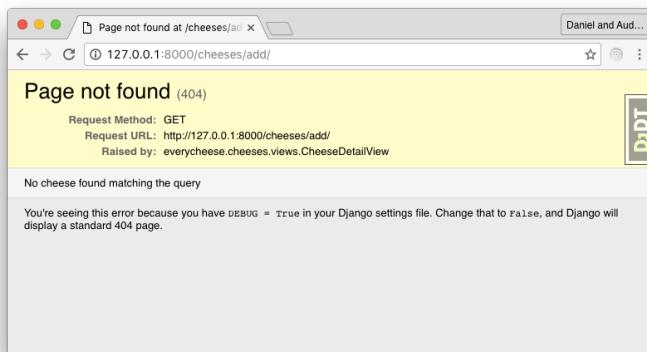


Figure 41: No cheese found!

Look closely at that page and note that it says:

Raised by: `everycheese.cheeses.views.CheeseDetailView`

Oddly enough, it looks like the URL is matching `CheeseDetailView` when it should be matching `CheeseCreateView`. Django thinks we're looking for the Cheese Detail page for a cheese with the slug of `add`.

Django tries each URL pattern in order until it finds a match. When it finds the first match, it calls the corresponding view.

Here the first match is `CheeseDetailView` because `add/` matches '`<slug:slug>/`'. Django never gets to the `CheeseCreateView` which comes next.

Look closely at `cheeses/urls.py` until we understand how this all works.

Then move the URL pattern for `CheeseCreateView` up before `CheeseDetailView`. Our code should now be:

```
from django.urls import path

from . import views

app_name = "cheeses"
urlpatterns = (
    path(
        route='!',
        view=views.CheeseListView.as_view(),
        name='list'
    ),
    path(
        route='add/',
        view=views.CheeseCreateView.as_view(),
        name='add'
    ),
)
```

```

path(
    route='<slug:slug>/',
    view=views.CheeseDetailView.as_view(),
    name='detail'
),
)

```

Return to our browser and refresh the page. We will see a new error:

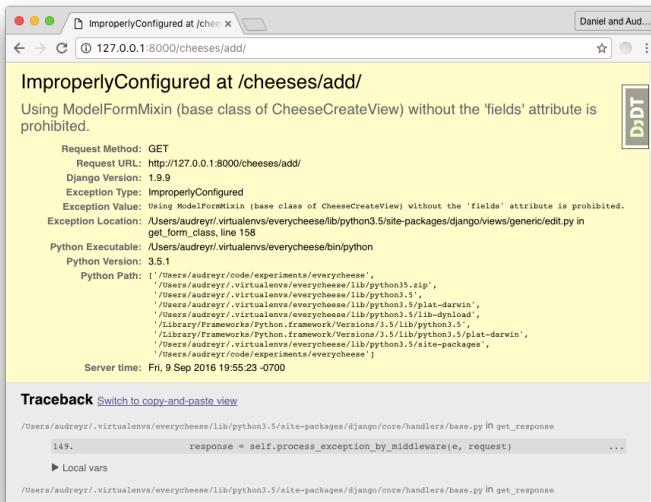


Figure 42: Need Fields Attribute

That's because when we use a `CreateView`, we need to specify a `fields` attribute.

46.3 Specify the Desired Form Fields

The `fields` attribute tells the `CreateView` which of the model's fields should appear on the form page.

Open `cheeses/models.py`. Take a look at our `Cheese` model. There are a number of fields. What do we want in the cheese creation form? The values a user should fill out for a cheese are:

- `name`
- `description`
- `firmness`
- `country_of_origin`

We don't want a user to enter a `slug`, because that should be automatically generated from the value of `name`. We also don't want a user to enter anything for the `created` and `modified` fields inherited from `TimeStampedModel` because those values are automatically taken care of for us.

Open `cheeses/views.py` again. Add this attribute to `CheeseCreateView`:

```
fields = [  
    'name',  
    'description',  
    'firmness',  
    'country_of_origin',  
]
```

Refresh the page in our browser. We should get a new error:

46.4 Define the Cheese Form Template

In `templates/cheeses/`, create a new file called `cheese_form.html`. Put this code inside:

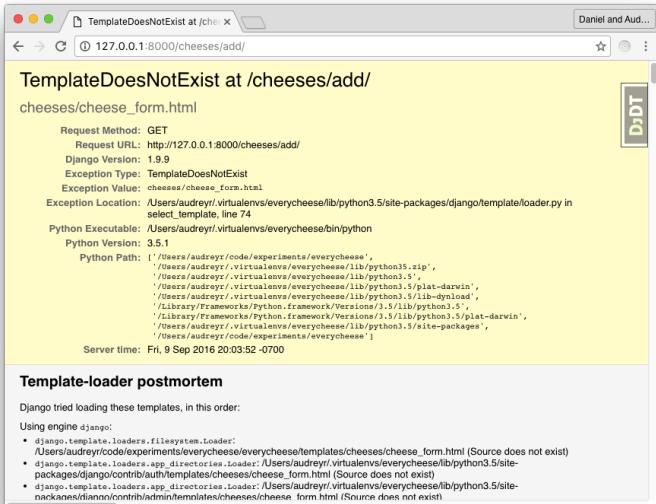


Figure 43: Cheese Form Template Does Not Exist

```

{% extends "base.html" %}

{% block title %}Add Cheese{% endblock title %}

{% block content %}
<h1>Add Cheese</h1>
<form method="post" action="{% url 'cheeses:add' %}">
    {% csrf_token %}
    {{ form.as_p }}
    <button type="submit" class="btn btn-primary">Save</button>
</form>
{% endblock content %}

```

Here's what's going on:

- Each item in the `fields` list is turned into the appropriate HTML label/input, as part of the form.
- Each label/input pair is displayed in a `<p>` element.
- When the user clicks Save, the form sends a POST request to the same URL with the form data.

46.5 Submit the Form

Save the file and go back to our browser. Refresh the page. We should now see the Add Cheese form:

Try entering a cheese:

- Name: Havarti
- Description: A mild, buttery cheese that comes in loaves or blocks.
- Firmness: Semi-Soft
- Country of Origin: Denmark

Click `Save`. Be forewarned as we're going to generate an error page:

46.6 Implement `get_absolute_url()`

Whenever we define a `CreateView`, we also need to define a `get_absolute_url()` method on the corresponding model if one doesn't exist yet.

Open `cheeses/models.py` in our text editor. Add the method to the `Cheese` class:

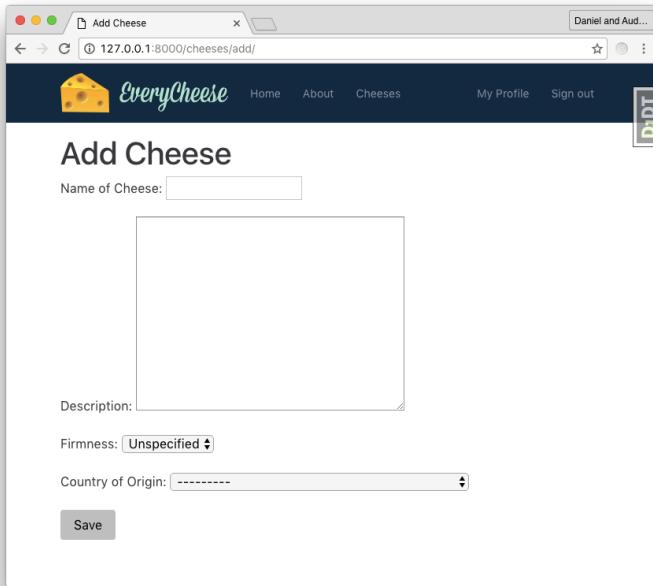


Figure 44: Add Cheese Form

```
def get_absolute_url(self):
    """Return absolute URL to the Cheese Detail page."""
    return reverse(
        'cheeses:detail', kwargs={"slug": self.slug}
    )
```

We'll also need to add an import to the top of `cheeses/models.py` to make this method work:

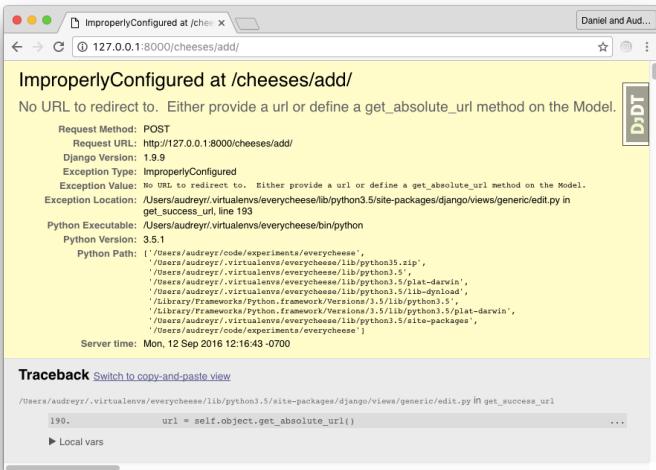


Figure 45: No URL to Redirect To

```
from django.urls import reverse
```

Now our `CheeseCreateView` will use this method. When a user fills out the Add Cheese form and submits the data, Django will create the cheese and redirect them to the Cheese Detail page for the cheese that they just created.

46.7 Resubmit the Form

Let's go back to our browser and resubmit the form:

The submission will go through. Then we'll be redirected to the Cheese Detail page for the cheese that we just created:

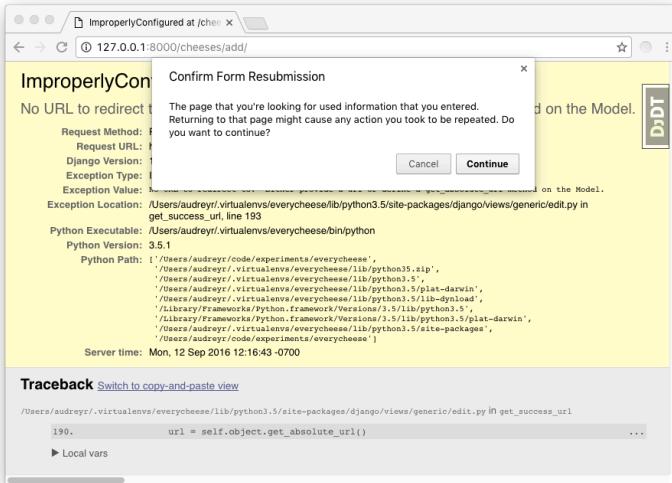


Figure 46: Resubmit Cheese

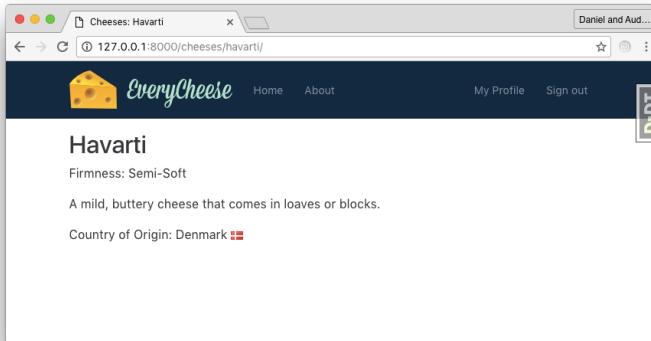


Figure 47: Cheese Detail for Havarti

Congrats! Our `CheeseCreateView` now lets users create new cheeses.

46.7.1 Troubleshooting Non-ASCII Names

This can occur when we enter a cheese with non-ascii characters like Κεφαλοτύρι and that generates this error: `django slug is defined before trying to ensure uniqueness.` This may occur if we created the `EveryCheese` project before February 20th, 2020.

If this happens, the solution is to install the `unidecode` library thus:

```
pip install unidecode==1.1.1
```

Don't forget to add the library to our project's requirements/base.txt file. Here's how it looks in the `django-crash-starter`:

https://github.com/feldroy/django-crash-starter/blob/master/%7B%7Bcookiecutter.project_slug%7D%7D/requirements/base.txt

46.8 Link to the Add Cheese Form

The form works, but users still need a way to get to it. Open `templates/cheeses/cheese_list.html` in our text editor and add this button link to the bottom of the page:

```
<hr/>
<p>Don't see a cheese listed here?</p>
<p>
    <a class="btn btn-primary"
        href="{% url 'cheeses:add' %}" role="button">
        Add Cheese
    </a>
</p>
```

Make sure we put the button inside of the `content` block, before
`{% endblock content %}`.

Now when we click on **Cheeses** in the navbar, we should see the button at the bottom of the page:

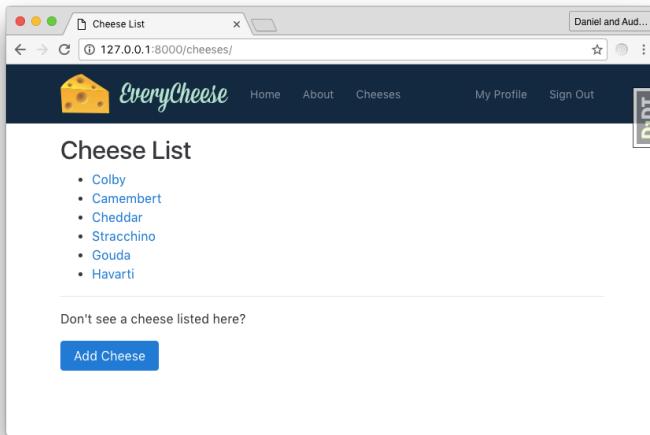


Figure 48: Cheese List With Add Cheese Button

Click on the button to make sure that it brings up the Add Cheese form.

46.9 Commit the Changes

We've done a lot this lesson. It's time to commit:

```
git status  
git add -A
```

```
git commit -m "First pass at working Add Cheese form"  
git push origin master
```

47 Use Django Crispy Forms for Better Display

If we're observant, we'll have noticed that the Add Cheese form controls aren't lined up properly.

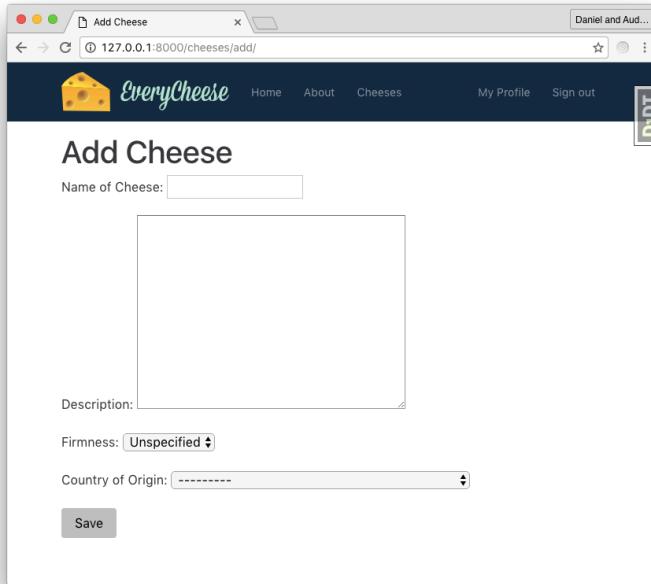


Figure 49: Cheese form with unstyled form fields

47.1 Isn't `as_p()` Enough?

Even if we use Django's built-in form display methods `as_p()`, `as_table()`, or `as_ul()`, there's no way to format the form so that

it uses Bootstrap's form styles properly.

47.2 A Quick History Lesson

Django started as a project in 2003, back when the internet was a lot simpler. Then it was enough for a form to work. It didn't have to be pixel-perfect. This was the time before HTML form UI toolkits like Bootstrap.

Flash forward to January of 2009. Daniel Feldroy, employed at NASA²⁸ at the time, was given a task. He had to convert around 70 Django forms from using `as_table()` to something that would match the Section 508 Web Content Accessibility Guidelines²⁹. Rather than convert them manually, which would be both tedious and error-prone, Daniel elected to write a custom template filter to do the work.

And thus was `django-uni-form`³⁰ born!

The project rapidly grew in features³¹. Over time support for formsets, custom layouts, and other features was added. The project increased in popularity³².

The code having grown organically had a few problems. Daniel and Miguel Araujo, the other major contributor at the time, began a rewrite. One issue was that the library only supported an obscure JavaScript/CSS library, and Bootstrap was becoming much more popular. Eventually Daniel decided to hand the project off to Miguel, who in accepting it took Audrey Feldroy's suggestion for a new form library name: `django-crispy-forms`³³.

And that is the superhero origin story for `django-crispy-forms`.

²⁸<https://www.nasa.gov/>

²⁹<https://www.section508.gov/create/web-content>

³⁰<https://pydanny.blogspot.com/2009/01/django-uni-form-lives.html>

³¹<https://pydanny.blogspot.com/2009/02/should-django-uni-form-handle.html>

³²<https://github.com/pydanny-archive/django-uni-form>

³³<https://github.com/maraujop/django-crispy-forms>

47.3 Crispy Forms and Cookiecutter Django

The django-crispy-forms package should have already been installed earlier when we installed all of django-crash-starter’s local requirements. Therefore, we don’t need to install it again.

django-crash-starter uses Crispy Forms to control the way forms are rendered in the *users* app. We’ll do something similar in the *cheeses* app.

47.4 Our Non-Crispy Form

This is the form that we’re about to change:

Right now form elements are rendered using `<p>` tags. That’s why they look so poorly aligned.

Once we modify it to use Crispy Forms, the fields will align nicely. That’s because by default, Crispy Forms renders form elements with Bootstrap-compatible HTML.

47.5 Use the `crispy` Template Tag

In our text editor, let’s open `templates/cheeses/cheese_form.html`.

Load the Crispy Forms template tags at the top of the template. Add this line right below `{% extends "base.html" %}`:

```
{% load crispy_forms_tags %}
```

Now the `crispy` tag is available for us to use in the template. Find this line:

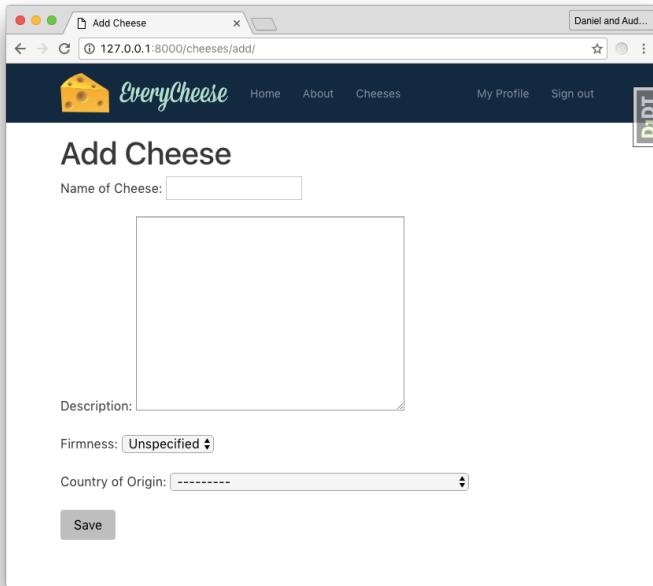


Figure 50: Add Cheese Form

```
 {{ form.as_p }}
```

And replace it with this line:

```
 {{ form|crispy }}
```

Now we are using the `crispy` filter.

Putting it all together, our code should now be:

```
{% extends "base.html" %}  
{% load crispy_forms_tags %}  
  
{% block title %}Add Cheese{% endblock title %}  
  
{% block content %}  
<h1>Add Cheese</h1>  
<form method="post" action="{% url 'cheeses:add' %}">  
    {% csrf_token %}  
    {{ form|crispy }}  
    <button type="submit" class="btn btn-primary">Save</button>  
</form>  
{% endblock content %}
```

47.6 Reload the Add Cheese Form

Let's go back to our browser and reload the **Add Cheese** form at <http://127.0.0.1:8000/cheeses/add/>. It should now look like this:

It looks much better.

Now the form is rendered with Bootstrap controls instead of `<p>` tags.

That's just the start of the power of Crispy Forms. There's so much more that we can do to make our forms render exactly how we want. Crispy Forms gives us fine-grained form rendering control.

47.7 Commit the Changes

Let's save our changes:

The screenshot shows a web browser window with the title "Add Cheese". The URL in the address bar is "127.0.0.1:8000/cheeses/add/". The page header includes the "EveryCheese" logo, navigation links for "Home", "About", "Cheeses", "My Profile", and "Sign out", and a "DDT" icon. The main content area is titled "Add Cheese" and contains the following form fields:

- Name of Cheese* (text input field)
- Description (text area)
- Firmness* (dropdown menu with option "Unspecified")
- Country of Origin (dropdown menu with option "-----")

A "Save" button is located at the bottom of the form.

Figure 51: Add Cheese Form, Rendered With Crispy Forms

```
git status
git add -A
git commit -m "Use django-crispy-forms for better Add Cheese form display"
git push origin master
```

48 Understand View Mixins and LoginRequiredMixin

In the previous chapter we made it possible for any user on EveryCheese to create new cheeses. But what happens when people use the **Add Cheese** form to enter fake data or spam the site?

48.1 User-Generated Content and Accountability

Inevitably, some users will try to mess with the site and enter in garbage data:

- People who are just trying out the site and don't know what to enter.
- Spammers adding links for SEO.

To control the creation of bogus cheeses, some level of accountability would help. We'll start by requiring users to be logged in when they create cheeses.

48.2 Try Accessing the Add Cheese Form Anonymously

Open a new private browser window:

- If we're using Chrome: **New Incognito Window**
- If Firefox: **New Private Window**

In the incognito/private browser window, let's go to our Add Cheese form: <http://127.0.0.1:8000/cheeses/add/>

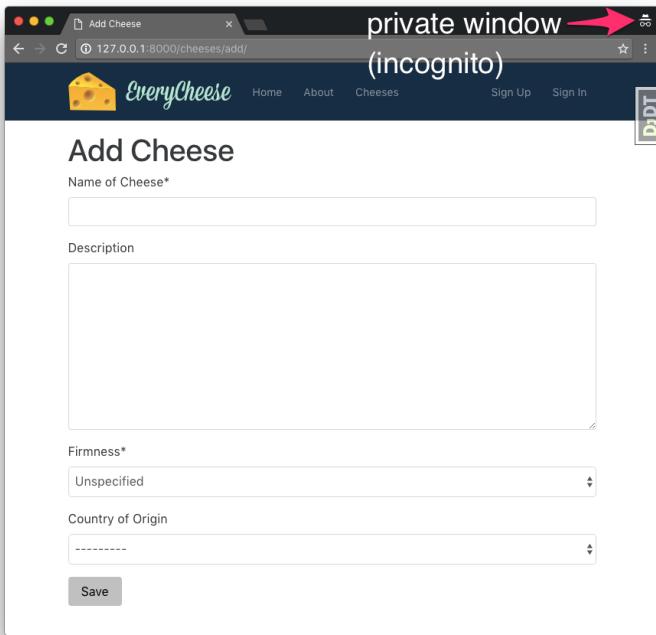


Figure 52: Add Cheese Form, As Anonymous User

Here are two important observations:

- In that window, we are not logged in.
- Yet we can access the Add Cheese form. That's bad.

48.3 Require Login

We're going to make the *Add Cheese* form accessible only to users who are logged into the site.

Open `cheeses/views.py` in our text editor.

At the top, add this import:

```
from django.contrib.auth.mixins import LoginRequiredMixin
```

Then modify `CheeseCreateView` to use `LoginRequiredMixin` like this:

```
class CheeseCreateView(LoginRequiredMixin, CreateView):
    ...
```

Now `CheeseCreateView` cannot be accessed unless we are logged into EveryCheese.

48.3.1 Try Accessing the Add Cheese Form Incognito

In our private (incognito) browser window, let's reload the Add Cheese form (<http://127.0.0.1:8000/cheeses/add/>).

We should now see this:

What happened?

- Because we were an anonymous user in that window, we were redirected to the login page.
- Note the URL in the address bar: <http://127.0.0.1:8000/accounts/login/?next=/cheeses/add/>
 - `/accounts/login/` is the standard login page.
 - The URL contains the parameter `next=/cheeses/add/`. That is the page that we will be redirected to after we log in.

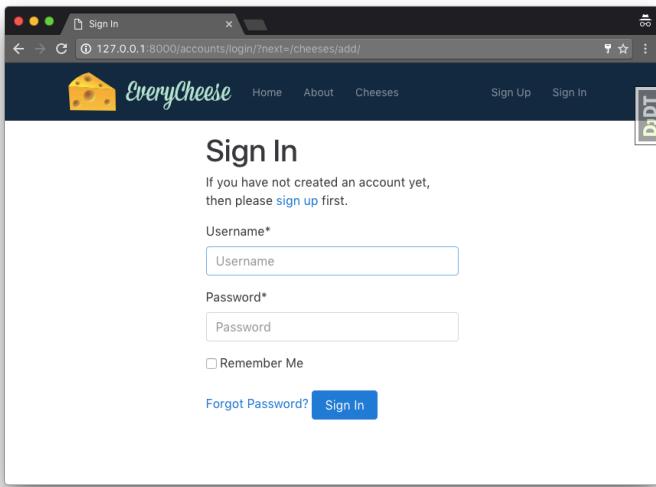


Figure 53: Incognito Redirect to Sign In Page

48.4 Try Accessing It as Cheesehead

Switch to the browser window where we are logged in as **cheesehead**.

Refresh the Add Cheese form page.

We should be able to access the form. That's because we are already logged in, so we can access that page normally.

48.5 View Mixins

Here we saw a common example of a **view mixin**. View mixins are used with class-based views. We use them by putting them to the left of the subclassed view name.

View mixins are frequently used to restrict access to a view.

Mixins seem very fancy, but they can be quite simple. A simple view mixin looks like this:

```
class MyMixin(object):
    def some_method(self):
        return self.something
```

If we were to use `MyMixin` in our `CheeseCreateView`, it would give `CheeseCreateView` a method called `some_method`.

48.6 Commit the Changes

Save our changes:

```
git status
git add -A
git commit -m "Constrain Add Cheese form to logged-in users only"
git push origin master
```

49 Add a Creator Field and Update Our Cheese Records

To increase accountability, we'll start tracking the creator of each cheese.

49.1 Add a Creator Field

Add the `creator` field to the `Cheese` model. Put this under the other field definitions but before the method declarations of `__str__` and `get_absolute_url`:

```
creator = models.ForeignKey(
    settings.AUTH_USER_MODEL,
    null=True,
    on_delete=models.SET_NULL
)
```

This field is a `ForeignKey` to a `User` object. In this case since we are defining a field and just need a string representation of the `User` model name, it's fine to import that string from `settings` rather than calling `get_user_model()`.

We'll also need to add this import to the top of the `cheeses/models.py` module:

```
from django.conf import settings
```

Remember to put it in the Django imports section, keeping that section organized alphabetically.

49.1.1 Explaining Foreign Keys

In relational databases, a foreign key is used to link two tables together. The first table has a field dedicated to tracking the key, which can only select amongst the rows of the second table. Selections cannot typically be made for rows not in the second table. This protects the integrity of data.

To use our own example, a cheese creator must be a user within the EveryCheese system. Our example also includes an `on_delete` action of `models.SET_NULL`, which means if the `user` selected as `creator` is deleted, the cheese is not deleted. Instead, the cheese record has a `null` value assigned to the creator. Other options used to protect the integrity of data might be to delete the cheese or assign it to a default “EveryCheese Master” record. It really depends on the business requirements for a project and how the data needs to be protected.

In summary, the idea that `foreign keys` are a critical part of the `relational in relational databases` is accurate and worth investigating:

- Django Docs on Foreign Keys: <http://bit.ly/django-db-models-ForeignKey>
- https://en.wikipedia.org/wiki/Foreign_key

49.2 Make and Apply the Migration

At the command-line run `migrate`, which will apply the migration that we just created and edited:

```
python manage.py makemigrations cheeses
python manage.py migrate
```

We don't want the new `creator` to ever be empty. It's a matter of data (and cheese) integrity. Once we run that, go into the Django shell with `python manage.py shell_plus`.

```
>>> cheesehead = User.objects.get(username='cheesehead')
>>> for cheese in Cheese.objects.all():
...     cheese.creator = cheesehead
...     cheese.save()
```

Now each `Cheese` record will have a `creator` field with the value set to the `cheesehead` user object. We can confirm this by checking cheese creators in either the Django admin or inside `shell_plus`. For example:

```
for cheese in Cheese.objects.all():
...     print(cheese, cheese.creator)
```

49.3 Commit the Changes

Let's save our changes:

```
git status
git add -A
git commit -m "Add creator to Cheese model and custom migration"
git push origin master
```

50 Track and Display the Cheese Creator

When a user submits a new cheese via the Add Cheese form, the `CheeseCreateView` will tie their `user` record to the new cheese that they created. That way if someone enters in bad data, we can go into the admin and warn or delete their account.

50.1 Set the Cheese Creator After Form Validation

The `creator` field shouldn't be shown on the Add Cheese form page. That would allow users to set it to whatever they want, which would be bad.

Instead, we want to automatically set the value of `creator`. A good place to do this is after the form data has been validated. We can override a `CreateView`'s `form_valid()` method to insert form data after validation occurs.

Open `cheeses/views.py` in our text editor. Add this `form_valid()` method to `CheeseCreateView`:

```
def form_valid(self, form):
    form.instance.creator = self.request.user
    return super().form_valid(form)
```

Here, the value of `creator` is set to the `user` object associated with the current request.

We can set `creator` programmatically *after* form validation because there's no need to validate the value of `creator`: it comes from our code, not from user input.

The finished view class should now look like this:

```
class CheeseCreateView(LoginRequiredMixin, CreateView):
    model = Cheese
    fields = ['name', 'description', 'firmness',
              'country_of_origin']

    def form_valid(self, form):
        form.instance.creator = self.request.user
        return super().form_valid(form)
```

50.2 Display the Creator on the Cheese Detail Pages

On the Cheese Detail page, we're going to display a bunch of info about the creator of the cheese:

- Their username
- Their name, if one exists in the database
- Their bio, if one exists in the database

Let's open `templates/cheeses/cheese_detail.html` in our text editor. At the bottom of the template, add a section containing info about who submitted the cheese:

```
<hr/>

<h3>Submitted by
  <a href="{% url 'users:detail' cheese.creator.username %}">
    {{ cheese.creator.username }}
  </a>
</h3>
{% if cheese.creator.name %}
```

```
<p>{{ cheese.creator.name }}</p>
{%- endif %}
```

Powered by `creator` foreign key to the `UserModel`, what we're providing:

- The creator's username
- A link to the creator's bio
- If they've filled it out, the creator's name

Inside of Django when we ask for information about the cheese creator it queries the user table for us. This is really useful, taking away the minutia of writing small queries.

50.3 Try It Out

Start `runserver` if it's not already running.

Go to any Cheese Detail page. Look at the bottom for info about who created the cheese.

While logged in as `cheesehead`, try adding a cheese:

- Name: Kesong Putî
- Description: A fresh, salty white cheese made from Philippine water buffalo milk.
- Firmness: Soft
- Country of Origin: Philippines

It's good to do this in order to ensure that our overridden `CheeseCreateView.form_valid()` is saving the current user as the cheese's creator.

Save the cheese. We should be redirected to the Cheese Detail page, which should have our `cheesehead` user as the creator.

EveryCheese Home About Cheeses My Profile Sign Out

Cheddar

Firmness: Hard

A relatively hard, pale yellow to off-white, and sometimes sharp-tasting cheese.

Country of Origin: United Kingdom 

Submitted by [cheesehead](#)

Cheesy Head

Figure 54: Cheese Detail With Creator

50.4 Commit the Changes

Save our changes:

```
git status  
git add -A  
git commit -m "Track and display the creator of each cheese"  
git push origin master
```

51 Update the Cheese Factory

Alright, we've made a number of code changes. We haven't run the tests in awhile, and there are probably tests that we need to update or write.

51.1 Run the Tests

Let's see what happens when we run the test suite:

```
coverage run -m pytest
```

The tests still pass. That doesn't mean that we're off the hook. We still have some changes to make.

51.2 Modify Cheese Factory

In VS Code, open `cheeses/tests/factories.py`. Study what we have so far in our `CheeseFactory` class. Notice that it doesn't set the value of `creator` anywhere.

To set `creator`, we'll need a `User` object. The easiest way to get one for our `CheeseFactory` is to create a `User` with `UserFactory`.

First, import `UserFactory` near the top of the `cheeses/tests/factories.py` module:

```
from everycheese.users.tests.factories import UserFactory
```

Then add this line to our `CheeseFactory` definition right underneath the `country_of_origin` definition:

```
creator = factory.SubFactory(UserFactory)
```

Now when we use `CheeseFactory` to create a `Cheese` instance, the cheese's creator will be a user created by `UserFactory`.

51.3 Run the Tests, Again

```
coverage run -m pytest
```

The tests should still pass.

51.4 Try `cheeseFactory` in the Shell

Okay, the tests passed. But how do we know that `CheeseFactory` is creating cheeses with creators properly? Well, we can see for ourselves in the shell.

Start up Shell Plus:

```
python manage.py shell_plus
```

Instantiate a `Cheese` object using `CheeseFactory`, and see what the value of `cheese.creator` is set to:

```
In [1]: from everycheese.cheeses.tests.factories import CheeseFactory
```

```
In [2]: cheese = CheeseFactory()
```

```
In [3]: cheese.creator  
Out[3]: <User: millsdustin>
```

As we can see, a `User` object was created with a username of `millsdustin`. Of course, the name of the user in this book might be different from what we get in our shell.

51.5 Delete the Random Cheese

Clean up by deleting the random cheese that we created:

```
In [4]: cheese.delete()  
Out[4]: (1, {'cheeses.Cheese': 1})
```

51.6 Delete the Random User

Clean up the random user as well:

```
In [5]: u = User.objects.last()  
  
In [6]: u  
Out[6]: <User: user-0>  
  
In [7]: u.delete()  
Out[7]:  
(1,  
 {'admin.LogEntry': 0,  
 'users.User_groups': 0,  
 'users.User_user_permissions': 0,  
 'users.User': 1})
```

We're done experimenting and cleaning up. Exit the shell with Ctrl+D.

51.7 Commit the Changes

Save our changes:

```
git status  
git add -A  
git commit -m "Modify cheese factory to create cheese creator user"  
git push origin master
```

52 Update the Cheese Model Tests

Open `cheeses/tests/test_models.py` in our text editor. We should have one test in there:

```
def test__str__():
    cheese = CheeseFactory()
    assert cheese.__str__() == cheese.name
```

Now look at `cheeses/models.py` to determine if any new model tests need to be written:

- `__str__()` has a test already.
- `get_absolute_url()` still needs a test.

52.1 Test `Get_absolute_url()`

Now we have a cheese ready to use in our next test. When we test `get_absolute_url()`, we want to call it and check that the result matches the expected absolute URL.

Suppose we have a cheese named *My Happy Cheese*. Its absolute URL should be `/cheeses/my-happy-cheese/`, using `cheese.slug` in the URL.

Add this test to the bottom of the `cheeses/test_models` module:

```
def test_get_absolute_url():
    cheese = CheeseFactory()
    url = cheese.get_absolute_url()
    assert url == f'/cheeses/{cheese.slug}/'
```

Run the cheese model tests:

```
coverage run -m pytest
```

All the tests should pass.

52.2 Commit the Changes

Let's save our changes:

```
git status  
git add -A  
git commit -m "Add test for get_absolute_url() method"  
git push origin master
```

53 Test All the Cheese Views

53.1 What to Test?

In a previous chapter, we added a `creator` field to the `Cheese` model which was a simple `ForeignKey`. This is just standard Django ORM usage. The Django core codebase already has tests for `ForeignKey`, so we don't need to test that.

There's no other new model code. If we had added any model methods, we would have to write tests for them.

We did define a new view: `CheeseCreateView` with a new URL pattern. It would be nice to test both of those, the view and the URL pattern. It's also a good idea to have basic tests on our other views and URL patterns for completeness.

53.2 Start With Imports

In our text editor, create `cheeses/tests/test_views.py`. This is where we'll be putting all our cheese view tests.

Let's import all the things we'll need for the tests. Put this at the top of the module:

```
import pytest
from pytest_django.asserts import assertContains

from django.urls import reverse
from django.contrib.sessions.middleware \
    import SessionMiddleware
from django.test import RequestFactory

from everycheese.users.models import User
```

```
from ..models import Cheese
from ..views import (
    CheeseCreateView,
    CheeseListView,
    CheeseDetailView
)
from .factories import CheeseFactory

pytestmark = pytest.mark.django_db
```

The first import is the pytest library. Then we import common utilities from Django. Finally, we import User and Cheese models and view from our EveryCheese project.

In this mix, we import the CheeseFactory so we can more easily write tests for cheese.

Finally, we set `pytestmark`, which connects our tests to the database.

53.3 The First Cheese View Tests

We like to start our tests by stubbing out a simple test function for each view. These stubs are a great place to start when you're not sure what view tests need to be written. All we'll do at first is check that the views are returning valid 200 HTTP status codes³⁴ for GET requests.

53.3.1 Testing the Cheese List

For the list view test, pass in the name string for the list view. That's `cheeses:list`. Add this test to `test_views.py` under the im-

³⁴<https://developer.mozilla.org/en-US/docs/Web/HTTP>Status/200>

ports. The test has been commented heavily so we know what's going on:

```
def test_good_cheese_list_view_expanded(rf):
    # Determine the URL
    url = reverse("cheeses:list")
    # rf is pytest shortcut to django.test.RequestFactory
    # We generate a request as if from a user accessing
    #   the cheese list view
    request = rf.get(url)
    # Call as_view() to make a callable object
    # callable_obj is analogous to a function-based view
    callable_obj = CheeseListView.as_view()
    # Pass in the request into the callable_obj to get an
    #   HTTP response served up by Django
    response = callable_obj(request)
    # Test that the HTTP response has 'Cheese List' in the
    #   HTML and has a 200 response code
    assertContains(response, 'Cheese List')
```

Try it out!

```
coverage run -m pytest
```



assertContains also checks HTTP Status

A more accurate name for the `assertContains` test case would be `assertContainsAndCheckStatus`. If we read the docs for `assertContains` we see it also confirms a 200 HTTP status code. For more details, reference the documentation on `assertContains` in <https://docs.djangoproject.com/en/3.1/topics/testing/tools/>.

Typically this test is written in much shorter format, but we expanded it as far as we could in order to understand exactly what's going on. Here's how this test is typically written:

```
def test_good_cheese_list_view rf:
    # Get the request
    request = rf.get(reverse("cheeses:list"))
    # Use the request to get the response
    response = CheeseListView.as_view()(request)
    # Test that the response is valid
    assertContains(response, 'Cheese List')
```

Let's try running tests again:

```
coverage run -m pytest
```

53.3.2 A Basic Cheese Detail Test

Similarly, we can test the CheeseDetailView by using CheeseFactory to generate some test data. Let's add this to our `test_views.py` module. Since individual cheeses have a URL based on their slug, our use of the `reverse()` function is expanded to use the cheese slug as an argument. We also pass in the cheese slug as part of the callable object. Here's what it looks like:

```
def test_good_cheese_detail_view rf:
    # Order some cheese from the CheeseFactory
    cheese = CheeseFactory()
    # Make a request for our new cheese
    url = reverse("cheeses:detail",
```

```
    kwargs={'slug': cheese.slug})  
request = rf.get(url)  
  
# Use the request to get the response  
callable_obj = CheeseDetailView.as_view()  
response = callable_obj(request, slug=cheese.slug)  
# Test that the response is valid  
assertContains(response, cheese.name)
```



Cheese doesn't have slugs

It goes without saying that Cheese doesn't have slugs. And when eating cheese, we advise against mixing it with slugs. There's a near-infinite selection of other things to mix with cheese. Indeed we suggest you start with more palatable options to partner with cheese.

Okay, enough about slugs, let's run the tests!

```
coverage run -m pytest
```

53.3.3 A Basic Cheese Create Test

The create view doesn't need a keyword argument. But it's a bit trickier because you can't access it unless you're logged in, due to the `LoginRequiredMixin` you used.

- You need to first set up a user so that you can log in as that user.
- In the test, the `admin_user` class provides an already authenticated user.

Add this test to `test_views.py`:

```
def test_good_cheese_create_view(rf, admin_user):
    # Order some cheese from the CheeseFactory
    cheese = CheeseFactory()
    # Make a request for our new cheese
    request = rf.get(reverse("cheeses:add"))
    # Add an authenticated user
    request.user = admin_user
    # Use the request to get the response
    response = CheeseCreateView.as_view()(request)
    # Test that the response is valid
    assert response.status_code == 200
```

Run the tests yet again:

```
coverage run -m pytest
```

At this point, we've stubbed out a test for each cheese view. That's a good start. These tests are better than nothing. But we can do better.

53.4 Really Test the Cheese List View

What does a list view do? It lists its associated objects. A good thing to test is whether the list view response contains a couple of object's names.

For that, we'll need to add a few kinds of cheese. Then look inside the Cheese List response and check that the names of the cheeses can be found.

```
def test_cheese_list_contains_2_cheeses(rf):
    # Let's create a couple cheeses
    cheese1 = CheeseFactory()
    cheese2 = CheeseFactory()
    # Create a request and then a response
    #   for a list of cheeses
    request = rf.get(reverse('cheeses:list'))
    response = CheeseListView.as_view()(request)
    # Assert that the response contains both cheese names
    #   in the template.
    assertContains(response, cheese1.name)
    assertContains(response, cheese2.name)
```

As always, run the tests:

```
coverage run -m pytest
```

53.5 Test the Cheese Detail View

A detail view shows detailed data for 1 object, in this case cheese. Let's write a test that checks the response contents:

```
def test_detail_contains_cheese_data(rf):
    cheese = CheeseFactory()
    # Make a request for our new cheese
    url = reverse("cheeses:detail",
                  kwargs={'slug': cheese.slug})
    request = rf.get(url)
    # Use the request to get the response
    callable_obj = CheeseDetailView.as_view()
    response = callable_obj(request, slug=cheese.slug)
```

```
# Let's test our Cheesy details!
assertContains(response, cheese.name)
assertContains(response, cheese.get_firmness_display())
assertContains(response, cheese.country_of_origin.name)
```

Run the tests again:

```
coverage run -m pytest
```

53.6 Test the Cheese Create View

A create view should create an object correctly. Upon POST, `CheeseCreateView` should redirect to the detail page for the created cheese. The creator of that cheese should be the user who was logged in and submitted the cheese.

We can test for this as follows:

```
def test_cheese_create_form_valid(rf, admin_user):
    # Submit the cheese add form
    form_data = {
        "name": "Paski Sir",
        "description": "A salty hard cheese",
        "firmness": Cheese.Firmness.HARD
    }
    request = rf.post(reverse("cheeses:add"), form_data)
    request.user = admin_user
    response = CheeseCreateView.as_view()(request)

    # Get the cheese based on the name
    cheese = Cheese.objects.get(name="Paski Sir")
```

```
# Test that the cheese matches our form
assert cheese.description == "A salty hard cheese"
assert cheese.firmness == Cheese.Firmness.HARD
assert cheese.creator == admin_user
```

Run the tests:

```
coverage run -m pytest
```

53.7 Commit the Changes

Let's save our changes:

```
git status
git add -A
git commit -m "Write tests for all cheese views"
git push origin master
```

53.8 Conclusion

In this chapter we wrote a bunch of tests, some to increase test coverage, and others to ensure that code already covered had more accurate tests. In other words, we added depth to our tests.

Keep in mind that 100% test coverage is only as meaningful as the tests that cover the code. It is possible to write meaningless tests that increase test coverage of code but don't account for checking the validity of the results of that code.

For example, while we came into this chapter with the code for the cheese list and detail views list at 100% coverage, whether or not cheese data showed up in their templates was not yet checked. We addressed that in this chapter, adding depth to our tests.

Keep in mind we're not necessarily done. It may not be obvious yet, but there are ways we can improve the tests in this chapter. It's not uncommon for experienced coders to come back to tests they wrote years, months, weeks, or even days earlier and find ways they could make them better.

And that's okay. it's just the nature of being a software developer writing tests.

54 Test All the Cheese URL Patterns

We like to test each of our URL patterns. Regular expressions can be error-prone. It's nice to have tests in place just to verify that they behave as expected.

54.1 Add the Imported Cheese

Create the module `cheeses/tests/test_urls.py`. Import `reverse` and `resolve` from `django.urls`, which we'll need to test URL patterns backwards and forwards:

```
import pytest

from django.urls import reverse, resolve

from .factories import CheeseFactory

pytestmark = pytest.mark.django_db
```

54.2 Write Our First Fixture

In this chapter we're going to need an instantiated cheese a few times. Rather than write `cheese = CheeseFactory()` in each test function, we're going to create a test fixture. It's quite easy to do, just put this underneath the imports:

```
@pytest.fixture
def cheese():
    return CheeseFactory()
```

We'll use this later in this chapter.

54.3 Test the Cheese List URL Pattern

When we test URL patterns, it's good to test them backwards and forwards:

- Reversing the view name should give us the absolute URL.
- Resolving the absolute URL should give us the view name.

Applying these concepts to testing the cheese list URL pattern, add the following to `test_urls.py`:

```
def test_list_reverse():
    """cheeses:list should reverse to /cheeses/. """
    assert reverse('cheeses:list') == '/cheeses/'

def test_list_resolve():
    """/cheeses/ should resolve to cheeses:list. """
    assert resolve('/cheeses/').view_name == 'cheeses:list'
```

Run the tests again:

```
coverage run -m pytest
```

What we like about writing these tests is that it provides us more than just proof that we have good URLs, and protects us from supplying “404 page not found” errors to users. Specifically, it helps us understand how Django resolves URLs.

54.4 Test the Add Cheese URL Pattern

The tests for the add cheese URL pattern are very similar to those for the cheese list. That's because for both URL patterns there are no slugs, primary keys, or other arguments to pass in.

Add these tests to `test_urls.py`:

```
def test_add_reverse():
    """'cheeses:add' should reverse to /cheeses/add/."""
    assert reverse('cheeses:add') == '/cheeses/add/'

def test_add_resolve():
    """'/cheeses/add/' should resolve to cheeses:add."""
    assert resolve('/cheeses/add/').view_name == 'cheeses:add'
```

Run the cheese URL tests:

```
coverage run -m pytest
```

54.5 Test the Cheese Detail URL Pattern

Here's where things get slightly fancier. The cheese detail URL pattern takes in a cheese slug. Remember how we created a cheese fixture earlier for testing purposes? Now's the time to use it. We just include it as the argument in the test functions.

Add these tests to `cheeses/tests/test_urls.py`:

```
def test_detail_reverse(cheese):
    """'cheeses:detail' should reverse to /cheeses/cheeseslug/."""
    url = reverse('cheeses:detail',
                  kwargs={'slug': cheese.slug})
    assert url == f'/cheeses/{cheese.slug}/'

def test_detail_resolve(cheese):
    """'/cheeses/cheeseslug/' should resolve to cheeses:detail."""
    pass
```

```
url = f'/cheeses/{cheese.slug}/'  
assert resolve(url).view_name == 'cheeses:detail'
```

Run the cheese URL tests:

```
coverage run -m pytest
```

Remember in the previous chapter when we used the `rf` and `admin_user` arguments in our test functions? Those were fixtures just like our new `cheese` fixture.

In any case, we've tested all our cheese URL patterns. That wasn't so bad. URL patterns are relatively simple to test.

54.6 Commit the Changes

Let's save our changes:

```
git status  
git add -A  
git commit -m "Write tests for all cheese URL patterns"  
git push origin master
```

55 Adding a CheeseUpdateView and Form Recycling

So far, EveryCheese has a way to create new cheeses. However, it lacks a way for end-users to update existing cheeses. If we're a regular user entering a new cheese and we make a mistake, we have no way to fix it.

In this chapter, we're going to add an update view to the cheeses app.

55.1 Add the CheeseUpdateView

The first step is to go to `cheeses/views.py` and import the generic `UpdateView` class. We can combine this import with the existing imports:

```
from django.views.generic import (
    ListView,
    DetailView,
    CreateView,
    UpdateView
)
```

At the bottom of the file, define `CheeseUpdateView`:

```
class CheeseUpdateView(UpdateView):
    model = Cheese
    fields = [
        'name',
        'description',
        'firmness',
```

```
        'country_of_origin'  
    ]  
    action = "Update"
```

Notice how the definition is very similar to that of `cheeseCreateView`.

55.2 Wire in the URL Pattern

Add the following URL pattern to `cheeses/urls.py`. We can put it before the `detail` and after the `add` views:

```
path(  
    route='<slug:slug>/update/',  
    view=views.CheeseUpdateView.as_view(),  
    name='update'  
) ,
```

The route here is equivalent to that of the `CheeseDetailView` plus `update/` at the end.

55.3 Try It in the Browser

Start `runserver` if it's not already running.

Go back to the browser. From the cheese list, click on any cheese to go to its cheese detail page. Then add `update/` to the end of the URL and load the page.

That should bring up the Add Cheese form. The difference from before is that the form fields should already be populated with data:

The screenshot shows a web browser window with the title 'Add Cheese'. The URL in the address bar is '127.0.0.1:8000/cheeses/havarti/update/'. The page has a header with the logo 'EveryCheese' and navigation links for Home, About, Cheeses, My Profile, and Sign Out. A small 'DDT' icon is in the top right corner. The main content area is titled 'Add Cheese'. It contains fields for 'Name of Cheese*' (Havarti), 'Description' (A mild, buttery cheese that comes in loaves or blocks.), 'Firmness*' (Semi-Soft), and 'Country of Origin' (Denmark). A 'Save' button is at the bottom.

Figure 55: Pre-populated Add Cheese Form

Try making a change to the description and country of origin. Save the changes.

We should see our changes reflected in the cheese detail page. Great! Right?

However, check the URL bar we'll notice something weird. The slug has a “-2” appended to it.

Even more noticeable is that if we go to <http://127.0.0.1:8000/>

`cheeses/` we can see that there are now 2 kinds of cheese with that name. What just happened?!?

55.4 What Happened?!?

By default, both `CheesecreateView` and `Cheeseupdateview` share the same `cheese_form.html` template.

The problem is that our current `cheese_form.html` always sends the user to the `CheesecreateView`, even if we're doing it from the `Cheeseupdateview`.

Let's fix that, making the form template flexible enough to handle both `CheesecreateView` and `Cheeseupdateview` views. Open `templates/cheeses/cheese_form.html` in your text editor.

55.4.1 Using View Properties In Templates

Right now the `h1` element of `templates/cheeses/cheese_form.html` and the form button are hardcoded as:

```
<h1>Add Cheese</h1>
...
<button type="submit" class="btn btn-primary">Save</button>
```

This makes the form confusing because adding cheese isn't the same as updating cheese. Let's fix it by replace the current code in `{% block content %}` with the following more flexible approach:

```
{% block content %}
{% with action=view.action|default:"Add" %}
  <h1>{{ action }} Cheese</h1>
```

```
<form method="post" action="{% url 'cheeses:add' %}">
    {% csrf_token %}
    {{ form|crispy }}
    <button type="submit" class="btn btn-primary">{{ action }}</button>
</form>
{% endwith %}
{% endblock content %}
```

Let's break down what we just did:

1. We used the Django template tag `{% with %}` to set the `view.action` view method under the simpler name of `action`, and default it to "Add". This only lasts for the duration of the request, and can only be used within one code block.
2. We used the `action` variable in both the `h1` and `submit` `form`.

If we refresh the page, we'll see that the `Add` is gone and replaced by `Update`. So where did the `view.action` variable come from? Let's dig in and find out!

1. In the section above titled [Add the CheeseUpdateView](#), the `CheeseUpdateView` included a property called `action` and was set with the value of "Update".
2. Inside a template rendered by a view, we can call attributes and properties of the view, referencing it under the easily remembered object name of `view`.
3. The `action` attribute of the view specifies what we are doing. Because we used clear language, it's not just easier to debug, we can use it as a internationalizable value in our project.

55.4.2 Smart Titling

Right now the title element of `templates/cheeses/cheese_form.html` is hardcoded as:

```
{% block title %}Add Cheese{% endblock title %}
```

Let's make it a more flexible title by leveraging in the `view.action` property. In our template, change the title block to be:

```
{% block title %}{{ view.action|default:"Add" }} Cheese{% endblock title %}
```

We just removed the word `Add` with `{{ view.action }}`, which calls the `action` property on the view used in a request. Refresh the page and if we check the browser tab the title of the page has changed.



Why didn't we wrap the whole page in `with`?

Unfortunately, Django's `{% with %}` template tag doesn't work across template blocks.

55.4.3 Form Posting to Itself

Right now the form method and action are defined as:

```
<form method="post" action="{% url 'cheeses:add' %}">
```

Using `action="."` as below is a commonly-used trick to reuse a form template for both create and update views. Replace the above with:

```
<form method="post" action="."> >
```

Now the form page posts to itself in both cases, eliminating the need to create 2 forms with hardcoded actions.

55.5 Link to the Update Form

It would be nice if every cheese detail page had an Update button, with the button going to the update form for the cheese.

Open `templates/cheeses/cheese_detail.html` in your text editor. Right below the page title, add a button link to the cheese detail form:

```
<p>
  <a class="btn btn-primary"
     href="{% url 'cheeses:update' cheese.slug %}"
     role="button">
    Update
  </a>
</p>
```

55.6 Try It in the Browser

Go to the Cheese Detail page for any cheese.

Click Update to make changes to a cheese. Then see what happens. Compare this with creating a cheese.

55.7 Make Login Required

Earlier we imported `LoginRequiredMixin` so that we could use it in `CheeseCreateView`. Add it to `CheeseUpdateView` as well:

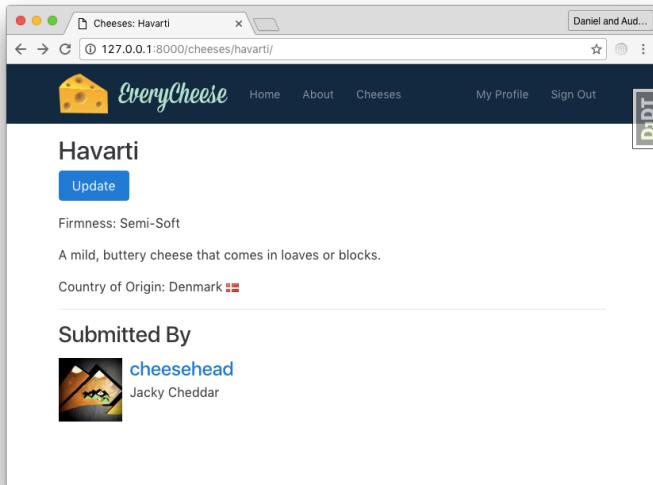


Figure 56: Cheese Detail With Update Button

```
class CheeseUpdateView(LoginRequiredMixin, UpdateView):
```

Order matters here with multiple inheritance. Make sure it's put to the left of `UpdateView`.

This will prevent anonymous users from modifying existing cheeses.

55.8 Commit the Changes

Finally, we save our work:

```
git status  
git add -A  
git commit -m "Add cheese update view, modify template"  
git push origin master
```

56 Test the Cheese Forms and Update View

We've implemented a `CheeseUpdateView`, and we've made changes to the `cheese_form.html` template used by both `CheeseCreateView` and `CheeseUpdateView`. Now's a good time to check on the tests and write more.

56.1 Refactoring our Cheese Fixture

Before we add more tests, let's do some refactoring. The cheese fixture that we created in the last chapter was so useful, let's add it to other Cheesy tests.

To do this, open up `cheeses/tests/factories.py` and under the other imports at the top bring in the `pytest` library. Also, copy in the cheese fixture:

```
import pytest

@pytest.fixture
def cheese():
    return CheeseFactory()
```

Now, let's open up `cheeses/tests/test_views.py` and bring our new cheese fixture. We'll do it by importing the cheese fixture right after `CheeseFactory` import. That means we should have a line like this at the top of the module:

```
from .factories import CheeseFactory, cheese
```

Once that's in place, in `cheeses/tests/test_views.py` find the test function named `test_good_cheese_detail_view`. Change the top three lines from this:

```
def test_good_cheese_detail_view(rf):
    # Order some cheese from the CheeseFactory
    cheese = CheeseFactory()
```

to this, where a `cheese` argument has been added to the function and the call to `CheeseFactory` has been removed:

```
def test_good_cheese_detail_view(rf, cheese):
    # Order some cheese from the CheeseFactory
```

Now run the tests again:

```
coverage run -m pytest
```

All tests should pass. Not only that, but we've reduced line count and added clarity to the tests. Yeah!

Now, with the exception of `test_cheese_list_contains_2_cheeses`, which needs two cheeses to function, go and change the other tests in `cheeses/tests/test_views.py`.

56.2 Test the Add Cheese Page Title

Since we added an if/else block to the page title in `cheese_form.html`, it's good to test that both branches work.

Add this test to `cheeses/tests/test_views.py`:

```
def test_cheese_create_correct_title(rf, admin_user):
    """Page title for CheeseCreateView should be Add Cheese."""
    request = rf.get(reverse('cheeses:add'))
    request.user = admin_user
    response = CheeseCreateView.as_view()(request)
    assertContains(response, 'Add Cheese')
```

This test checks that the web page corresponding to `CheeseCreateView` contains the string `Add Cheese`.

56.3 Test That `CheeseUpdateView` Is a Good View

So we can test it, add `CheeseUpdateView` to the imports:

```
from ..views import (
    CheeseCreateView,
    CheeseListView,
    CheeseDetailView,
    CheeseUpdateView
)
```

Then, following the same pattern established in previous chapters, we start testing `CheeseUpdateView`. We define a test case in `test_views.py`, comment it extensively, and call it `test_good_cheese_update_view()`.

```
def test_good_cheese_update_view(rf, admin_user, cheese):
    url = reverse("cheeses:update",
                  kwargs={'slug': cheese.slug})
    # Make a request for our new cheese
```

```
request = rf.get(url)
# Add an authenticated user
request.user = admin_user
# Use the request to get the response
callable_obj = CheeseUpdateView.as_view()
response = callable_obj(request, slug=cheese.slug)
# Test that the response is valid
assertContains(response, "Update Cheese")
```

Again, `test_good_cheese_update_view()` is just a start. It gives us some peace of mind, especially as EveryCheese grows in new and unexpected directions.

56.4 Test That a Cheese Updates Correctly

Remember, the point of `CheeseUpdateView` is to give us a form page for modifying cheeses that already exist in the database.

A good thing to test is whether we can send a POST request to `CheeseUpdateView` with data modifying an existing cheese. Add this test to `test_views.py` module:

```
def test_cheese_update(rf, admin_user, cheese):
    """POST request to CheeseUpdateView updates a cheese
    and redirects.

    """
    # Make a request for our new cheese
    form_data = {
        'name': cheese.name,
        'description': 'Something new',
        'firmness': cheese.firmness
    }
    url = reverse("cheeses:update",
```

```
    kwargs={'slug': cheese.slug})
request = rf.post(url, form_data)
request.user = admin_user
callable_obj = CheeseUpdateView.as_view()
response = callable_obj(request, slug=cheese.slug)

# Check that the cheese has been changed
cheese.refresh_from_db()
assert cheese.description == 'Something new'
```

Notice how we call `refresh_from_db()` to update the `cheese` instance with the latest values from the database. This is needed because the database was modified, the old `cheese` object is stale until refreshed.

56.5 Commit the Changes

It's time to save our changes:

```
git status
git add -A
git commit -m "Test the cheese forms and update view"
git push origin master
```

57 EveryCheese is the Foundation!

Congratulations! We've reached the end of the tutorial part of this book, but this isn't the end for `EveryCheese`. After the summary below, this chapter includes [Next Steps After This Book](#).

The `EveryCheese` project is built off solid Django principles, the same ones that we've espoused in our **Two Scoops of Django** book series for over seven years. Like the `hellodjango` project, we recommend keeping `EveryCheese` as a reference project to see how to write tests, modify views, use choices fields, and other techniques used in production Django projects.

57.1 Summary

We started with a deployable project by using the `django-crash-starter` Cookiecutter template. We installed dependencies, created a database, and started up Django's development server. Then we saved our progress using `git`.

Next, we explored authentication and the `user` model. We expanded upon the `user` model by adding a `bio` field. Then we learned about tests and test coverage.

Now we got into the cheesiness of things. We created a Cheeses app and a Cheese model. We generated the model migration and executed it, creating a table in our database. And we began writing our tests.

From here we expanded on our cheese model and began adding views so users could start adding their favorite cheeses. Working with views meant learning about controlling access to views, adding links, buttons, multi-use templates, and third-party packages like `django-countries` and `django-crispy-forms`.

Throughout all of this, we reinforced the idea of writing easily understood function-based tests powered by `pytest`. That came

with more knowledge about useful project ingredients like test factories and `pytest` fixtures.

Speaking of project ingredients, for sample data we mentioned delicious cheeses from around the world.

57.2 Next Steps After This Book

This isn't the end for `EveryCheese!` In the weeks and months to come, we're going to be releasing **Django Crash Course Extensions**, all of which will use `EveryCheese` as the foundation.

Rather than write a **HUGE** tutorial book off what we think our readers want, we're writing a series of "micro-books" starting at US\$2.99 based on the material we've taught based on previous customer requests. This allows readers to pick and choose what they want to learn. Here are some extensions we are considering:

- Individual deployment/optimization extensions for AWS, Azure, *GCP*, and Heroku
- VueJS
- React*
- Django REST Framework
- GraphQL
- Async, ASGI, and Channels
- Celery
- Payment gateways like Stripe, Paddle, and PayPal

If you're interested in helping us write any of the extensions listed above or have suggestions for ones you would like to write, we pay authors a generous 50% royalties for books published by us. While we reserve the right to determine what we publish, we do promise to seriously consider every submission. Contact us at hi@feldroy.com³⁵.

³⁵ <mailto:hi@feldroy.com>

57.3 Tutorial Books by Other Authors

Right now most tutorial books do not support Django 3. The exception is Will Vincent's excellent efforts, which you can find at <https://wsvincent.com/books/>.

57.4 Level Up With Two Scoops of Django 3.x

If you feel you are past the point of tutorials and ready to build real projects, then you are ready for Two Scoops of Django.

In Two Scoops of Django we'll introduce you to various tips, tricks, patterns, code snippets, and techniques that we've picked up over the years. Two Scoops of Django is NOT for beginners just starting out. Rather, it is meant for people who are at least building their first real project.

<https://www.feldroy.com/products/two-scoops-of-django-3-x>

57.5 Giving Us Feedback

If you have any feedback, the absolute best place to give it to us is on our official issue tracker at <https://github.com/feldroy/django-crash-course/issues>.

Part III

Aftermatter

58 Troubleshooting

This appendix is for helping readers resolve problems that may come up during the Django Crash Course.

58.1 Troubleshooting Conda Installations on Pre-Catalina OSX

If `conda list` fails, then enter these two commands, replacing `THEUSERNAME` with our Mac username:

```
source /Users/THEUSERNAME/miniconda3/bin/activate  
conda init
```

58.2 Troubleshooting Conda Installations on Catalina or higher OSX

```
source /Users/THEUSERNAME/miniconda3/bin/activate  
conda init zsh
```

Reference:

<https://docs.conda.io/projects/conda/en/latest/user-guide/install/macos.html>

If that still doesn't work, we recommend reading <https://towardsdatascience.com/how-to-successfully-install-anaconda-on-a-mac-and-actually-get-it-to-work-53ce18025f97>

58.3 Troubleshooting PostgreSQL: Role Does Not Exist

We'll probably run into this if we're on GNU/Linux, and if we haven't given our local development user a role yet. If we get this error:

```
createdb: could not connect to database template1: FATAL:  
role "audreyr" does not exist
```

Then it means we need to create a role for our local user. Start the `psql` prompt as the `postgres` user, and create a role for ourselves with the `CREATEDB` and `LOGIN` attributes. Change `audreyr` to our own username:

```
psql -U postgres  
postgres=# CREATE ROLE audreyr WITH CREATEDB LOGIN;  
postgres=# \q
```

Our username is what prints out when we type `whoami` at the command line.

Try `createdb everycheese` again. With this role we shouldn't need to create a Postgres user or password specific to `everycheese`, which means we won't need to edit our settings to include any new database-specific username or password.

58.4 Troubleshooting PostgreSQL: Cannot Create Database

If we get an error about not having permission to create a database, we can try enabling trust authentication for all local users in PostgreSQL. Edit our `pg_hba.conf` (e.g. `/etc/postgresql/9.5/main/pg_hba.conf`) to have this line:

```
local all all trust
```

Make sure that there's no other line that cancels this line out, such as `local all all md5`. Then restart PostgreSQL:

```
sudo service postgresql restart
```

Try `createdb everycheese` again.

58.5 Troubleshooting PsycopG2

If we get the error `pg_config executable not found`, it most likely means that `psycopg2` can't find where we installed Postgres on our system. Try adding our Postgres path to our PATH variable.

58.6 Troubleshooting GCC Errors on the Mac

If you get this error that looks similar to this on the Mac:

```
error: command 'gcc' failed with exit status 69
```

That could mean **XCode** development tools haven't been fully installed yet due to licensing. Apple insists Mac users agree to their license. To ensure we've met their requirements, type this on the command-line:

```
sudo xcodebuild -license
```

Go ahead and agree to the license, then run `pip install -r requirements/local.txt` again.

58.7 Troubleshooting the MS Visual Studio Build Tools Error

Windows users might get an error that says `Need MS Visual Studio Build Tools 2014" error`. If that's the case, installing VS Tools won't help. Instead, run `pip` again with this install option:

```
pip install rcssmin --install-option="--without-c-extensions"
```

59 Changelog

59.1 Beta Changelog 2020-05-28

- Close all `{% endblock %}` tags consistently across the book
- Properly donate code blocks across the book that were missing code hilighting
- Remove internal cruft from across the book
- Added a pagebreak between Part I intro and Chapter 2
- Added short intro to chapter 5
- Remove unnecessary `{sample}` tag in chapter 16
- Be more explicit for windows users when running Cook-iecutter in chapter 16

59.2 Beta Changelog 2020-05-23

- Added link to code at <https://github.com/feldroy/django-crash-course/tree/master/code> in introduction
- More easily understood git config instructions in chapter 1
- Added missing import to code example in chapter 33
- Fixed code highlighting in chapters 12, 13, 16, 17, and 24

59.3 Beta Changelog 2020-05-09

- Windows users are now on sqlite in Chapter 1 and 16
- Removed TODO for using VS Code to set up SSH keys in Chapter i1
- Linked to other authored books in chapter 57

59.4 Beta Changelog 2020-05-04

- Grammar and spelling review in Chapter 1

- Changed “Installing Git on Windows” tutorial to use CMD instead Anaconda Prompt to check if git was successfully installed in Chapter 1
- Updated the short link of the vscode quick install script in Chapter 1
- Updated the short link of the PostgreSQL 12 quick install script in Chapter 1
- Revised PostgreSQL setup for Windows in Chapter 1
- Added Two Scoops of Django to Chapter 59

59.5 Beta Changelog 2020-04-14

- Made clarifications to the windows VS Code installation instructions in the Ultimate Django Setup Chapter
- Made clarifications to the Mac VS Code installation instructions in the Ultimate Django Setup Chapter
- Provided a warning to users of Safari on Mac and finding downloaded files in the Ultimate Django Setup Chapter
- Removed TODO from the Ultimate Django Setup Chapter
- Broke up Git installation instructions for Windows and Mac in the Ultimate Django Setup Chapter
- Added global Git configuration to the Ultimate Django Setup Chapter
- Improved the Conda instructions in the Ultimate Django Setup Chapter
- New Linux content!
 - Added Git installation instructions for Linux to the Ultimate Django Setup Chapter
 - Added Linux VS Code installation instructions to the Ultimate Django Setup Chapter
 - Added PostgreSQL instructions for Linux to the Ultimate Django Setup Chapter
- Remove backticks from first commit message in chapter 20

- Added `UserDetailView` comments to `django-crash-starter` to match what we show in chapter 22
- Tiny grammar fix in chapter 45
- Fixed spelling in the changelog

59.6 Beta Changelog 2020-04-08

- Tweaked the Kindle/Mobi render so it should work in all devices
- Various small grammar edits
- Improved installation git instructions in Chapter 1
- Added Configuring git section in Chapter 1
- Improve installation of vscode on Mac instructions in Chapter 1
- Closed parenthesis in the description of tests in chapter 42

59.7 Beta Changelog 2020-03-25

- Changed links and references from `roygreenfeld` to `feldroy` per <https://www.feldroy.com/blogs/news/were-now-a-little-company-called-feldroy>.
- Description improvements across the book
- Fixed two more code overruns
- Explained why we add `__init__.py` to our `cheeses/tests/` directory in chapter 29

59.8 Beta Changelog 2020-03-22

- Working `kindle/mobi` version thanks to Carlos Johnson!

59.9 Beta Changelog 2020-03-19

- Small grammar improvements across the book

- Switched to Latin Modern font in kindle/epub to increase accessibility of code examples across the book
- Reordered the installation instructions in chapter 1
- Removed reference to `test.txt` in chapter 18
- Corrected template tag ending in chapter 55

59.10 Beta Changelog 2020-03-13

- Reordered the installation steps on chapter 1
- Explained views a little more in chapter 10
- Reordered some of the text in chapter 5 and removed a duplicate senter in chapter 25
- Explain Django model Choices and how they are based on Python enums in chapter 27
- Specify better where the cheeses path include should go in chapter 35
- Explain where `get_firmness_display` comes from in chapter 38
- Add missing code block around output of test results in chapter 42
- Fixed flawed URL in chapter 46
- Re-explained basic foreign principles in chapter 49
- Removed unnecessary import of `assertRedirect` in chapter 53

59.11 Beta Changelog 2020-03-10

- Simplified add/update page titles using view properties rather than the harder-to-test-in-templates `HttpRequest` approach in chapter 55

59.12 Beta Changelog 2020-03-06

- Made all chapters except the introduction have a number, this is to make referencing code examples easier
- Added Fabio as a tech reviewer
- Warning box for password managers had the word “names” corrected to “passwords”
- Accepted PR that fixed django-crash-starter
- Revised Postgres.app installation instructions in chapter 1
- Rename `README.rst` to `README.md` in chapter 17
- Replace the reference to `cookiecutter-django` to `django-crash-starter` in chapter 17
- Refer back to basic url routing in chapter 22
- Explained `app_name` and `path name` in chapter 34
- Add mention and links to Factory Boy in chapters 40 and 41
- Use correct fontface for `country_of_origin` in chapter 44
- Included missing `app_name` in chapter 46
- Made `INSTALLED_APPS` a list rather than a tuple in chapter 48
- Added troubleshooting chapter 58 and began moving troubleshooting instructions there

59.13 Beta Changelog 2020-03-03

- Give Christian and Enrique formal credit as tech reviewers
- Grammar and spelling corrections, including some embarrassingly large ones
- Test `str()` built-in function result in chapters 28 and 41
- Fixed location of figure 54 in chapter 47
- Removed unnecessary usage of Stracchino in chapter 51. Up for debate is if there ever an unnecessary usage of cheese
- Corrected markdown error in chapter 53
- Used even more flexible approach in chapter 54 to account for form changes

- Added typesetting to acknowledgements

59.14 Beta Changelog 2020-02-26

- Minor grammar and spelling corrections
- Replaced old summary with chapter 16 with 16.2 paragraphs
- Combine end text for chapter 16 with start text in chapter 17 to be new start text of chapter 17
- Put **verify your email** image into correct place within chapter 22
- Explained source of `cheese_list` in chapter 35
- Properly use cheese firmness in chapter 41
- Use **f-strings** instead of `format()` in chapter 41
- Correct git message in chapter 41
- Added tipbox in chapter 52 explaining that `assertContains` includes an HTTP status check

59.15 Beta Changelog 2020-02-22

- Minor grammar and spelling corrections
- Added the cover back to the PDF version
- Fixed epub metadata so Audrey shows up as author
- Made some explanations more concise per the classic `Two Scoops of Django` style
- Added explanation for `as_view()` method in Chapter 9

59.16 Beta Changelog 2020-02-21

- Code examples are now at 70% scale, meaning code overlaps should be a thing of the past
- The PDF now uses Source Code Pro as the code font

- Added section in introduction titled **Why Learn Django?**
- Linux instructions for installing Conda in the Ultimate Django Setup, authored by Enrique Matías Sánchez
- Added unidecode to `django-crash-starter` to deal with future unicode issues like Κεφαλοτύρι
- Added another troubleshooting link for Conda on Mac in the Ultimate Setup Chapter.
- Added troubleshooting instructions for GCC failures on the Mac in chapter 17
- Windows users now have troubleshooting instructions for MS Visual Studio code failures in chapter 17
- Put figures (images) into their right places in chapters 22 and 23
- Chapter 24 test run example now lists the correct number of tests
- Troubleshooting non-ASCII characters added to chapter 45
- Rewrote chapter 56, next steps

59.17 Beta Changelog 2020-02-19

- Pronoun corrections across the book
- Specific Django version in the introduction
- Various grammar fixes
- Removed `vendor.js` from `django-crash-starter`
- Corrected Spanish in chapter 8
- Now using `django-crash-starter` as a name consistently
- Added missing exit from psql in chapter 17
- Accepted PR that patched the totally borked `django-crash-starter`
- For repo creation in chapter 19, corrected text and image
- Made HTML in chapter 35 match what exists in `django-crash-starter`
- Added missing closing backtick in chapter 35

- Fixed broken test in chapter 41

59.18 Alpha Changelog 2020-02-14

- Imported more art!
- New tip and warning icons
- More pronoun corrections
- Removed mention of `UnitTest` from several chapters
- Note in Ultimate Django Setup about using alternatives to `conda`
- In Ultimate Django Setup added instruction for CLI tools for Mac
- Finished fixing chapter 11 `context['my_statement']` dialogue to say ‘Nice to see you!’
- Chapter 15 updates: `django-crash-starter` Cookiecutter prompts updated to match current template, and fix escaping and margins
- More clear description of allauth source code in chapter 21
- Now calling Cheese firmness the correct way in chapter 27, 40, and 41
- Wrote literal definition of Cheese Factory to chapter 39
- Added chapters 51, 52, 53, 54, and 55! All chapters are in! Hooray!

59.19 Alpha Changelog 2020-02-11

- Described Django settings as constants
- Converted chapter 26 to use Django 3-style enums
- Pronoun corrections in numerous chapters
- Image size optimizations to reduce filesize
- Added calling `code` command from shell for Mac in Ultimate Django Setup chapter
- Added summary to chapter 6

- Fixed chapter 11 `context['my_statement']` result to say ‘Nice to see you!’
- Added chapter 50: Updating the cheese factory

59.20 Alpha Changelog 2020-02-07

- ePUB TOC now only lists chapter level items
- Removed `avatar_tags` template tag reference
- Fixed pytest segments
- upgraded from legacy `django.core.urlresolvers.reverse` to modern `django.urls.reverse`
- Foreign keys now have `on_delete` arguments set
- Minor grammar corrections
- Better description faker material so it’s more obvious what’s going on
- Describe git commit messages to better reflect the content of their chapters
- Cleanup on chapters 37 to 49. Next up, getting more chapters into the book!
- Added how to give feedback to the next steps chapter

59.21 Alpha Changelog 2020-02-05

- Fix for digits at the end of some PDF links
- Make lowercase code segments like `#!/usr/bin/env python` and `__str__` caused by an overzealous titlecase script
- Added strong password and good storage practices reminder to Django superuser creation
- Replaced link to image to the actual image
- Corrected index links to projects
- Removed broken link markup
- Replaced old mentions of GitLab with GitHub
- Use lists instead of tuples to avoid missing-comma tuple confusion

- Updated PyPI link to <https://pypi.org/project/>
- Better description for hard forks of open source projects
- Added troubleshooting for Conda on Mac
- Cleanup on chapter 35
- Cleanup on chapter 36

59.22 Alpha Changelog 2020-02-04

- Added acknowledgements and changelog sections
- Fixed conda setup for hellodjango project
- grammar and spelling fixes
- URL path corrections
- Removed : suffix from `cookiecutter` command

59.23 Alpha Changelog 2020-02-03

- Release of the alpha!

60 Acknowledgements

This book was not written in a vacuum. We would like to express our thanks to everyone who had a part in putting it together.

Contributors are listed in the order that their bug reports, tips, and other submissions were addressed.

60.1 Tech Reviewers

It is often said that a good technical book is impossible without great technical editing. The book would not be in the shape it is without the three following people:

60.1.1 Christian Hetmann

A lifelong learner, Christian Hetmann is a degreed German engineer working for a Swedish furniture retailer in transport logistics. He's passionate about documenting and modeling of processes and concepts in logistics, automation and robotics. Christian enjoys watching movies and doing computer things with his two sons.

60.1.2 Enrique Matías Sánchez

Enrique is an engineer who loves strong-flavored cheeses, software development, system administration and everything in between. When he is not at his job as a Python programmer at the University of Zaragoza in Spain, he can be found hiking the mountains nearby or traveling the world. He shares a black cat with his lovely girlfriend, another cheese-lover.

Enrique also provided our Linux installation instructions. Any inaccuracies or problems in that section are due to our inability to copy and paste his writing.

60.1.3 Fabio C. Barrionuevo da Luz

Fabio is a Brazilian engineer working for Feldroy. He likes to focus on producing the highest quality code that runs on all platforms. He enjoys open source and is a Cookiecutter and Cookiecuter Django core developer. Fabio is a creator and maintainer of <http://pythonclub.com.br/>. When not programming, Fabio enjoys reading science fiction, playing the guitar, and spending time with his wife.

Fabio created the new book building system at Feldroy, for which we are very grateful.

60.2 Contributors to 3.x Beta

We could not have survived without our beta readers. Their attention to detail cannot be understated:

Carla Breden, Enrique Matías Sánchez, Christian Hetmann, Derrick Kearney, Joe Talarovich, Justin Kanusek, Magnus Vaughan, Ivange Larry, Bob Earl, Og Maciel, Doug Gibbs, Mark Pors, Romack Natividad, Fábio C. Barrionuevo da Luz, Rohith PR, Toby Bettridge, Matt Winslow, Jonn Doe, Ben McNeill, Leigh Michael Forrest, Kevin J. Murray, Miguel Pachas, Marc Richter, Trevor Pierce, Carlos Johnson, Kim Roberts, Pedro Queiroga, Nigel Finch, Aaron C. Hall

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If your name is not on these lists but should be, please send us an email so we can make corrections!

60.4 Typesetting

We originally wrote **Django Crash Course** using ReStructuredText and compiled using Sphinx. It was moved later to GFM markdown and hosted on a custom corporate training platform. For this book the material was converted to R-Markdown and an extended version of Bookdown³⁶ created and maintained by Daniel FeldRoy, Audrey FeldRoy, and Fabio C. Barrionuevo da Luz.

³⁶<https://bookdown.org/>