

URLs and Views



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#python-web

1. Creating a **New Django Project**
2. **URLs in Django**
3. **Function-Based Views**
 - **Request and Response Objects**
 - **Dynamic Views**
4. **Views Communicating Errors**
 - **Handling HTTP Exceptions**





Creating a Project

Initial Steps

Creating a Project in PyCharm

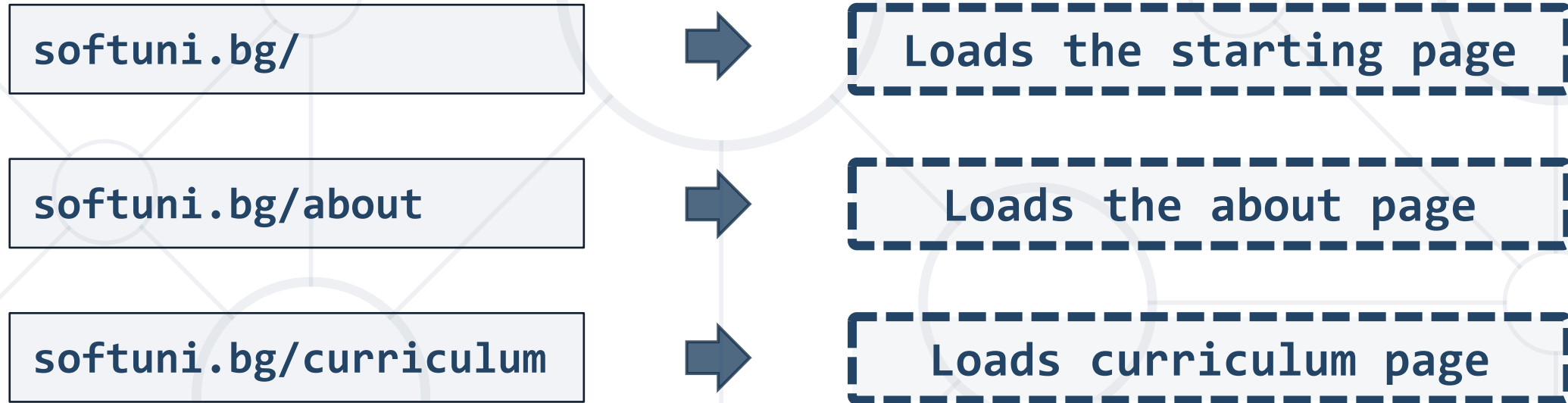
- 
- Start a new project
 - Set up a database
 - Create a new app called **department**
 - Include the app in the project
 - Create an **urls.py** file in the app
 - Include the **app/urls.py** module in the **project/urls.py**



URLs in Django

Design with No Framework Limitations

- When a user attempts to access a URL, it **ensures** that a certain **page is reached**



URL Configuration

- How it happens:
 - Django looks for the **urlpatterns** variable in the **urls.py** file
 - Runs through each URL pattern and stops at the **first matching** one
 - Calls the given **view** and passes an instance of the class **HttpRequest**

my-site.com/department

```
urlpatterns = [  
    path('department/', views.show_department),  
]
```



- To **create more pages on a website**, you can add additional paths and views

```
urlpatterns = path('department/1/',  
views.show_department_with_id_one),  
              path('department/2/', views.show_department_with_id_two),  
              path('department/3/', views.show_department_with_id_three),  
              path('department/4/', views.show_department_with_id_four),  
              path('department/5/', views.show_department_with_id_five),  
              ]
```

- In this case, it is better to use **dynamic path segments**

Dynamic Path Segments (2)

- Set one **dynamic URL pattern** for all departments

```
path('department/<department_name>/', views.show_department_by_name)
```

- Optionally, it can include a **converter type** (otherwise, it is converted to a string)

```
path('department/<int:department_id>/', views.show_department_by_id)
```

- The value is passed as an **argument** to the **view**

```
def show_department_by_id(request, department_id):  
    ...
```

Default Path Converters

- **str** – matches any **non-empty string**, excluding "/"
- **int** – matches **zero** or any **positive integer**
- **slug** – matches any slug string consisting of ASCII letters, numbers, hyphens, and **underscores**
- **path** - matches any **non-empty string**, including "/"
 - Allows you to **match a complete URL path**
- **uuid** – matches a formatted UUID



- Using **re_path()** instead of **path()**


```
re_path(r'^archive/(?P<archive_year>202[0-3])/$', views.show_archive)
```

- Allows you to use **regular expressions** for more **flexible** URL **pattern matching**
- This can be **useful** when you need **more complex matching** patterns
- With **re_path()**, each captured **argument** is sent to the view as a **string**

- It's recommended to use **named** groups in your regular expressions for **better readability** and **maintainability**
 - Using **unnamed** regex groups can make your code **harder** to understand
- When using a **mix** of **both** styles (**path()** and **re_path()**)
 - any **unnamed** groups from the regular expression pattern are **ignored**
 - only **named** groups are **passed** to the **view** function

Including URLs

- **Include** a `urls.py` module




```
from django.urls import include, path

urlpatterns = [
    ...
    path('department/', include('department.urls')),
]
```

- Django will **remove** the part of the **matched** URL specified in the **`include()`** function and **pass** the **remaining string** to the **included `urls.py`** file for further processing

Including a urlpatterns List

- You can **include** a urlpatterns list



```
urlpatterns = [  
    path('profile/', include([  
        path('create/', views.create),  
        path('edit/', views.edit),  
        path('delete/', views.delete),  
    ])),  
]
```

- It removes **redundancy** from URL configuration modules, especially when a **single pattern prefix** is used **repeatedly**



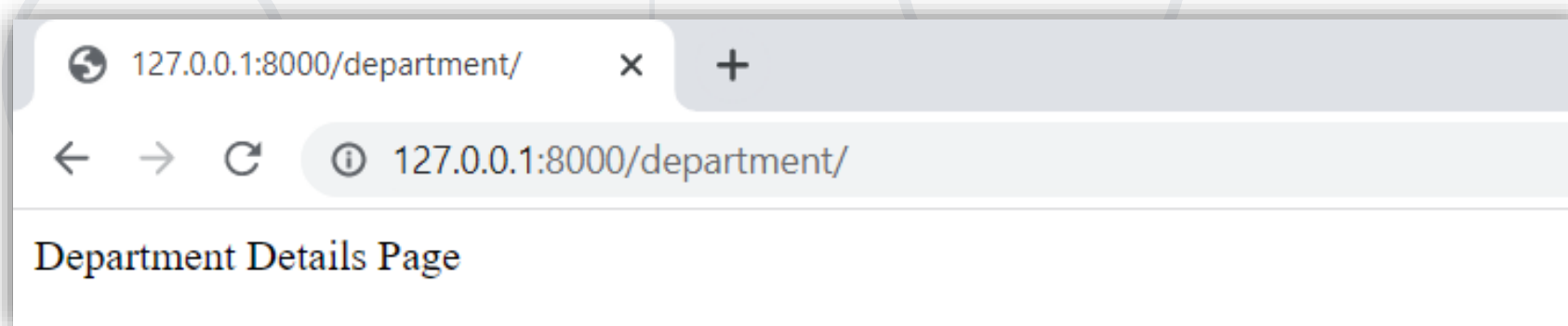
```
def index(re
```

Function-Based Views

Returning HttpResponse

- **View** in Django contains the **logic** necessary to **produce** the desired **outcome** when a specific **URL** is accessed

```
from django.http import HttpResponse  
  
def show_department(request):  
    return HttpResponse("Department Details Page")
```



Views in Django

- Each view receives
 - **HttpRequest** object as its **first** argument (conventionally named **request**)
 - ***args** - matches from **no named groups** in the URL pattern
 - ****kwargs** - matches from **named parts** in the URL pattern
- Each view returns
 - **HttpResponse** object



HttpRequest Object



- Represents an **incoming HTTP request** from a **client** (usually a web browser)
- Contains **information** about the **request**
 - including **headers**, **method** (GET, POST, etc.), user **session**, and any **data** submitted in the request
- Typically passed as the **first argument** to a **view** function
 - allowing the view to **access** and **process** the **incoming requests**

HttpResponse Object



- Represents the **HTTP response** that a view **sends back** to the **client** in **response** to a request
- Contains the **content** that will be **sent** in the **response**
 - along with any relevant **headers** (e.g., **content type**, **status code**)
- Views are **expected** to **return** an **HttpResponse** object
 - which can include **HTML content**, **JSON data**, or any other type of **response** content

Views in Django – Example

department/views.py

```
from django.http import HttpResponse

def show_department_by_id(request, department_id):
    if department_id == 1:
        department_name = "Developers"
    elif department_id == 2:
        department_name = "Trainers"
    html_output = "<html><body><h1>" \
        "Department Name: %s, Department ID: %s" \
        "</h1></body></html>" \
        % (department_name, department_id)
    return HttpResponse(html_output)
```

Views in Django – Example

department/urls.py

```
from django.urls import path
from . import views

urlpatterns = [
    path('department/<int:department_id>/', views.show_department_by_id),
]
```



127.0.0.1:8000/department/1/

127.0.0.1:8000/department/1/

Department Name: Developers, Department ID: 1

Django Shortcut Functions

- Django **shortcut** functions are **utility** functions
 - that **simplify** common tasks in Django **development**
- They **streamline** the **process** of working with the Model-View-Template (**MVT**) paradigm by providing **convenient** methods
 - **render()**
 - **redirect()**
 - **reverse()**
 - **get_object_or_404()**
 - **get_list_or_404()**



render()

- Combines a **template** with a **context** dictionary
- Returns an **HttpResponse** object with the **rendered** text
- Simplifies the process of **rendering dynamic content**
 - by **automatically** handling the **template** rendering
 - creating an **HTTP response** with the **rendered content**



render()

- Required arguments
 - **request** - The **HttpRequest** object used in generating the **response**
 - **template_name** - The full name of the **template** to be used for **rendering**

```
render(  
    request=request,  
    template_name='department/department_by_id.html',  
)
```



- **context** – an optional argument (empty dictionary by default)
 - A dictionary containing values that are added to the template **context**

```
from django.shortcuts import render

def show_department_by_id(request, department_id):
    ...
    context = {"department_name": "marketing",
               "department_id": department_id}
    return render(
        request=request,
        template_name='department/department-details.html',
        context=context,
    )
```

- The **variable** names in the **context** correspond to the **variables** used in HTML templates

department-details.html

```
<!DOCTYPE html>
<html lang="en">
  <head>
    <meta charset="UTF-8">
    <title>Department Info</title>
  </head>
  <body>
    <p>Department Name: {{ department_name }}</p>
    <p>Department ID: {{ department_id }}</p>
  </body>
</html>
```

redirect()

- Is used to **redirect** the **user** to the **appropriate URL**

- By passing a **hardcoded URL** to redirect to

```
redirect('/some/url/')
```

- By passing the **name** of a **view** along with **optional** positional or keyword arguments

```
redirect(some_view_name, *args, **kwargs)
```

- It returns an HTTP **status** code of **302**



- Directly injecting the URL into the function

department/views.py

```
from django.shortcuts import render, redirect

def show_department_by_name(request, department_name):
    # find the id of the department by its name
    return redirect(
        'http://127.0.0.1:8000/department/' + str(found_department_id)
    )

def show_department_by_id(request, department_id):...
```

- However, this approach is **not dynamic** and could potentially lead to **issues**

- Add a **name** to the **path** in the urls.py module

department/urls.py

```
from django.urls import path
from . import views

urlpatterns = [
    path(
        'department/<int:department_id>/',
        views.show_department_by_id,
        name='department-by-id',
    ),
]
```

- The `redirect()` function **constructs** a **URL** based on the **name** of the **view** and its **parameters**

department/views.py

```
from django.shortcuts import redirect

def show_department_by_name(request, department_name):
    # find the id of the department by its name
    return redirect('department-by-id',
                    department_id=find_department_id)

def show_department_by_id(request, department_id):
    ...
```

reverse()

- URL **reversing** is a process in Django that allows you
 - to **generate** a URL for a **specific view**
 - based on its **name** and any **arguments** it may require

```
from django.urls import reverse
```

```
url = reverse('department-by-id', kwargs={'department_id': 1})
```

- Helps to **decouple** URLs from **view** functions
- Allows you to **generate** URLs based on the **current state** of your application and the **data** available



- The `reverse()` function **generates** a **URL** based on the **name** of the **view** and its **parameters**

department/views.py

```
from django.shortcuts import reverse, redirect

def show_department_by_name(request, department_name):
    # find the id of the department by its name
    url = reverse('department-by-id',
                  kwargs = {'department_id':found_department_id})
    return redirect(url)

def show_department_by_id(request, department_id):
    ...
```



Views Communicating Errors

Communicating Errors



- When a view needs to communicate an **error** status **instead** of returning a normal **HttpResponse** object, several options are available
 - Using **HttpResponse Subclasses**
 - Passing an **HTTP Status Code** to the **HttpResponse** Class
 - Raising **Http404** Exception

- Django provides **subclasses** of **HttpResponse** like **HttpResponseNotFound**, **HttpResponseServerError**, etc.
 - Can be **returned** directly to indicate specific **HTTP error** statuses

```
from django.http import HttpResponse, HttpResponseNotFound

def employees_by_department_id(request, department_id):
    if condition_is_met:
        # Logic for when the condition is met
        ...
        return HttpResponse(html)
    return HttpResponseNotFound('Department was not found')
```

- A view can return an `HttpResponse` object with a specific **status code** using the **status** parameter

```
from django.http import HttpResponse

def show_department_by_id(request, department_id):
    if condition_is_met:
        # Logic for when the condition is met
        ...
        return HttpResponse(html)
    return HttpResponse(status=404)
```

Raising Http404 Exception

- To indicate a "Not Found" **error**, a view can **raise** the **Http404** exception
- This will be **caught** by Django's **exception handling** and **result** in a **response** with a **404 status code**

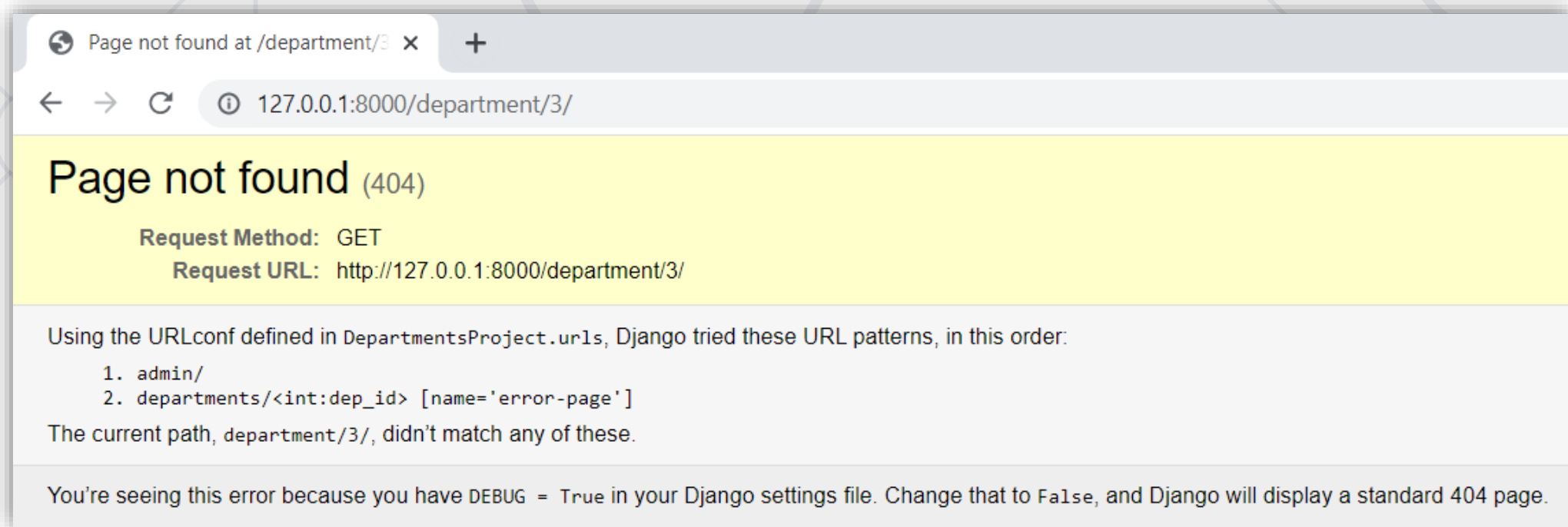


```
from django.http import Http404

def show_department_by_id(request, department_id):
    ...
    else:
        raise Http404
```

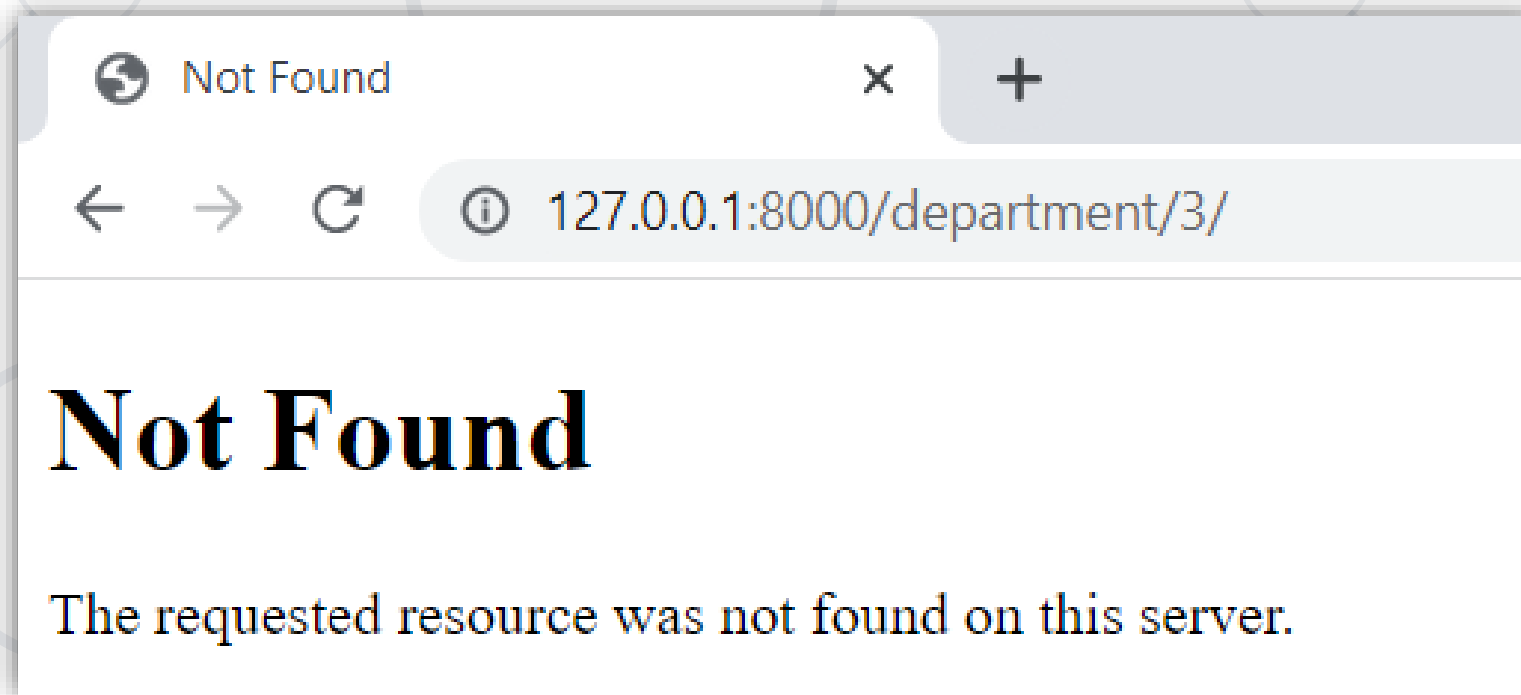
Raising Http404 Exception

- When the **DEBUG** setting is set to **True** in a Django application, any message provided to the **Http404** exception will be **displayed** in the **standard 404** debug template



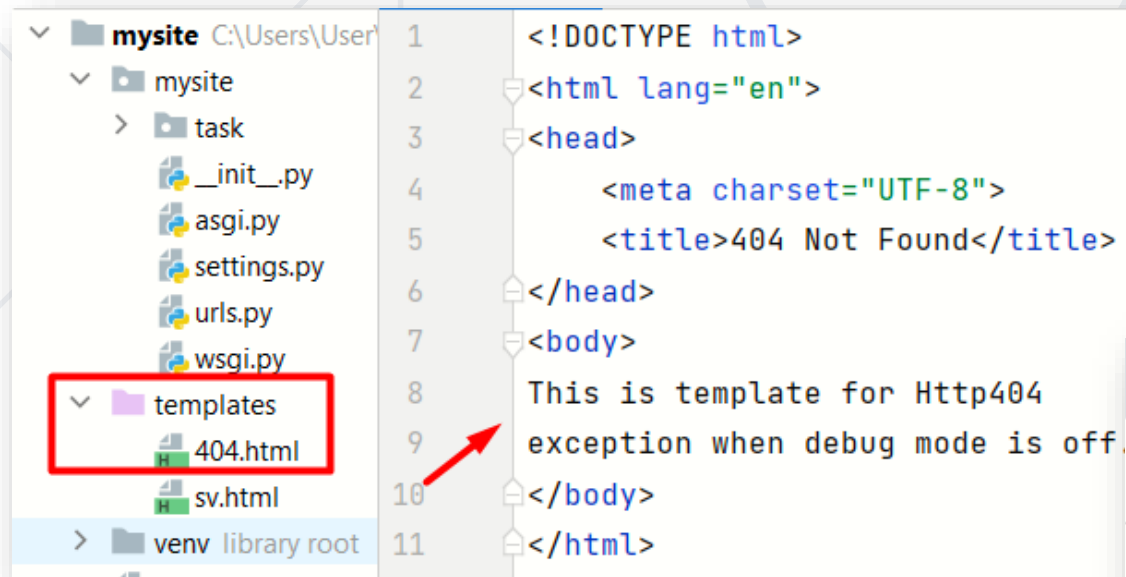
Raising Http404 Exception

- When the **DEBUG** setting is set to **False** in a Django application, Django will **display a default 404 page** for this **exception**



Raising Http404 Exception (4)

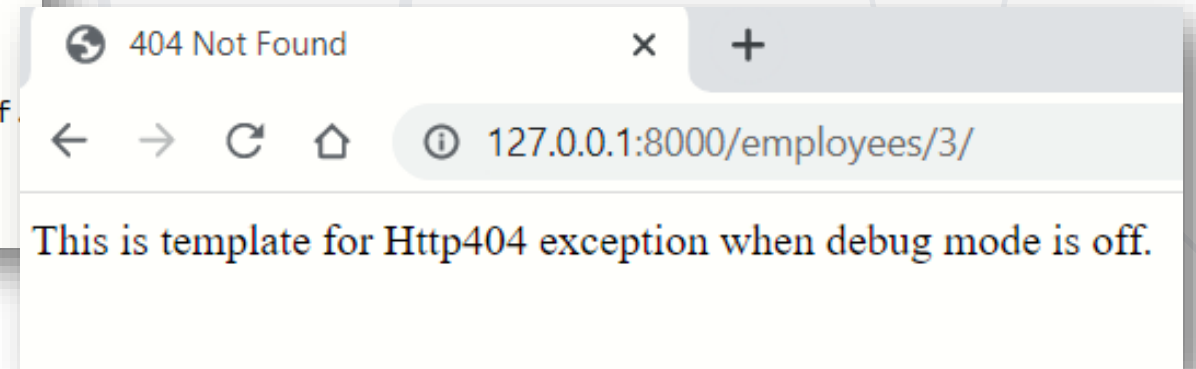
- To display a **customized** page for a **404 error**, create a **404.html** template
- This **template** will be used when the **DEBUG** setting is set to **False**



The image shows a file explorer on the left with a tree view of a project named 'mysite'. The 'templates' folder is highlighted with a red box, and the '404.html' file inside it is also highlighted. To the right, a code editor displays the content of '404.html'. The code is as follows:

```
1 <!DOCTYPE html>
2 <html lang="en">
3 <head>
4     <meta charset="UTF-8">
5     <title>404 Not Found</title>
6 </head>
7 <body>
8     This is template for Http404
9     exception when debug mode is off.
10 </body>
11 </html>
```

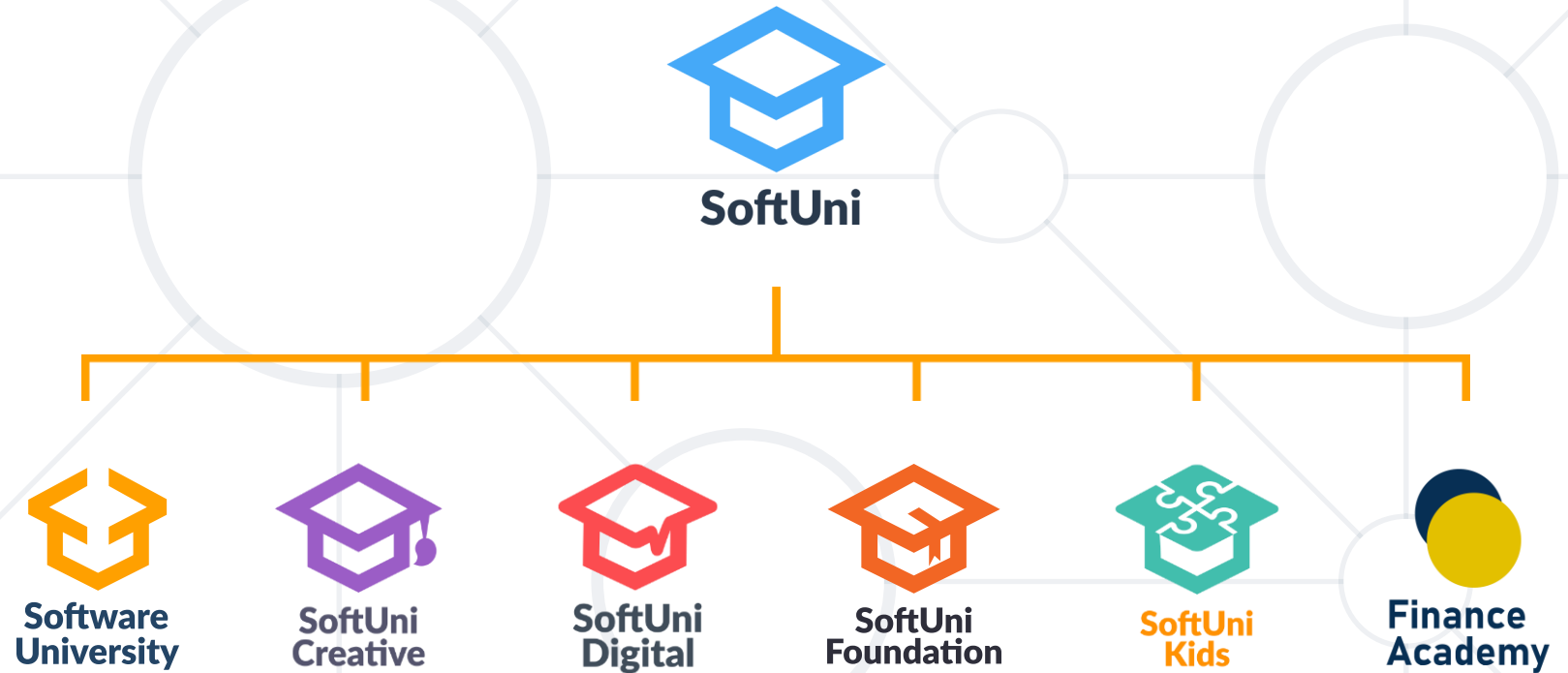
A red arrow points from the '404.html' file in the file explorer to the content of the template in the code editor.



- The **views.py** file contains the logic for when a specific URL is reached
- The **urls.py** file uses the views.py file to map the URLs patterns
- It is strongly recommended to **avoid hard-coding** URL patterns



Questions?



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