CS50 Section 9

Slides and Exercises at github.com/cjleggett/2022-section

Please scan your ID!

Think.

Pair.

Share.

Think. Pair. Share.

- How do we organize files in a Flask app?
- How do we get started with Flask?
- What order should I write my code in?

Outline

- Upcoming Schedule (3:05)
- HTTP (3:10)
- HTML (3:15)
- CSS (3:25)
- JavaScript (3:35)
- Test Prep (3:55)

Upcoming Schedule

11/7 - 11/13: Finance + Proposal

- Normal pset, lab, section
- Maybe the most time-consuming pset
- But also one of the most fun!
- **Also time to get into groups and start thinking about final project!**

Financial Advice

- The walkthrough is 20 minutes long, but worth it
- Don’t forget the personal touch!
- Save versions that are working
- Work through piece-by-piece:
  - Implement
  - Test
  - Check50
  - Repeat

11/14 - 11/20: Test

- Test released 11/14
- Test Due 11/20
- No Section / Lecture / Lab
- No problem set
- Harvard-Yale is 11/19!

11/21 - 11/27: Break

- Monday Lecture
- Thanksgiving Break!
- No problem set / section / lab
- You should start working on your final project!

11/28 - 12/4: Final Project Sprint

- No Lecture / Section / Pset / Lab
- 12/1 - 12/2: CS50 Hackathon!

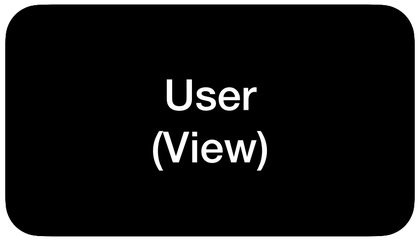
12/5 - 12/7: Finishing Up

- No Lecture / Section / Pset / Lab
- 12/6: Final Projects Due
- 12/7: CS50 Fair

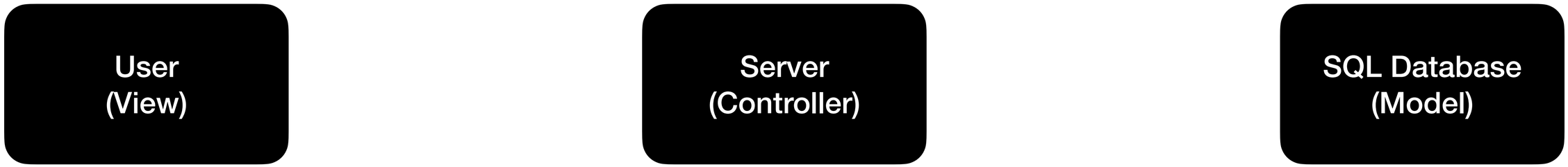
Unfortunate Announcement

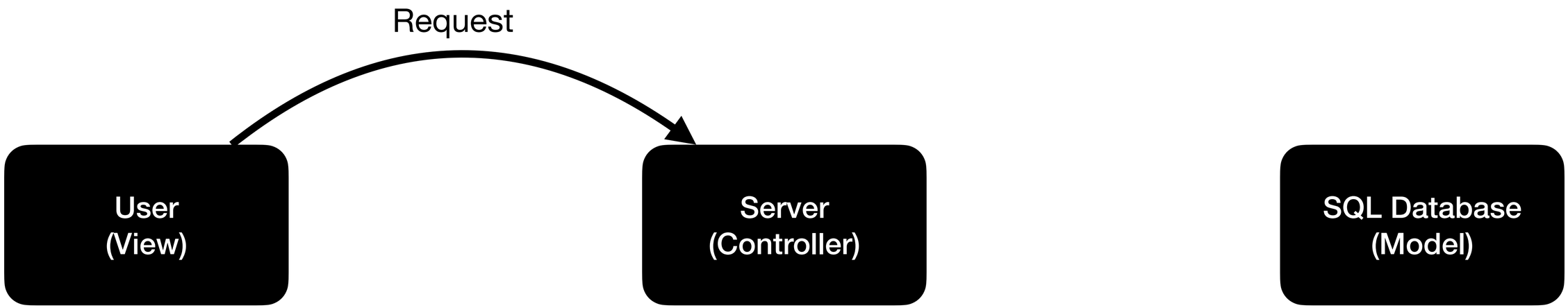
- I’m getting surgery tomorrow and will be out of commission for a little while
- So if you have logistical questions, email heads@cs50.harvard.edu!

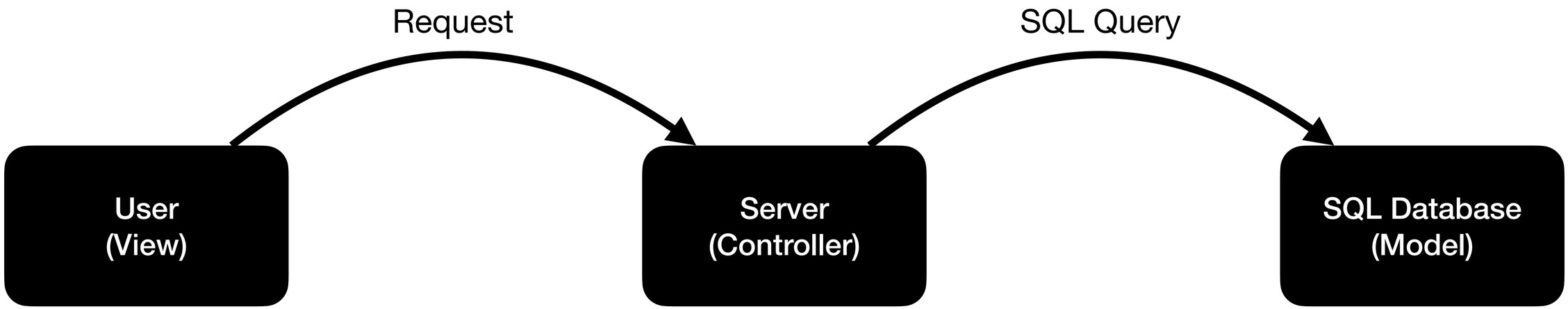
Overall Diagram

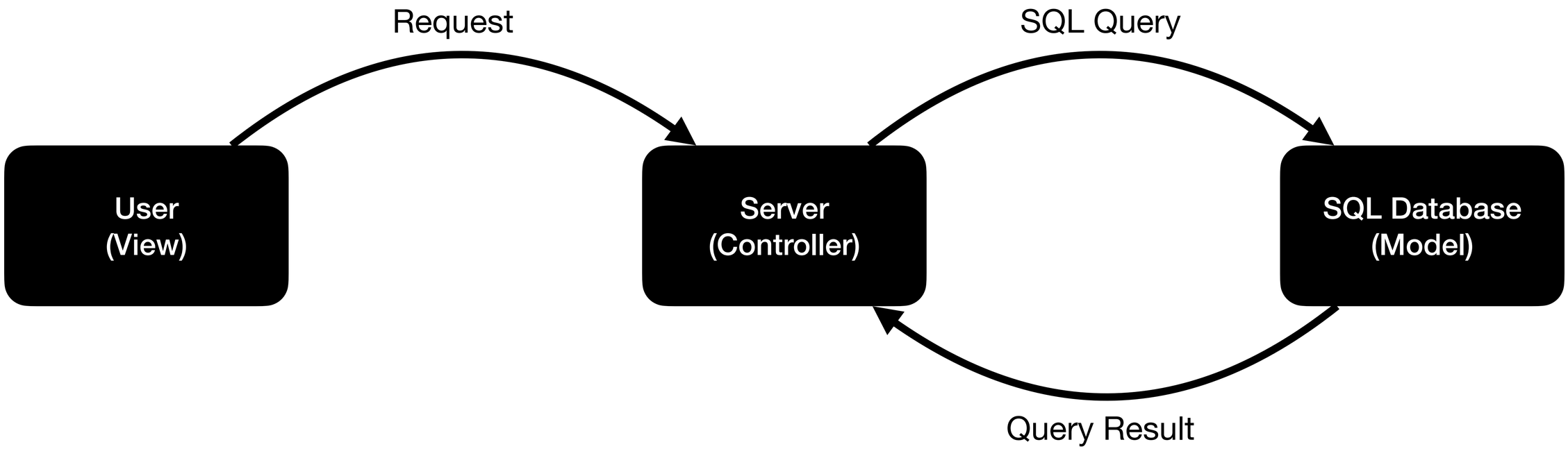

User
(View)

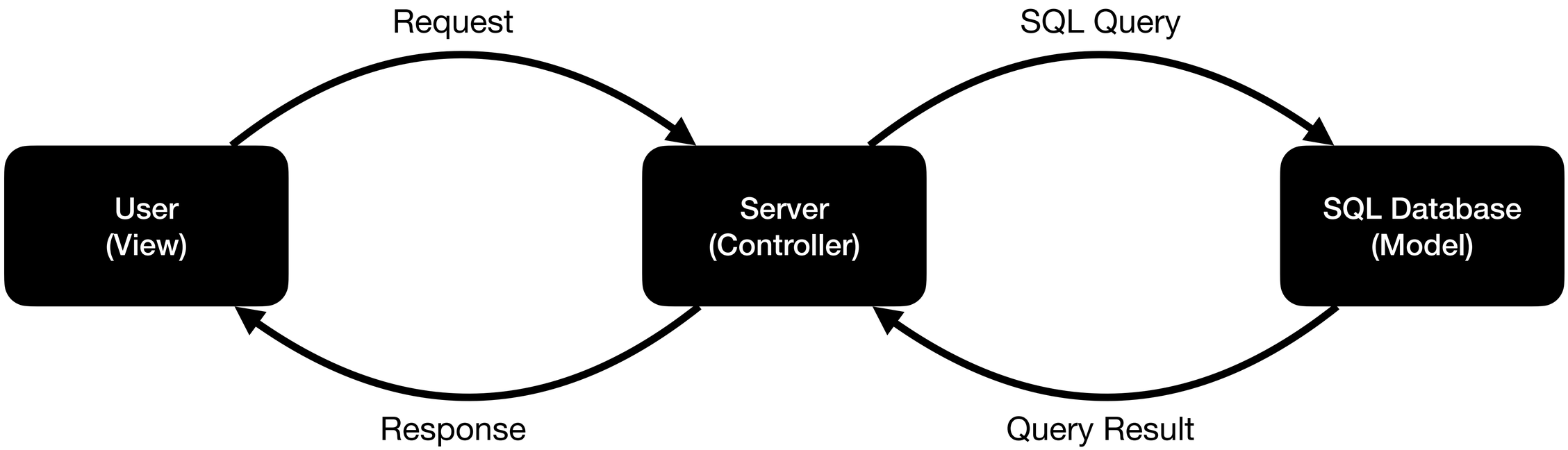

User
(View)
SQL Database
(Model)

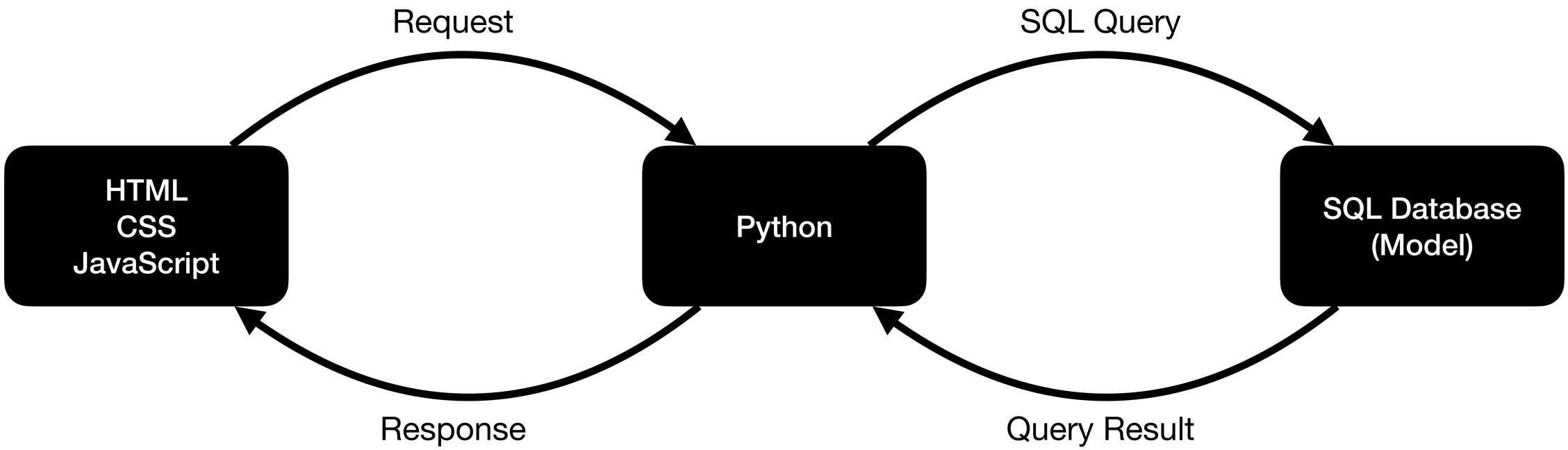

User
(View)
Server
(Controller)
SQL Database
(Model)


Request
User
(View)
Server
(Controller)
SQL Database
(Model)


Request
SQL Query
User
(View)
Server
(Controller)
SQL Database
(Model)


Request
SQL Query
User
(View)
Server
(Controller)
SQL Database
(Model)
Query Result


Request
SQL Query
User
(View)
Server
(Controller)
SQL Database
(Model)
Response
Query Result


Request
SQL Query
HTML
CSS
JavaScript
Python
SQL Database
(Model)
Response
Query Result

Flask

Why Flask?

- Allows us to dynamically generate HTML pages
- Allows us to store data over time and over different devices
- It’s a simple way to get started compared to some alternatives:
  - Django
  - Express.js
  - Ruby on Rails

Getting Started

```
# Import Flask Library
from flask import Flask

# Initialize Flask Application
app = Flask(__name__)
```

Using Functions to Define Behavior

```
# This next line is a “decorator”
# It modifies the function below
@app.route(“/“)
def index():
    return “You are at the index page”

@app.route(“/cat“)
def cat():
    return “You are at the cat page”
```

Returning HTML

```
# Import Flask Library
from flask import Flask, render_template

# Initialize Flask Application
app = Flask(__name__)

@app.route(“/“)
def index(name):
    return render_template(“index.html”)
```

Passing in Data via URL

```
# We use <> to surround the argument
@app.route(“/welcome/<name>“)
def welcome(name):
    return f“Welcome, {name}!”
```

Passing in Data via URL query

```
# This handles URL params like ?q=cats for google
@app.route(“/welcome“)
def welcome():
    name = request.args.get(“name”)
    return f“Welcome, {name}!”
```

Passing in Data via Form

```
# We use <> to surround the argument
@app.route(“/form”, methods=[“GET”, “POST”])
def index():
    if request.method == “POST”:
        # Handle the form response
    else:
        # Display the form for the user
        return render_template(“form_page.html”)
```

Passing in Data via Form

```
# We use <> to surround the argument
@app.route(“/form”, methods=[“GET”, “POST”])
def index():
    if request.method == “POST”:
        # Handle the form response
        age = request.form.get(“age”)
        # Do something with age…
    else:
        # Display the form for the user
        return render_template(“form_page.html”)
```

Passing in Data via Form

```
<form action=“/something“ method=“POST”>

</form>
```

Passing in Data via Form

```
<form action=“/something“ method=“POST”>
    <input name=“name” type=“text”>
    <input name=“age” type=“number”>
    <button type=“submit”>Submit</button>
</form>
```

Passing in Data via Form

```
<form action="/something" method="POST">
    <input name="name" type="text">
    <input name="age" type="number">
    <button type="submit">Submit</button>
</form>
```

Passing in Data via Form

```
<form action="/something" method="POST">
    <input name="name" type="text">
    <input name="age" type="number">
    <button type="submit">Submit</button>
</form>
```

Jinja

Jinja

- A templating language
- Allows us to dynamically generate HTML files
- Allows us to use layouts to avoid repeating code
- Remember to place all HTML files in the “templates” directory

index.html

```
<!DOCTYPE html>

<html lang=“en”>
  <head>
    <title>Hello!</title>
  <head>
  <body>
    Hello, World!
  </body>
<html>
```

layout.html

```
<!DOCTYPE html>

<html lang="en">
  <head>
    <title>Hello!</title>
  <head>
  <body>
    {% block body %}
    {% endblock %}
  </body>
<html>
```

index.html

```
{% extends layout.html %}

{% block body %}
  Hello, world!
{% endblock %}
```

Response to User

```
<!DOCTYPE html>

<html lang=“en”>
  <head>
    <title>Hello!</title>
  <head>
  <body>
    Hello, World!
  </body>
<html>
```

welcome.html

```
{% extends layout.html %}

{% block body %}
  Welcome, {{ name }}!
{% endblock %}
```

Response to User

```
<!DOCTYPE html>

<html lang="en">
  <head>
    <title>Hello!</title>
  <head>
  <body>
    Welcome, Connor!
  </body>
<html>
```

welcome.html

```
{% extends layout.html %}

{% block body %}
  Welcome, {{ name }}!
{% endblock %}
```

Response to User

```
<!DOCTYPE html>

<html lang="en">
  <head>
    <title>Hello!</title>
  <head>
  <body>
    Welcome, Connor!
  </body>
<html>
```

Passing Arguments for Template

```
@app.route(“/welcome“)
def welcome(name):
    return render_template(
        “welcome.html”,
        name=name
    )
```

welcome.html

```
{% extends layout.html %}

{% block body %}
  Welcome, {{ name }}!
{% endblock %}
```

Response to User

```
<!DOCTYPE html>

<html lang="en">
  <head>
    <title>Hello!</title>
  <head>
  <body>
    Welcome, Connor!
  </body>
<html>
```

Jinja

- Use {{ }} to input variables
- Use {% %} to input logic
  - Layouts
  - For Loops
  - If - Else Logic

Incorporating SQL

We already know how to do this!

- Using CS50’s Python library, we can import SQL!

Incorporating CSS + JS

CSS + JavaScript

- Include .css and .js files in the “static” directory
- Link to those files using “/static/filename”
- Other than that, it’s all the same!

Sessions

Sessions

- Keep track of data for a single user
- Update session with `session[“key”] = value`
- Get value from session with `value = session.get(“key”)`
- You’ll use these to keep track of the current user in Finance
- Most log

Life After CS50

Ways to Continue with CS

- Classes
- Clubs
- Jobs/Internships/Research
- Projects
- Joining Staff

Classes

“Typical” Next CS Classes for Concentrators

- CS51: Abstraction and Design in Computer Science
- CS61: Systems
- CS20: Discrete Math for Computer Science
- CS121: Introduction to Theoretical Computer Science
- CS120: Introduction to Theory and Algorithms
- CS124: Data Structures and Algorithms
- Stat 110: Introduction to Probability
- Math 1a/1b/21a/21b

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- **Math 1a/1b/21a/21b**

CS Classes for Everyone

- CS Classes Related to Other Fields
  - CS109a: Data Science
  - CS136: Economics and Computation
  - CS171: Data Visualization
- Classes in Other Fields Related to CS
  - Gov50: Data
  - Econ50: Big Data in Economics
  - Stat 111: Introduction to Statistical Inference
  - Econ 1123: Econometrics

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  - **Econ 1123: Econometrics**

Clubs

- Harvard Computer Society
- Women in Computer Science
- Datamatch
- Engineers Without Borders
- Harvard College Open Data Project
- Harvard Sports Analytics Collective
- Tech position for any club!

Jobs/Internships/Research

- Check out Crimson Careers for Job Postings
- Go to Career Fairs (especially startup fairs)
- Check out research on Harvard CS Website
- Think about applying CS concepts to non-CS jobs/research
  - My roommate who’s pre-med uses Python all the time in her lab!
  - My roommate who worked at LucasFilm wrote a program to automate a repetitive task

Personal Projects

- Making a Website
- Making an App
- Analyzing Data
- Automating Some Repetitive Task

Moving Away From Codespace

- Install a Text Editor (VSCode, Sublime, are good and free!)
- Start using GitHub to save work and collaborate
- Look up tutorials on how to use new technologies
- For Python, look into downloading Anaconda to use Python on your computer

Join CS50 Staff

- Emails will come out sometime next semester
- TFs: Lab, OHs, Tutorials
- CAs: OHs, Tutorials
- Helps solidify knowledge and a great way to meet new people!

cjleggett@college.harvard.edu

If you have questions!