Flask Tutorial

Rafael Castro G. Silva

Department of Computer Science
University of Copenhagen

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Learning Goals

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1. Learn what is Flask, and some basic Flask concepts
2. Learn the Model View Control (MVC) pattern
3. Learn basic Docker

Flask Introduction

What is Flask?

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  - In/for Python

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Other frameworks out there

- Ruby on Rails
- Django (Python)
- Java Spring
- Symfony (PHP)

Who uses Flask?

Who uses Flask?

airbnb

trivago

reddit

Uber

Prerequisites

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- Very basic Python
    - Variables, functions, indentation, lists, maps (dictionaries), if-then-else, for loops, class (OO programming), import libraries
- Terminal commands: `ls`, `cd`, `pwd`...
- Basic HTML
- CSS (optional)
- SQL

Flask Concepts

The App Variable

- Our app is an instance of the Flask class
- __name__ is a default configuration telling that the files of the project are in the current directory

```python
from flask import Flask

app = Flask(__name__)
```

Views (Routing)

```python
from flask import Flask

app = Flask(__name__)

@app.route("/")
def hello_world():
    return "<p>Hello, World!</p>"
```

- `@app.route("/")` is Python decorator: extends the behavior of a function
  - Tells Flask what URL should trigger our function
  - The `"/"` is the root of our web site domain
    `http://127.0.0.1:5000` takes us to this route
  - We can have other routes: `@app.route("/register")`
    `http://127.0.0.1:5000/register` takes us to this other route

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What else to learn:

- Variable rules:
  `https://flask.palletsprojects.com/en/stable/quickstart/#variable-rules`
- HTTP methods:
  `https://flask.palletsprojects.com/en/stable/quickstart/#http-methods`

Templates

File `./app.py`:

```python
from flask import render_template

@app.route('/hello/')
@app.route('/hello/<name>')
def hello(name=None):
    return render_template('hello.html', person=name)
```

File `./templates/hello.html`:

```html
<!doctype html>
<title>Hello from Flask</title>
{% if person %}
  <h1>Hello {{ person }}!</h1>
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- The function has a named argument

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- 2 routes for the same function
- The function has a named argument
- `render_template` passes the named arguments
- The template has access to the Python variables.
  Inside of `{% %}` is Jinja2 code
  Inside of `{{ }}` is to print as HTML

What else to learn about templates?

- If statements: `https://jinja.palletsprojects.com/en/stable/templates/#if`
- For loops: `https://jinja.palletsprojects.com/en/stable/templates/#for`
- Template Inheritance
  `https://jinja.palletsprojects.com/en/stable/templates/#template-inheritance`

MVC (extra)

Model View Controller

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We split the applications in:

- Model: The internal representation of the information
  - Interacts with the database
  - Business logic (e.g. transfer money)
- View: The interface for the user
  - Builds the HTML/Javascript/JSON/Text
- Controller: Links model and view
  - Routes
  - Application logic: how to handle requests

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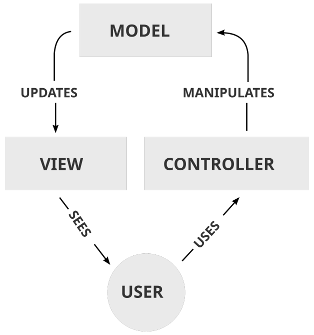

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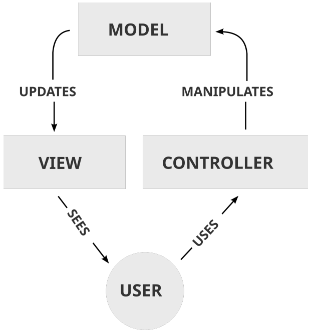

MVC in Flask

The Flask terminology does not quite fit the MVC model!

- Model: Python classes in a `models` folder
- View: Templates in the `templates` folder
- Controller:
  Flask views in a `controllers` folder, or a single `app.py` file

Docker (extra)

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Why use Docker?

- Like git, it is a standard in the industry
- It will make the life of the TAs way easier

Docker basics

Docker basics

More concepts

- Docker container: isolated process with its own file system
- Docker image: is a package that includes all of the files, binaries, libraries, and configurations to run a Docker container
    - Built on layers: make your own image on top of existing ones
- Docker volume: persistent data stores for containers

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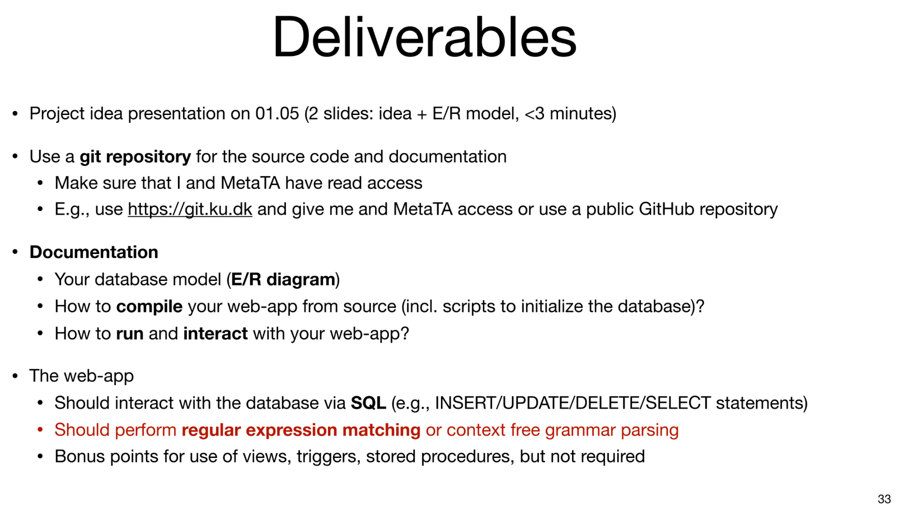
An usual setup:

- `Dockerfile`: The Docker image in which you main app will run on
- `entrypoint.sh`: The script that the Dockerfile calls when its container is starting up
- `docker-compose.yml`: Organizes all the different Docker container of your application

Let's write our web apps!

Requirements Reminder



Deliverables

- Project idea presentation on 01.05 (2 slides: idea + E/R model, <3 minutes)
- Use a **git repository** for the source code and documentation
  - Make sure that I and MetaTA have read access
  - E.g., use https://git.ku.dk and give me and MetaTA access or use a public GitHub repository
- **Documentation**
  - Your database model (**E/R diagram**)
  - How to **compile** your web-app from source (incl. scripts to initialize the database)?
  - How to **run** and **interact** with your web-app?
- The web-app
  - Should interact with the database via **SQL** (e.g., INSERT/UPDATE/DELETE/SELECT statements)
  - Should perform **regular expression matching** or context free grammar parsing
  - Bonus points for use of views, triggers, stored procedures, but not required

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Hands-on

- Follow my step-by-step guide: `https://github.com/rafaelcgs10/dis2025`
- Follow the official Flask tutorial: `https://flask.palletsprojects.com/en/stable/tutorial/`
- Study the examples from previous years in Absalon (Bank, GreenGroceries, and nft-crypto-punk)