

WEB AND DATABASE PROGRAMMING IN PYTHON

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Our Agenda

Session 1

1. Overview of **full-stack** web and mobile application development: Front-end vs. Back-end.
2. The **MVC** (Model, View, Controller) pattern used in full-stack application development.
3. Python **Flask** as a framework for supporting full-stack application development.
4. **Hands-on exercises** to develop full-stack applications using **Flask**.

Session 2

5. The rise of **platform** in digital disruption and transformation.
6. **API** as the driving force for building platform.
7. Use of API for provisioning **back-end services**.
8. Use of **Python Flask** for provisioning API services.
9. Discussion and Demonstration: Use of Flask in the **data cycle**.

How does internet application work?

Browser/ Mobile

Web Server



Frontend

App Server NodeJS/Python Php/C#/Java



Database Server SQL/NoSQL Data



```
<!DOCTYPE html>
<html lang="en">
<head>
<meta charset="utf-8">
<title> A Tiny HTML Document </title>
<link href = "styles.css" rel="stylesheet">
<script src="scripts.js"></script>
</head>
<body>
<p>Let's rock the browser, HTML5 style.</p>
</body>
</html>
```

```
for powerx,y in
    print powerx,y
    """Data given goes here"""

take input from the user
int("Select operation.")?
int("1.Add")
int("2.Subtract")
int("3.Multiply")
int("4.Divide")
int("5.Power")?
choice = Input("Enter choice(1/2/3/4/5):")

a1 = int(input("Enter first number:"))
a2 = int(input("Enter the second number:"))

choice == '1'?
print(a1, "+", a2, '=', add(a1,a2))
print(value, ..., sep=' ', end='\n', file=peo.stdout, flush=False)
```

#	ID	PHONE	POPULARNAME	PREFERREDNAME	LATITUDE	LONGITUDE
1	1194020	00994414	preferred_name_00994414	preferred_name_00994414	23.789675	120.289675
2	1194021	00994415	preferred_name_00994415	preferred_name_00994415	23.789675	120.289675
3	1194022	00994416	preferred_name_00994416	preferred_name_00994416	23.789675	120.289675
4	1194023	00994417	preferred_name_00994417	preferred_name_00994417	23.789675	120.289675
5	1194024	00994418	preferred_name_00994418	preferred_name_00994418	23.789675	120.289675
6	1194025	00994419	preferred_name_00994419	preferred_name_00994419	23.789675	120.289675
7	1194026	00994420	preferred_name_00994420	preferred_name_00994420	23.789675	120.289675
8	1194027	00994421	preferred_name_00994421	preferred_name_00994421	23.789675	120.289675
9	1194028	00994422	preferred_name_00994422	preferred_name_00994422	23.789675	120.289675
10	1194029	00994423	preferred_name_00994423	preferred_name_00994423	23.789675	120.289675
11	1194030	00994424	preferred_name_00994424	preferred_name_00994424	23.789675	120.289675
12	1194031	00994425	preferred_name_00994425	preferred_name_00994425	23.789675	120.289675
13	1194032	00994426	preferred_name_00994426	preferred_name_00994426	23.789675	120.289675

Backend

Front-end vs. Back-end

HTTP/ REST

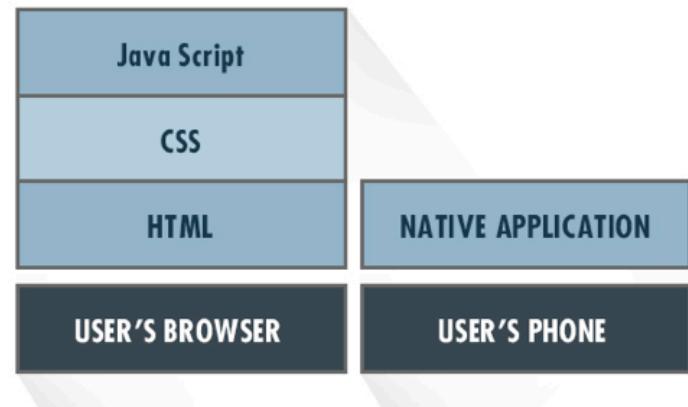


BACK-END

后台

<HTML>/
{ JSON }

THE INTERNET



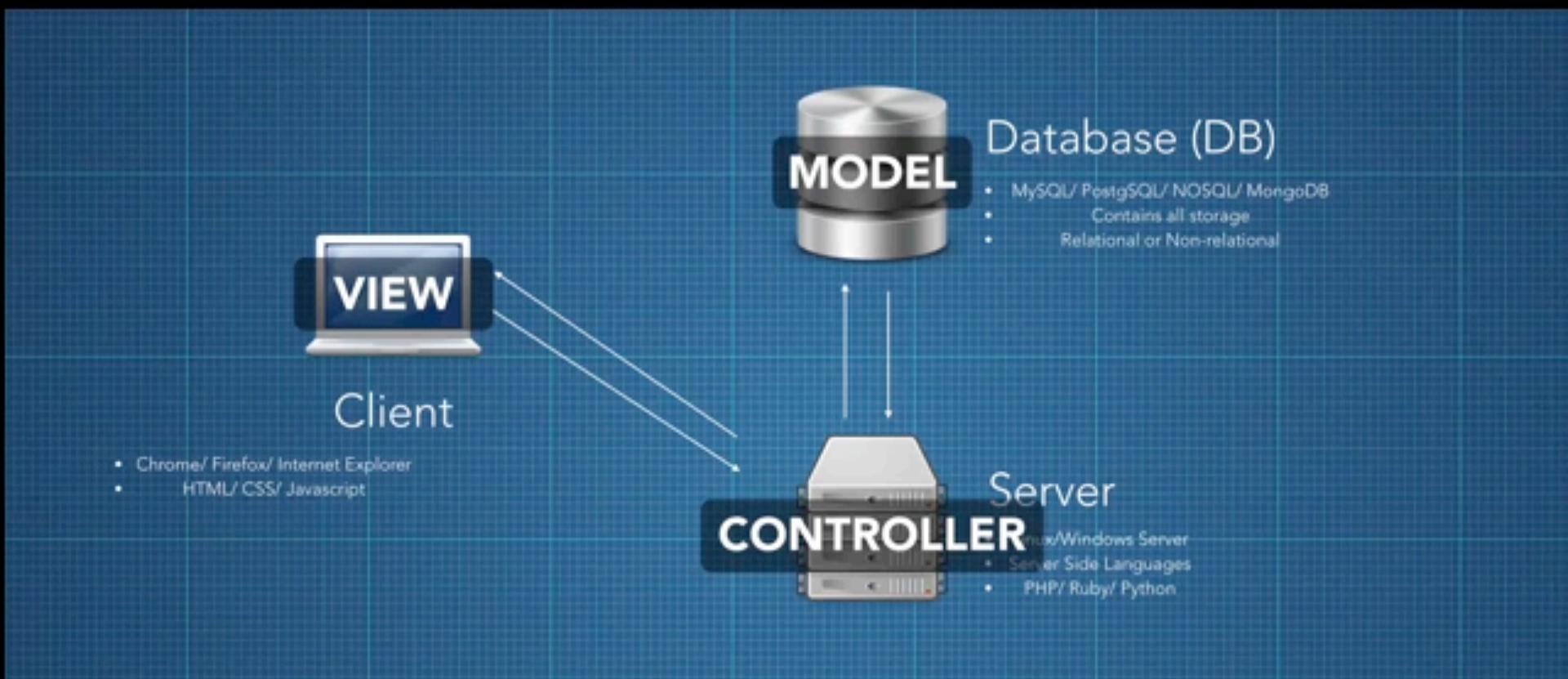
CLIENT-SIDE

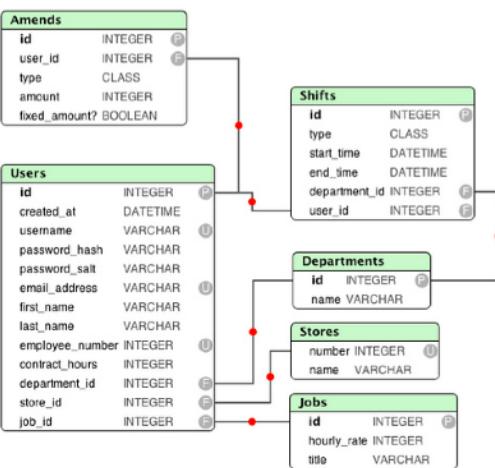
FRONT-END

前台

The **MVC** Pattern for Structuring Application Development

HOW DOES A WEBSITE WORK? THE FLOW





Source: commons.wikimedia.org



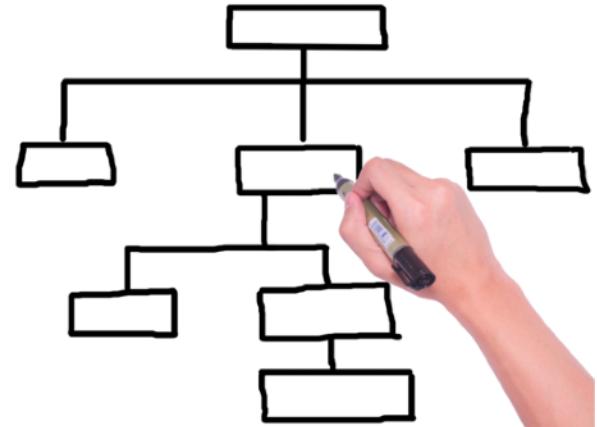
Source: [Caius Durling \(Flickr\)](https://flic.kr)

V(iew) (Flask templates)

Source: pexels.com

M(o del)
(SQL/NoSQL data models and processing functions)

C(ontroller)
(e.g. Routes, rights and authentication)



The **View** Component

Bootstrap

Build responsive, mobile-first projects on the web with the world's most popular front-end component library.

Bootstrap is an open source toolkit for developing with HTML, CSS, and JS. Quickly prototype your ideas or build your entire app with our Sass variables and mixins, responsive grid system, extensive prebuilt components, and powerful plugins built on jQuery.

[Get started](#)[Download](#)

Currently v4.3.1

2



<https://getbootstrap.com/>

Bootstrap Components for Responsive Web Page Layout and Composition.

Source: <https://getbootstrap.com/docs/4.0/components/forms/>

Email address

Enter email

We'll never share your email with anyone else.

Password

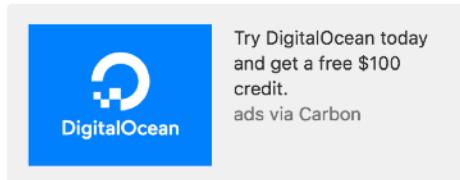
Password

Check me out

Submit

Buttons

Use Bootstrap's custom button styles for actions in forms, dialogs, and more with support for multiple sizes, states, and more.



Examples

<https://getbootstrap.com/docs/4.0/components/buttons/>

Bootstrap includes several predefined button styles, each serving its own semantic purpose, with a few extras thrown in for more control.

Primary Secondary Success Danger Warning Info Light Dark Link

```
<button type="button" class="btn btn-primary">Primary</button>
<button type="button" class="btn btn-secondary">Secondary</button>
<button type="button" class="btn btn-success">Success</button>
<button type="button" class="btn btn-danger">Danger</button>
<button type="button" class="btn btn-warning">Warning</button>
<button type="button" class="btn btn-info">Info</button>
<button type="button" class="btn btn-light">Light</button>
<button type="button" class="btn btn-dark">Dark</button>

<button type="button" class="btn btn-link">Link</button>
```

[Getting started](#)[Layout](#)[Overview](#)[Grid](#)[Utilities for layout](#)[Content](#)[Components](#)[Utilities](#)[Extend](#)

Grid system

Use our powerful mobile-first flexbox grid to build layouts of all shapes and sizes thanks to a twelve column system, five default responsive tiers, Sass variables and mixins, and dozens of predefined classes.

How it works

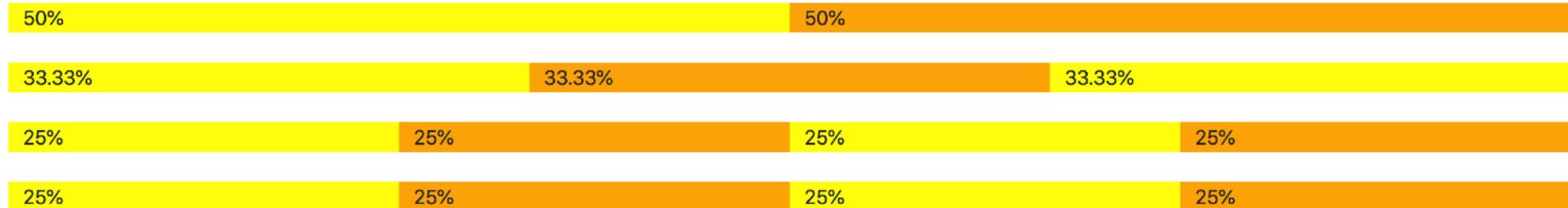
Bootstrap's grid system uses a series of containers, rows, and columns to layout and align content. It's built with [flexbox](#) and is fully responsive.

Basic Grid Structure

Resize the browser window to see the effect.

The first, second and third row will automatically stack on top of each other when the screen is less than 576px wide.

Use CDN link to access remote CSS and JS libraries for Bootstrap 4.5.2.



```
<head>
  <meta charset="UTF-8">
  <meta name="viewport" content="width=device-width, initial-scale=1.0">
  <link rel="stylesheet" href="https://maxcdn.bootstrapcdn.com/bootstrap/4.5.2/css/bootstrap.min.css">
</head>
```

Source: https://www.w3schools.com/bootstrap4/tryit.asp?filename=trybs_grid_ex_structure&stacked=h

Basic Grid Structure

Resize the browser window to see the effect.

The first, second and third row will automatically stack on top of each other when the screen is too small.

**Number of columns add up to 12
then auto resize.**



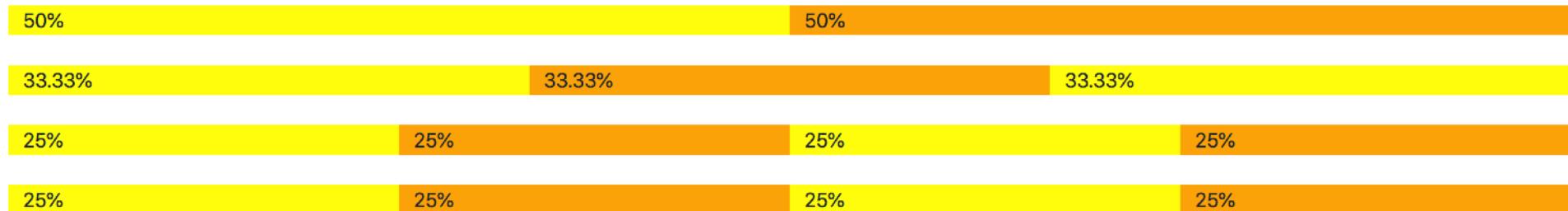
```
<div class="container-fluid">
  <!-- Control the column width, and how they should appear on different devices -->
  <div class="row">
    <div class="col-sm-6" style="background-color: #yellow;">50%</div>
    <div class="col-sm-6" style="background-color: #orange;">50%</div>
  </div>
  <br>

  <div class="row">
    <div class="col-sm-4" style="background-color: #yellow;">33.33%</div>
    <div class="col-sm-4" style="background-color: #orange;">33.33%</div>
    <div class="col-sm-4" style="background-color: #yellow;">33.33%</div>
  </div>
  <br>
```

Basic Grid Structure

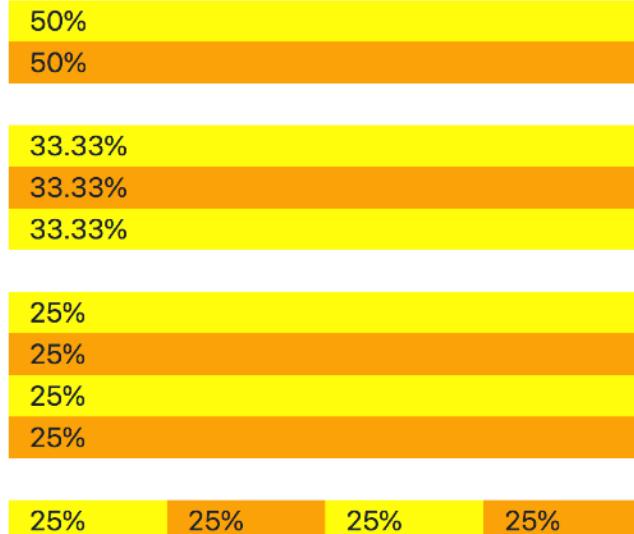
Resize the browser window to see the effect.

The first, second and third row will automatically stack on top of each other when the screen is less than 576px wide.



```
<div class="row">
  <div class="col-sm" style="background-color: #yellow;">25%</div>
  <div class="col-sm" style="background-color: #orange;">25%</div>
  <div class="col-sm" style="background-color: #yellow;">25%</div>
  <div class="col-sm" style="background-color: #orange;">25%</div>
</div>
<br>

<div class="row">
  <div class="col" style="background-color: #yellow;">25%</div>
  <div class="col" style="background-color: #orange;">25%</div>
  <div class="col" style="background-color: #yellow;">25%</div>
  <div class="col" style="background-color: #orange;">25%</div>
</div>
```



**Auto resize disabled
without column
specification.**

```
<div class="row">
  <div class="col-sm" style="background-color: #yellow;">25%</div>
  <div class="col-sm" style="background-color: #orange;">25%</div>
  <div class="col-sm" style="background-color: #yellow;">25%</div>
  <div class="col-sm" style="background-color: #orange;">25%</div>
</div>
<br>

<div class="row">
  <div class="col" style="background-color: #yellow;">25%</div>
  <div class="col" style="background-color: #orange;">25%</div>
  <div class="col" style="background-color: #yellow;">25%</div>
  <div class="col" style="background-color: #orange;">25%</div>
</div>
```

Common Bootstrap Components

Components

Over a dozen reusable components built to provide iconography, dropdowns, input groups, navigation, alerts, and much more.

Glyphicons

Available glyphs

Includes over 250 glyphs in font format from the Glyphicon Halflings set. [Glyphicons](#) Halflings are normally not available for free, but their creator has made them available for Bootstrap free of cost. As a thank you, we only ask that you include a link back to [Glyphicons](#) whenever possible.

 glyphicon glyphicon-asterisk	 glyphicon glyphicon-plus	 glyphicon glyphicon-euro	 glyphicon glyphicon-eur	 glyphicon glyphicon-minus	 glyphicon glyphicon-cloud	 glyphicon glyphicon-envelope	 glyphicon glyphicon-pencil
 glyphicon glyphicon-glass	 glyphicon glyphicon-music	 glyphicon glyphicon-search	 glyphicon glyphicon-heart	 glyphicon glyphicon-star	 glyphicon glyphicon-star-empty	 glyphicon glyphicon-user	 glyphicon glyphicon-film
 glyphicon glyphicon-th-large	 glyphicon glyphicon-th	 glyphicon glyphicon-th-list	 glyphicon glyphicon-ok	 glyphicon glyphicon-remove	 glyphicon glyphicon-zoom-in	 glyphicon glyphicon-zoom-out	 glyphicon glyphicon-off

Glyphicons
Dropdowns
Button groups
Button dropdowns
Input groups
Navs
Navbar
Breadcrumbs
Pagination
Labels
Badges
Jumbotron
Page header
Thumbnails
Alerts
Progress bars
Media object
List group
Panels
Responsive embed
Wells

<https://getbootstrap.com/docs/3.3/components/#nav>

[Getting started](#)[Layout](#)[Overview](#)[Grid](#)[Utilities for layout](#)[Content](#)[Components](#)[Utilities](#)[Extend](#)

Overview

Components and options for laying out your Bootstrap project, including wrapping containers, a powerful grid system, a flexible media object, and responsive utility classes.

Containers

Containers are the most basic layout element in Bootstrap and are **required when using our default grid system**. Choose from a responsive, fixed-width container (meaning its `max-width` changes at each breakpoint) or fluid-width (meaning it's `100%` wide all the time).

Components

[Alerts](#)[Badge](#)[Breadcrumb](#)[Buttons](#)[Button group](#)[Card](#)[Carousel](#)[Collapse](#)[Dropdowns](#)[Forms](#)

Alerts

Provide contextual feedback messages for typical user actions with the handful of available and flexible alert messages.

Examples

Alerts are available for any length of text, as well as an optional dismiss button. For proper styling, use one of the eight **required** contextual classes (e.g., `.alert-success`). For inline dismissal, use the [alerts jQuery plugin](#).

Search...

Input group

Jumbotron

List group

Media object

Modal

Navs

Navbar

Pagination

Popovers

Progress

Scrollspy

Alerts

Provide contextual feedback messages for typical user actions with the handful of available and flexible alert messages.

Examples

Alerts are available for any length of text, as well as an optional dismiss button. For proper styling, use one of the eight **required** contextual classes (e.g., `.alert-success`). For inline dismissal, use the [alerts jQuery plugin](#).

[Popovers](#)[Progress](#)[Scrollspy](#)[Spinners](#)[Toasts](#)[Tooltips](#)[Utilities](#)[Extend](#)[Migration](#)[About](#)

Bootstrap “spinners” can be used to show the loading state in your projects. They’re built only with HTML and CSS, meaning you don’t need any JavaScript to create them. You will, however, need some custom JavaScript to toggle their visibility. Their appearance, alignment, and sizing can be easily customized with our amazing utility classes.

For accessibility purposes, each loader here includes `role="status"` and a nested `Loading...`.

Border spinner

Use the border spinners for a lightweight loading indicator.



Popular Components

- a. Container
- b. Navbar
- c. Gliphicons
- d. Grid/Row/Column
- e. Thumbnail
- f. Button
- g. Form
- h. Panel/Wells/Jumbotron
- i. Carousel/Collapse
- j. Tabs
- k. Table
- l. Pagination
- m. Badges/List Group/Cards
- n. Modal/Tooltip/Popover

<https://www.w3schools.com/bootstrap4/default.asp>



Bootstrap themes, templates, and more to help you start your next project!

Start Bootstrap creates free, open source, MIT license, Bootstrap [themes](#), [templates](#), and [code snippets](#) for you to use on any project, [guides](#) to help you learn more about designing and developing with the Bootstrap framework, and premium Bootstrap products.



<https://startbootstrap.com/>

The **Database** Component



MAMP PRO MAMP Cloud Comparison Matrix Support Products ▾

Downloads

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Your local web development solution



MAMP

Free Download

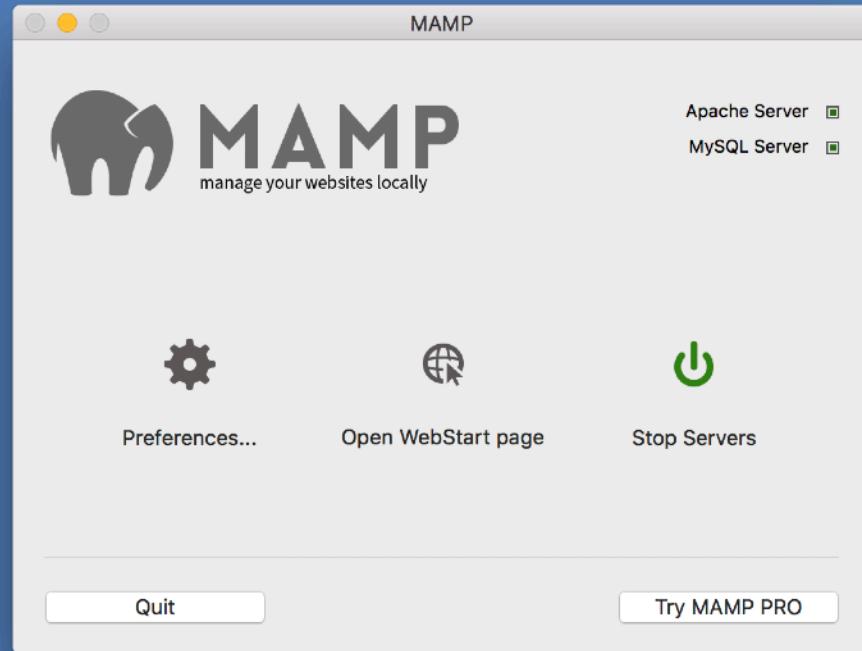


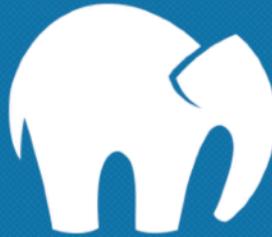
MAMP PRO

Try now

Buy now





[Start](#)[My Website](#)[phpInfo](#)[Tools](#) ▾[FAQ](#)[MAMP Website](#)[Buy MAMP PRO](#)

MAMP PRO 5

New version out now!

[Try Now](#)

PHP

[phpinfo](#) shows the current configuration of PHP.

MySQL

MySQL can be administered with [phpMyAdmin](#).

To connect to the MySQL server from your own scripts use the following connection parameters:

Host	localhost
Port	3306
User	root
Password	root
Socket	/Applications/MAMP/tmp/mysql/mysql.sock

Examples

[PHP <= 5.5.x](#)[PHP >= 5.6.x](#)[Python](#)[Perl](#)

MAMP Version

3.5 → [Update \(5.2\) available!](#)

News

[MAMP & MAMP PRO 5 out now!](#)

31th July, 2018 – MAMP & MAMP PRO 5 has just been released

Comes with new WordPress features

Snapshots, Grouped Host List, and much more...

[MAMP Cloud Function available now with MAMP 4.4](#)

February, 2018 – MAMP Cloud Function has been released

Work on different machines, move or backup your project data.

MAMP Cloud allows you to save and load your host and database data using a cloud provider, such as Dropbox. You can easily save your host and database data in the cloud and later retrieve it on another Mac, or on the same Mac, when backing up data before making changes on your host.

[BLACK FRIDAY SALE](#)

Setting MySQL on MAMP

phpMyAdmin

Recent Favorites

Filter databases by name or

- New
- acehub
- BucketList
- campus_prdev
- cellar
- cl
- com5940
- csdemo
- d734_e
- d739
- d744
- d744a
- d750a
- d751_a
- d753a
- d753e
- d753f
- d753g
- d754_e

Server: localhost:3306

Databases SQL Status Users Export Import Settings Replication VariablesCharsets Engines

General Settings

Server connection collation: utf8mb4_unicode_ci

Appearance Settings

Language: English

Theme: Original

Font size: 82%

More settings

Database server

- Server: Localhost via UNIX socket
- Server type: MySQL
- Server version: 5.5.42 - Source distribution
- Protocol version: 10
- User: root@localhost
- Server charset: UTF-8 Unicode (utf8)

Web server

- Apache/2.2.29 (Unix) mod_wsgi/3.5 Python/2.7.10 PHP/5.6.10 mod_ssl/2.2.29 OpenSSL/1.0.2h DAV/2 mod_fastcgi/2.4.6 mod_perl/2.0.9 Perl/v5.22.0
- Database client version: libmysql - mysqld 5.0.11-dev - 20120503 - Ssl: 3c686b6bcb30d36af3ac34ffd4b7b5b787fe5555 \$
- PHP extension: mysqli
- PHP version: 5.6.10

phpMyAdmin

- Version information: 4.4.10
- Documentation
- Wiki
- Official Homepage
- Contribute
- Get support
- List of changes

 phpMyAdmin

Setup SQLite for Quick Prototyping



DB Browser for SQLite

The Official home of the DB Browser for SQLite

Screenshot

The screenshot shows the SQLite Database Browser interface. At the top, there's a menu bar with options like 'New Database', 'Open Database', 'Write Changes', and 'Revert Changes'. Below the menu is a toolbar with buttons for 'Database Structure', 'Browse Data' (which is selected), 'Edit Pragmas', and 'Execute SQL'. A dropdown menu labeled 'Table:' shows 'total_members'. There are 'New Record' and 'Delete Record' buttons. The main area displays a table with three columns: 'list', 'month', and 'members'. The data shows two entries:

	list	month	members
1	gluster-board	2013-09-05	99999
2	gluster-users	2013-09-05	99999

Below the table are navigation buttons for pages 1-2 of 12 and a 'Go to:' input field set to 1. At the bottom, there's a 'SQL Log' section with a dropdown for 'Show SQL submitted by' (set to 'Application') and a 'Clear' button. The log contains the following SQL code:

```
PRAGMA foreign_keys = "1";
PRAGMA encoding
SELECT type, name, sql, tbl_name FROM sqlite_master;
SELECT COUNT(*) FROM (SELECT rowid,* FROM `total_members` ORDER BY `rowid` ASC);
SELECT rowid,* FROM `total_members` ORDER BY `rowid` ASC LIMIT 0, 50000;
```

The status bar at the bottom right indicates 'UTF-8'.

DB Browser for SQLite - /Users/yssuen/flask_apps/Classes/Flask_Web_REST_API_Programming/** Flask Workshop/04 MVC Framework and Flask-SQLAlchemy/workshop.db

New Database Open Database Write Changes Revert Changes Open Project Save Project Attach Database Close Database

Database Structure Browse Data Edit Pragmas Execute SQL

Create Table Create Index Modify Table Delete Table Print

Name Type Schema

Tables (2)

- blogs
- users

Indices (0)

Views (0)

Triggers (0)

CREATE TABLE blogs (id INTEGER NOT NULL,title VARCHAR(255),body TEXT NOT NULL)
CREATE TABLE users (id INTEGER NOT NULL,username VARCHAR(50),email VARCHAR(255))

Edit Database Cell

Mode: Text

1

Type of data currently in cell

Size of data currently in table

Apply

DB Schema

Name Type Schema

Tables (2)

- blogs
- users

Indices (0)

Views (0)

Triggers (0)

CREATE TABLE blogs (id INTEGER NOT NULL,title VARCHAR(255),body TEXT NOT NULL)
CREATE TABLE users (id INTEGER NOT NULL,username VARCHAR(50),email VARCHAR(255))

SQL Log Plot DB Schema Remote

UTF-8

The **Controller** Component

DEVELOPING FLASK APP IN PYTHONANYWHERE AND JUPYTER NOTEBOOK

FLASK DEVELOPMENT IN JUPITER NOTEBOOK

```
from flask import Flask

app = Flask(__name__)
@app.route("/")
def hello():
    return "Hello World!"

if __name__ == '__main__':
    app.run('localhost', port=9000)
```

FLASK DEVELOPMENT VIA PYTHONANYWHERE



Dashboard Consoles Files Web Tasks Databases

yiusin.pythonanywhere.com

+ Add a new web app

Configuration for yiusin.pythonanywhere.com

Reload:

Reload yiusin.pythonanywhere.com

Best before date:

We're happy to host your free website – and keep it free – for as long as you want to keep it running, but you'll need to log in at least once every three months and click the "Run until 3 months from today" button below. We'll send you an email a week before the site is disabled so that you don't forget to do that. [See here for more details.](#)

This site will be disabled on **Saturday 07 April 2018**

Run until 3 months from today

Paying users' sites stay up forever without any need to log in to keep them running.



/home/ yiusin

Directories

Enter new directory name

New directory

.local/
.virtualenvs/
mysite/



Files

Enter new file name, eg hello.py

New file

.bash_history	2018-01-02 16:17 23 bytes
.bashrc	2017-12-17 15:47 559 bytes
.gitconfig	2017-12-17 15:47 266 bytes
.profile	2017-12-17 15:47 79 bytes
.python_history	2018-01-06 10:22 49 bytes
.pythonstartup.py	2017-12-17 15:47 77 bytes
.vimrc	2017-12-17 15:47 4.6 KB
README.txt	2017-12-17 15:47 235 bytes

Upload a file

Dashboard Consoles **Files** Web Tasks Databases

Open Bash console here

0% full – 148.0 KB of your 512.0 MB quota



/home/yiusin/ msite

Directories

Enter new directory name

New directory

static/
templates/



Dashboard Consoles **Files** Web Tasks Databases

Open Bash console here

0% full – 148.0 KB of your 512.0 MB quota

Files

Enter new file name, eg hello.py

New file

flask_app.py 2018-01-29 12:45 403 bytes
 flask_app.pyc 2018-01-29 12:45 784 bytes

Upload a file

```
from flask import Flask, render_template

app = Flask(__name__)
@app.route("/")
def hello():
    return "Hello World!"

if __name__ == '__main__':
    app.run(debug=True)
```

Hands-on Workshop

Clean Blog

A Blog Theme by Start Bootstrap

**Man must explore, and this is
exploration at its greatest**

Problems look mighty small from 150 miles up

Posted by Start Bootstrap on September 24, 2021

**I believe every human has a finite
number of heartbeats. I don't intend to
waste any of mine.**

Posted by Start Bootstrap on September 18, 2021

Dashboard

ID	Title	Author	Date	EDIT	DELETE
1	MAKING REMOTE WORKS COLLABORATIVE AND ACCOUNTABLE	info	2021-05-16 14:00:45.036667	EDIT	DELETE
2	LESSON FROM THE TIKTOK DEAL: NAVIGATING THE PARALLEL INTERNET	info	2021-05-16 14:01:18.393540	EDIT	DELETE
3	COVID-19: THE GREAT ACCELERATOR OF WORK AND LEARNING	info	2021-05-16 14:01:54.522165	EDIT	DELETE
4	THINK MVA WHILE DEVELOPING MVP	bernard	2021-05-16 16:32:42.238190	EDIT	DELETE
5	THE IOT TECHNOLOGY STACK MAY BE FALLING APART	bernard	2021-05-16 16:33:08.147485	EDIT	DELETE



Thanks for joining me today!