All Projects

1. Install Homebrew

Use https://brew.sh for the latest information.

Homebrew is a package manager for macOS that simplifies the installation of software. If brew has not been installed already, install it following the below steps:

1. Open Terminal.
2. Run the following command

```
/bin/bash -c "$(curl -fsSL https://raw.githubusercontent.com/Homebrew/install/HEAD/install.sh)"
```

1 Use HomeBrew to Install VSCode on the MAC (Optional)

1. Using HomeBrew Install Visual Studio Code (VSCode) if not already installed:

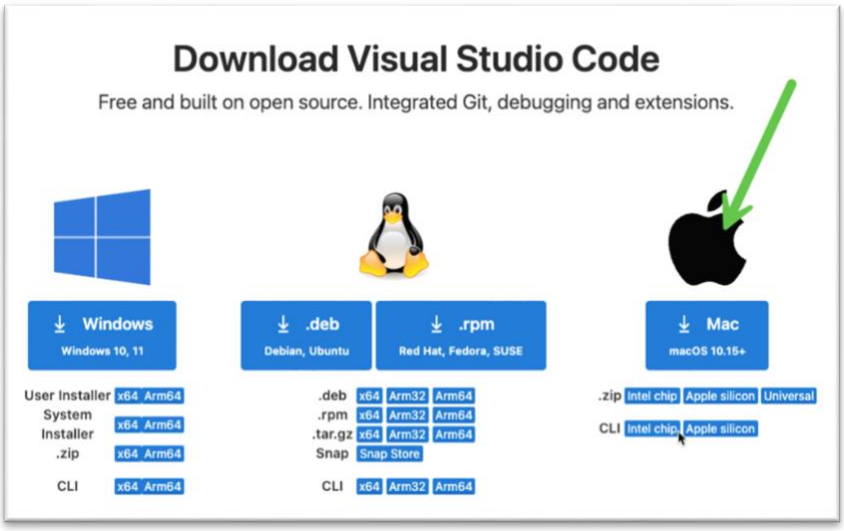
brew install --cask visual-studio-code

2 Installing Visual Studio Code

The below section shows different OS and various ways to install the VSCode.

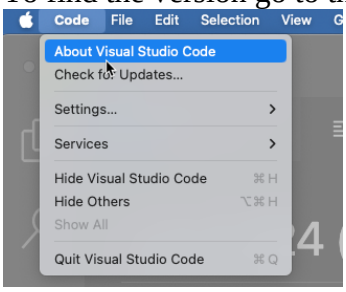
- *Direct download and Install Visual Studio Code on Mac*

Go to https://code.visualstudio.com/Download
Download Visual Studio Code, and unzip if needed.

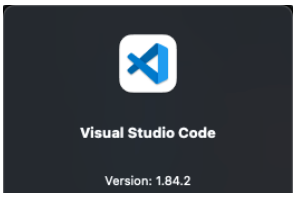


Move the app to your application folder

To find the version go to the top menu on Visual Studio, Code → About Visual Studio Code

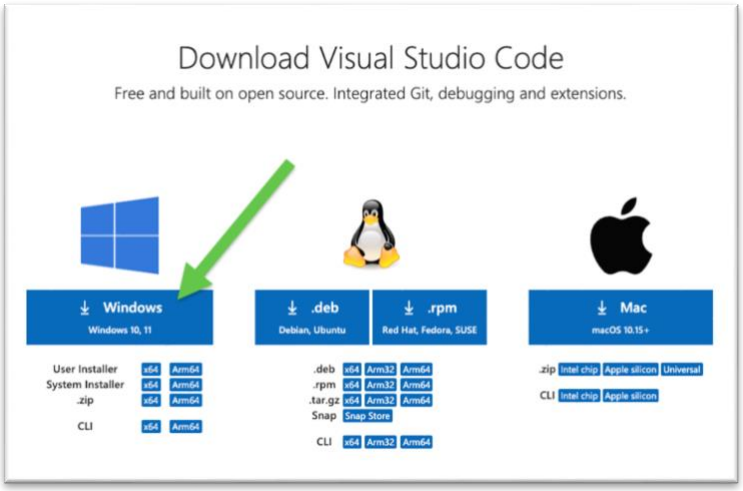


Clicking code → Check for Updates allows you to upgrade to the latest version



- Installing Visual Studio Code (Direct download on Windows)

Go to https://code.visualstudio.com/download



If you need step-by-step instructions, follow the below link to install:
https://pureinfotech.com/install-visual-studio-code-windows-10/

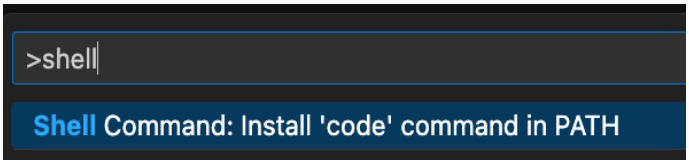
2. Install the GitHub Copilot Plugin for VS Code

GitHub Copilot assists in generating code during the project.

1. Open VSCode and go to the **Extensions** view (Cmd+Shift+X).
2. Search for **GitHub Copilot** and install the extension.
3. Authenticate your GitHub account to enable Copilot.

3. Install VS Code in your Shell for Mac

4. Go to the top of VS and select menu View → Command Palette...
5. Open the Command Palette via ⌘⇧P and type the shell command to find the Shell Command:



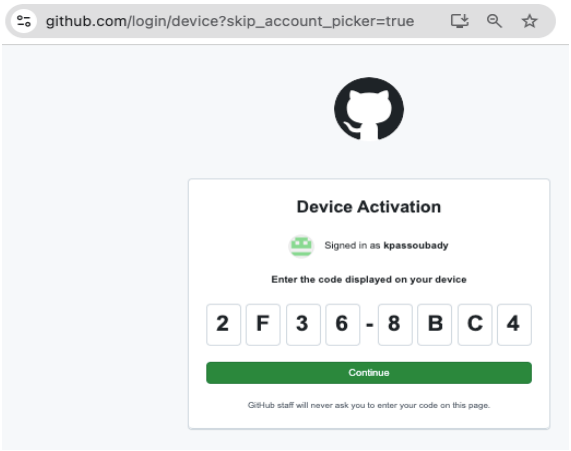
4. Github Copilot CLI

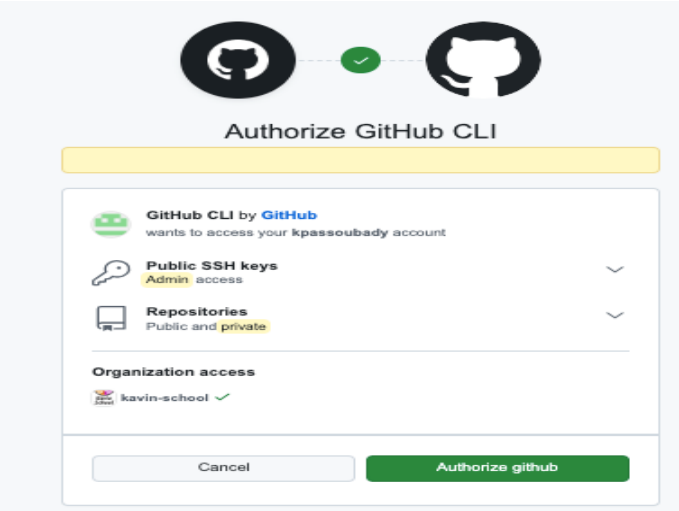
URL: https://github.com/cli/cli#installation

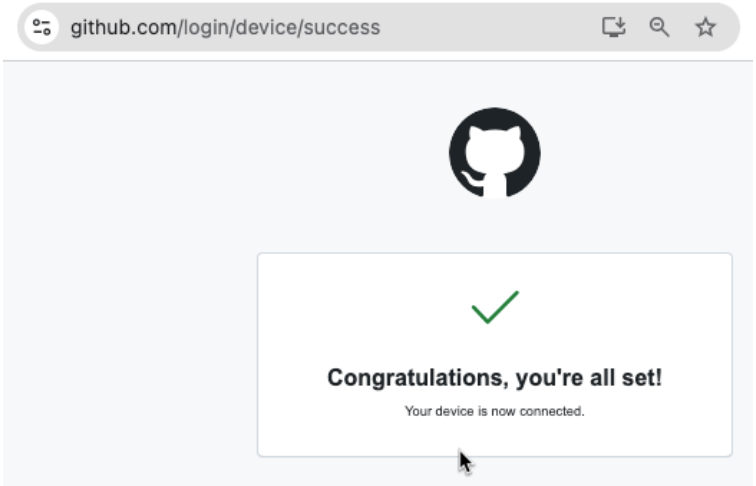
brew install gh

```
meera@Kangs-Home-Mac ~ % gh auth login

? Where do you use GitHub? GitHub.com
? What is your preferred protocol for Git operations on this host? SSH
? Upload your SSH public key to your GitHub account? /Users/meera/.ssh/kp_git_id_rsa.pub
? Title for your SSH key: kp_git_id_rsa
? How would you like to authenticate GitHub CLI? Login with a web browser

! First copy your one-time code: 2F36-8BC4
Press Enter to open https://github.com/login/device in your browser...
```

https://github.com/login/device?skip_account_picker=true







Follow the online prompts and authenticate your github account.

```
meera@Kangs-Home-Mac ~ % gh auth login

? Where do you use GitHub? GitHub.com
? What is your preferred protocol for Git operations on this host? SSH
? Upload your SSH public key to your GitHub account? /Users/meera/.ssh/kp_git_id_rsa.pub
? Title for your SSH key: kp_git_id_rsa
? How would you like to authenticate GitHub CLI? Login with a web browser

! First copy your one-time code: 2F36-8BC4
Press Enter to open https://github.com/login/device in your browser...
✓ Authentication complete.
- gh config set -h github.com git_protocol ssh
✓ Configured git protocol
✓ SSH key already existed on your GitHub account: /Users/meera/.ssh/kp_git_id_rsa.pub
✓ Logged in as kpassoubady
meera@Kangs-Home-Mac ~ %
```

5. Install GitHub Copilot Extension

You can use the below link to intall
https://docs.github.com/en/copilot/managing-copilot/configure-personal-settings/installing-github-copilot-in-the-cli

In the terminal run the below command

gh extension install github/gh-copilot

```
meera@Kangs-Home-Mac ~ % gh extension install github/gh-copilot
✓ Installed extension github/gh-copilot
```

6. Install Node

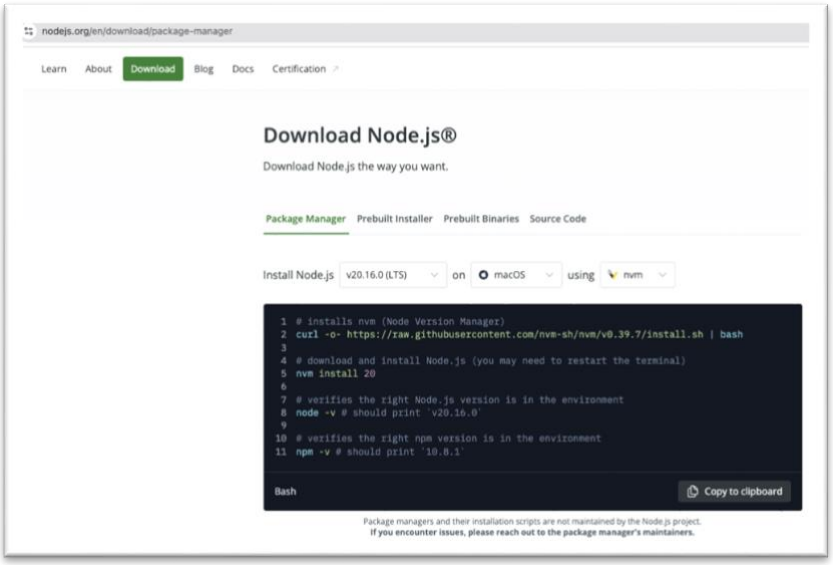
- *Installing Node using Package Manager on Mac*

Go to the below link:
https://nodejs.org/en/download/package-manager

From the dropdown, select the node version, OS, and package manager and follow the instructions to install.

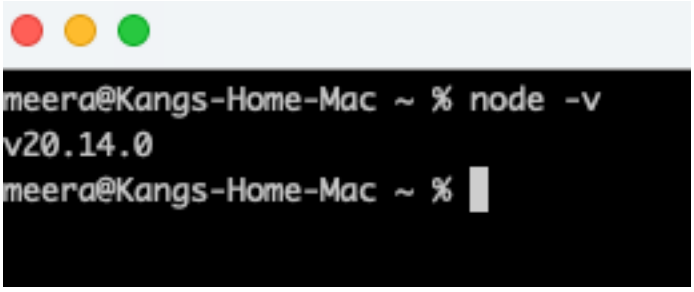
Select Node Version v20.x.y+ (recommended v20+)
Select your OS (Mac shown below)

Select your package manager (nvm is shown below)
Follow the instructions provided to install.



- *Verify Node Exists*

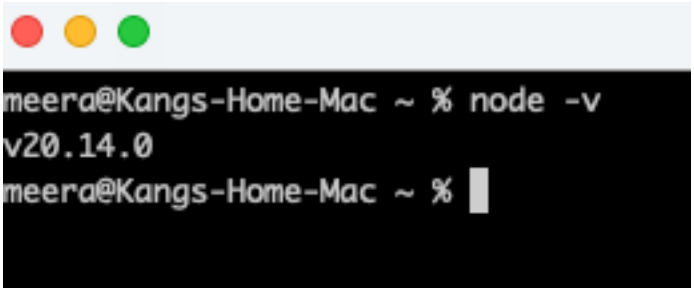
To install TypeScript, you should have NodeJS installed first.
Verify whether nodejs exists in your system.
In your terminal check **node -v**



Make sure if you have not already set in your PATH variable in your .bash_profile add the below two lines at the end of your .bash_profile file:

export LOCAL_BIN=/usr/local/bin
export PATH=.:/usr/bin:$LOCAL_BIN:$PATH

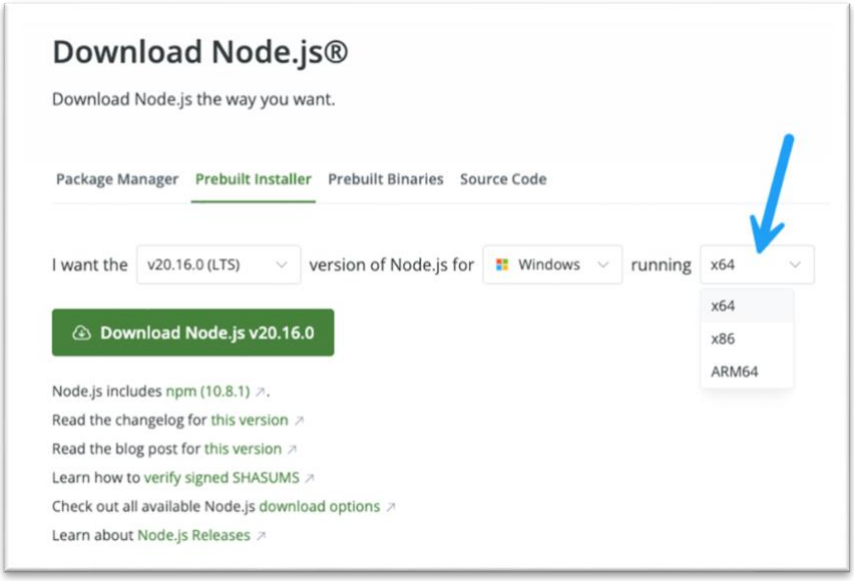
In your terminal check **node -v**



- *Install Node Using Prebuilt Installer for Windows*

Go to the below URL
https://nodejs.org/en/download/prebuilt-installer

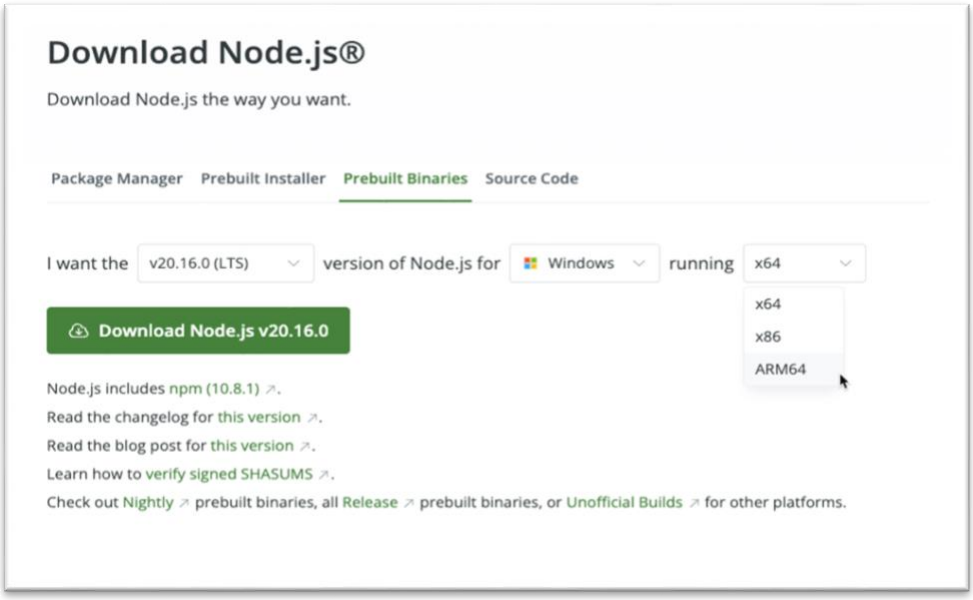
Select from the list of available node versions, OS, and processor types, then download and install the prebuilt installer.



- *Installing Node using Prebuilt Binaries for Windows*

Go to the below URL:
https://nodejs.org/en/download/prebuilt-binaries

Select the node version, OS, and your processor type, download, and install.



Project 1: Data Analysis Pipeline with Python and Pandas

MacOS Install Guide

```
meera@Kangs-Home-Mac ~ % brew --version

Homebrew 4.4.11
```

Step 1: Install Python

Ensure Python 3 is installed (preferably version 3.8 or higher).

1. Install Python using Homebrew:

brew install python

Verify the Python installation:

python3 --version

```
meera ) python3 --version
Python 3.9.6
```

pip3 --version

```
-zsh
meera@Kangs-Home-Mac copilot % pip3 --version
pip 24.3.1 from /Users/meera/Library/Python/3.9/lib/python/site-packages/pip (python 3.9)
```

Step 2: Set Up a Virtual Environment

A virtual environment isolates dependencies for your project.

1. Install `virtualenv`:

pip3 install virtualenv

```
copilot ) pip3 install virtualenv

Defaulting to user installation because normal site-packages is not writeable
Requirement already satisfied: virtualenv in /Users/meera/Library/Python/3.9/lib/python/site-packages (20.25.3)
Requirement already satisfied: distlib<1,>=0.3.7 in /Users/meera/Library/Python/3.9/lib/python/site-packages (from virtualenv) (0.3.8)
Requirement already satisfied: filelock<4,>=3.12.2 in /Users/meera/Library/Python/3.9/lib/python/site-packages (from virtualenv) (3.13.4)
Requirement already satisfied: platformdirs<5,>=3.9.1 in /Users/meera/Library/Python/3.9/lib/python/site-packages (from virtualenv) (4.2.0)

[notice] A new release of pip is available: 24.0 -> 24.3.1
[notice] To update, run: /Library/Developer/CommandLineTools/usr/bin/python3 -m pip install --upgrade pip
```

Create a virtual environment for the project:

mkdir -p copilot/project1

cd copilot/project1

python3 -m venv data_pipeline_env

```
copilot ) python3 -m venv data_pipeline_env

copilot ) ls -ltr
total 0
drwxr-xr-x  6 meera  staff  192 Dec 14 17:31 data_pipeline_env/
```

Activate the virtual environment:

source data_pipeline_env/bin/activate

Step 3: Install Required Python Libraries

Install the libraries needed for the project.

1. Create a `requirements.txt` file with the following content:

```
pandas
matplotlib
seaborn
jupyter
```

requirements.txt — copilot

```
1 pandas
2 matplotlib
3 seaborn
4 jupyter
5
```

pip3 install -r requirements.txt

Step 4: Install Jupyter Notebook

Jupyter Notebook will be used to write and present the summary report.

1. Install Jupyter Notebook:

pip3 install notebook

```
copilot ) pip install notebook

Collecting notebook
  Downloading notebook-7.3.1-py3-none-any.whl (13.2 MB)
     |                                        | 13.2 MB 5.2 MB/s
```

2. Optionally upgrade pip if needed

data_pipeline_env/bin/python3 -m pip install --upgrade pip

```
WARNING: You are using pip version 21.2.4; however, version 24.3.1 is available.
You should consider upgrading via the '/Users/meera/copilot/data_pipeline_env/bin/python3 -m pip install --upgrade pip' command.
copilot ) data_pipeline_env/bin/python3 -m pip install --upgrade pip
Requirement already satisfied: pip in ./data_pipeline_env/lib/python3.9/site-packages (21.2.4)
Collecting pip
  Downloading pip-24.3.1-py3-none-any.whl (1.8 MB)
     |                                        | 1.8 MB 6.7 MB/s
Installing collected packages: pip
  Attempting uninstall: pip
    Found existing installation: pip 21.2.4
    Uninstalling pip-21.2.4:
      Successfully uninstalled pip-21.2.4
Successfully installed pip-24.3.1
copilot )
```

3. Verify installation:

jupyter --version

```
(data_pipeline_env) meera@Kangs-Home-Mac copilot % jupyter --version

Selected Jupyter core packages...
IPython          : 8.18.1
ipykernel        : 6.29.5
ipywidgets       : 8.1.5
jupyter_client   : 8.6.3
jupyter_core     : 5.7.2
jupyter_server   : 2.14.2
/Users/meera/copilot/data_pipeline_env/lib/python3.9/site-packages/urllib3/__init__.py:35: NotOpenSSLWarning: urllib3 v2 only supports OpenSSL 1.1.
1+, currently the 'ssl' module is compiled with 'LibreSSL 2.8.3'. See: https://github.com/urllib3/urllib3/issues/3020
  warnings.warn(
jupyterlab       : 4.3.3
nbclient         : 0.10.1
nbconvert        : 7.16.4
nbformat         : 5.10.4
notebook         : 7.3.1
qtconsole        : not installed
traitlets        : 5.14.3
```

pip3 list | grep jupyter

```
(data_pipeline_env) meera@Kangs-Home-Mac copilot % pip3 list | grep jupyter
jupyter                   1.1.1
jupyter_client            8.6.3
jupyter-console           6.6.3
jupyter_core              5.7.2
jupyter-events            0.10.0
jupyter-lsp               2.2.5
jupyter_server            2.14.2
jupyter_server_terminals  0.5.3
jupyterlab                4.3.3
jupyterlab_pygments       0.3.0
jupyterlab_server         2.27.3
jupyterlab_widgets        3.0.13
```

Step 5: Test the Setup

1. Create a new Python script to test your environment:

touch test_pipeline.py

2. Open the script in VSCode using the terminal using the below command or directly from VSC:

code test_pipeline.py

3. Add the following lines of code to test Pandas and Matplotlib:

```
import pandas as pd
import matplotlib.pyplot as plt

print("Pandas and Matplotlib are working!")
```

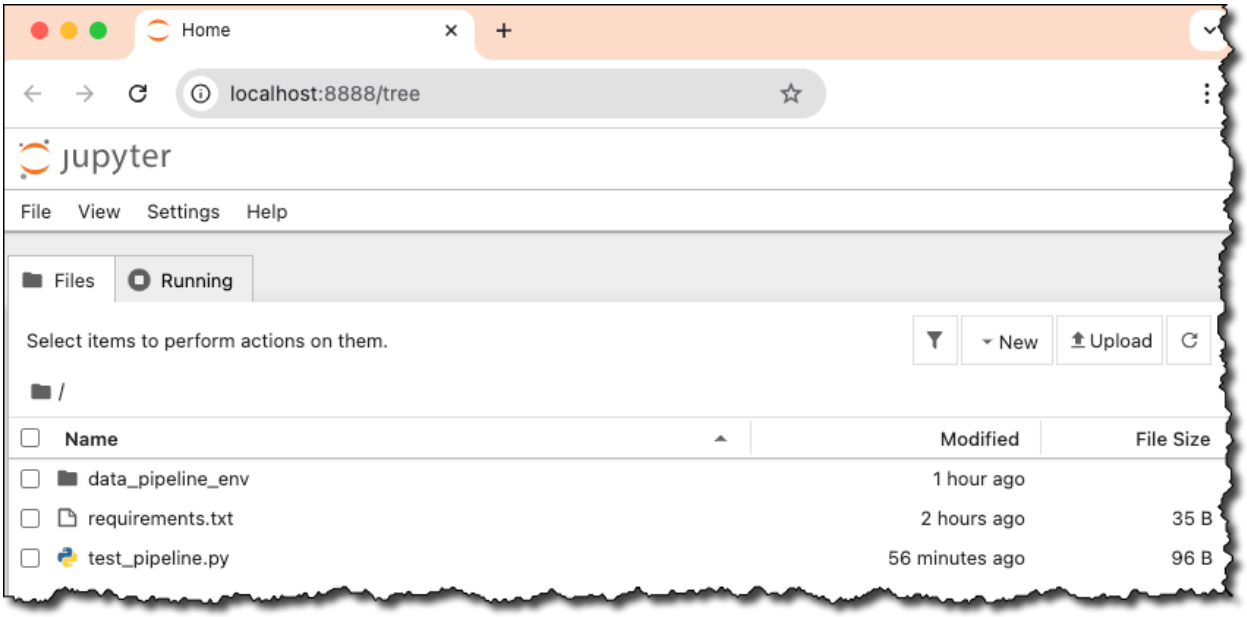
python test_pipeline.py

```
(data_pipeline_env) meera@Kangs-Home-Mac copilot % python ./test_pipeline.py
Pandas and Matplotlib are working!
```

Step 6: Start Jupyter Notebook

1. Launch Jupyter Notebook:

jupyter notebook



Press Ctrl+S

Shut down this Jupyter server (y/[n])? Y

Step 7: Optional: Install Additional Tools

1. Install Pandas Profiling for Quick EDA

pip3 install pandas-profiling

2. Install Seaborn for Advanced Visualizations

pip3 install seaborn

Project 2: Full-Stack Web Application with React and Node.js

MacOS Install Guide

Step 1: Install Homebrew

Provided the instructions under All Projects

Step 2: Install Node.js and npm

Provided the instructions under All Projects

Project Setup

1 Install Create React App

Create React App is a tool for bootstrapping React applications.

mkdir -p copilot/project2
cd copilot/project2

1. Globally install `create-react-app`

npm install -g create-react-app
create-react-app –version

```
project2 ) create-react-app --version
5.0.1
```

2 Set Up the Frontend

1. Create a React project:

npx create-react-app frontend

```
project2 ) npx create-react-app frontend

Creating a new React app in /Users/meera/copilot/project2/frontend.

Installing packages. This might take a couple of minutes.
Installing react, react-dom, and react-scripts with cra-template...
```

2. Navigate into the project directory:

cd frontend

```
project2 ) cd frontend/
frontend ) pwd
/Users/meera/copilot/project2/frontend
```

3. Install Axios in the React frontend:

```
npm install axios
```

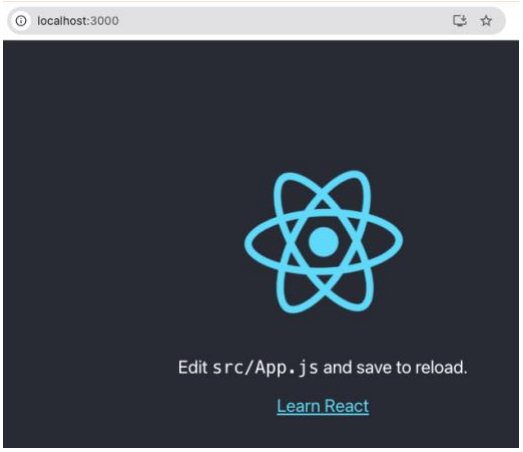
4. Use Axios to make API calls to the backend in your React components.

```
backend ) pwd
/Users/meera/copilot/project2/backend
backend ) cd ../frontend
          npm install axios


added 4 packages, changed 1 package, and audited 1325 packages in 3s

265 packages are looking for funding
  run `npm fund` for details

8 vulnerabilities (2 moderate, 6 high)

To address all issues (including breaking changes), run:
  npm audit fix --force

Run `npm audit` for details.
```

5. Start the development server:

npm start

6. Confirm the React development server is running at http://localhost:3000



3 Set Up the Backend

1. Create a folder for the backend:

cd copilot/project2/
mkdir backend
cd backend

```
meera ) cd copilot/project2/
project2 ) mkdir backend
project2 ) cd backend/
backend ) pwd
/Users/meera/copilot/project2/backend
backend )
```

2. Initialize a new Node.js project:

npm init -y

```
backend ) npm init -y

Wrote to /Users/meera/copilot/project2/backend/package.json:

{
  "name": "backend",
  "version": "1.0.0",
  "main": "index.js",
  "scripts": {
    "test": "echo \"Error: no test specified\" && exit 1"
  },
  "keywords": [],
  "author": "",
  "license": "ISC",
  "description": ""
}
```

3. Install Express and other dependencies:

npm install express body-parser cors jsonwebtoken bcryptjs dotenv

```
backend ) npm install express body-parser cors jsonwebtoken bcryptjs

added 89 packages, and audited 90 packages in 2s

17 packages are looking for funding
  run `npm fund` for details

found 0 vulnerabilities
```

4. Install development dependencies:

npm install --save-dev nodemon

```
backend ) npm install --save-dev nodemon


added 28 packages, and audited 118 packages in 2s

21 packages are looking for funding
  run `npm fund` for details

found 0 vulnerabilities
```

5. Create an entry file (e.g., index.js):

touch index.js

```
backend ) touch index.js

backend ) ls -ltr
total 120
drwxr-xr-x  116 meera  staff   3712 Dec 14 22:46 node_modules/
-rw-r--r--    1 meera  staff    431 Dec 14 22:46 package.json
-rw-r--r--    1 meera  staff  50072 Dec 14 22:46 package-lock.json
-rw-r--r--    1 meera  staff    330 Dec 14 22:51 index.js
```

4 Implement API Endpoints

1. Open `index.js` in a code editor (e.g., VSCode), Open the script in VSCode using the terminal using the below command or directly from VSC.

code index.js

2. Add a basic Express server setup (index.js):

```
const express = require('express');
const bodyParser = require('body-parser');
const cors = require('cors');

const app = express();
app.use(bodyParser.json());
app.use(cors());

app.get('/', (req, res) => {
  res.send('Backend is working!');
});

app.listen(5000, () => {
  console.log('Server is running on port 5000');
});
```

3. Run the backend server:

node index.js

4. Confirm the server is running at http://localhost:5000.

```
backend ) node index.js
  express:application set "x-powered-by" to true +0ms
  express:application set "etag" to 'weak' +2ms
  express:application set "etag fn" to [Function: generateETag] +0ms
  express:application set "env" to 'develop' +0ms
  express:application set "query parser" to 'extended' +1ms
  express:application set "query parser fn" to [Function: parseExtendedQueryString] +0ms
  express:application set "subdomain offset" to 2 +0ms
  express:application set "trust proxy" to false +0ms
  express:application set "trust proxy fn" to [Function: trustNone] +0ms
  express:application booting in develop mode +0ms
  express:application set "view" to [Function: View] +0ms
  express:application set "views" to '/Users/meera/copilot/project2/backend/views' +0ms
  express:application set "jsonp callback name" to 'callback' +0ms
  express:router use '/' query +1ms
  express:router:layer new '/' +0ms
  express:router use '/' expressInit +0ms
  express:router:layer new '/' +0ms
  express:router use '/' jsonParser +0ms
  express:router:layer new '/' +0ms
  express:router use '/' corsMiddleware +1ms
  express:router:layer new '/' +0ms
  express:router:route new '/' +0ms
  express:router:layer new '/' +0ms
  express:router:route get '/' +0ms
  express:router:layer new '/' +0ms
Server is running on port 5000
```

Project 3: Machine Learning Model Deployment with Flask

MacOS Install Guide

Step 1: Install Homebrew

See installation instructions under All Projects

Step 2: Install Python

Ensure Python 3 is installed (preferably version 3.8 or higher).

Install Python using Homebrew:

brew install python

Verify the Python installation:

python3 --version

```
meera ) python3 --version
Python 3.9.6
```

pip3 --version

```
-zsh
meera@Kangs-Home-Mac copilot % pip3 --version
pip 24.3.1 from /Users/meera/Library/Python/3.9/lib/python/site-packages/pip (python 3.9)
```

Project Setup

Step 1: Create a project folder

Open your terminal

mkdir -p copilot/project3
cd copilot/project3

```
meera ) cd copilot/project3
project3 ) ls -ltr
total 0
project3 ) pwd
/Users/meera/copilot/project3
```

Step 2: Create a Virtual Environment

Create a virtual environment in the project directory

python3 -m venv venv

Activate the virtual environment:

source venv/bin/activate

```
meera@Kangs-Home-Mac project3 % source venv/bin/activate

(venv) meera@Kangs-Home-Mac project3 % ls -ltr
total 0
drwxr-xr-x  7 meera  staff  224 Dec 15 21:54 venv
(venv) meera@Kangs-Home-Mac project3 %
```

Step 3: Create the requirements.txt File

Add the following dependencies in the requirements.txt

```
Flask==3.0.0
pandas==2.0.3
scikit-learn==1.3.2
numpy==1.26.0
joblib==1.3.2
requests==2.31.0
gunicorn==21.2.0
```

```
(venv) meera@Kangs-Home-Mac project3 % ls -ltr
total 8
drwxr-xr-x  7 meera  staff  224 Dec 15 21:54 venv
-rw-r--r--  1 meera  staff  109 Dec 15 22:00 requirements.txt
(venv) meera@Kangs-Home-Mac project3 %
```

Step 4: Install Dependencies

Run the following command to install the dependencies:

pip install -r requirements.txt

Step 5: Verify Installation

Check installed libraries:

pip freeze

```
(venv) meera@Kangs-Home-Mac project3 % pip freeze

blinker==1.9.0
certifi==2024.12.14
charset-normalizer==3.4.0
click==8.1.7
Flask==3.0.0
gunicorn==21.2.0
idna==3.10
importlib_metadata==8.5.0
itsdangerous==2.2.0
Jinja2==3.1.4
joblib==1.3.2
MarkupSafe==3.0.2
numpy==1.26.0
packaging==24.2
pandas==2.0.3
python-dateutil==2.9.0.post0
pytz==2024.2
requests==2.31.0
scikit-learn==1.3.2
scipy==1.13.1
six==1.17.0
threadpoolctl==3.5.0
tzdata==2024.2
urllib3==2.2.3
Werkzeug==3.1.3
zipp==3.21.0
```

Step 6: Add a Sample Dataset (sample_data.csv)

Create a small CSV file to simulate training data:

```
feature1,feature2,target
1,2,0
2,3,1
3,4,0
4,5,1
```

Step 7: Train the Model (`train_model.py`)

This script will preprocess the data, train a simple model, and save it.

```
import pandas as pd
import sklearn

from sklearn.model_selection import train_test_split
from sklearn.linear_model import LogisticRegression
from joblib import dump

print(sklearn.__version__)

# Load data
data = pd.read_csv("sample_data.csv")
X = data[['feature1', 'feature2']]
y = data['target']

# Split data
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, random_state=42)

# Train a simple model
model = LogisticRegression()
model.fit(X_train, y_train)

# Save the trained model
dump(model, 'model.pkl')
print("Model trained and saved as 'model.pkl'")
```

To train the model run in the terminal

python3 train_model.py

Step 8: Create a Flask API (app.py)

This script loads the model and exposes a prediction endpoint.

```
from flask import Flask, request, jsonify
from joblib import load

app = Flask(__name__)

# Load the trained model
model = load("model.pkl")

@app.route('/')
def home():
    return "Flask API for Model Predictions!"

@app.route('/predict', methods=['POST'])
def predict():
    data = request.json
    features = [data['feature1'], data['feature2']]
    prediction = model.predict([features])
    return jsonify({'prediction': int(prediction[0])})

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

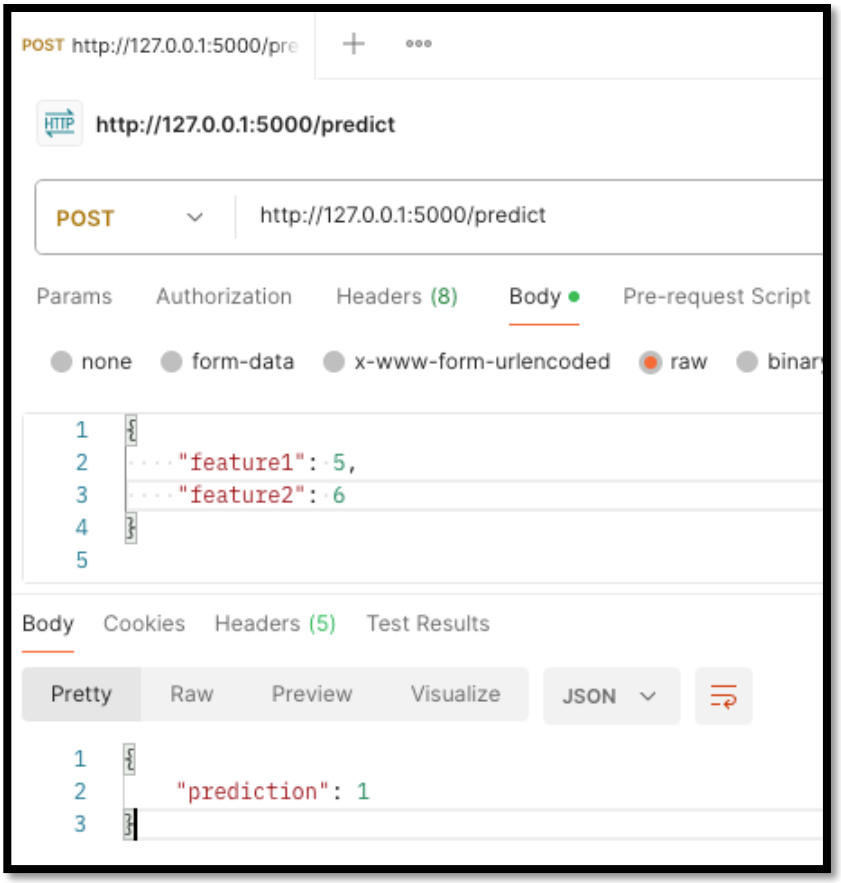
Step 9: Test the API

Using cURL to test:

curl -X POST -H "Content-Type: application/json" -d '{"feature1":3, "feature2":4}' http://127.0.0.1:5000/predict

Send a POST request to the `/predict` endpoint with JSON data

Using Postman:



Project 4: Automated Testing for Web Application using Selenium

Step 1: Install Java Development Kit (JDK)

Open the terminal and install OpenJDK (any version above openjdk11+ is good, but keep 21 or latest 23)

brew install openjdk@21

```
meera ) brew install openjdk@21
==> Downloading https://ghcr.io/v2/homebrew/core/openjdk/21/manifests/21.0.5
##################################################################################################################
==> Fetching openjdk@21
==> Downloading https://ghcr.io/v2/homebrew/core/openjdk/21/blobs/sha256:1f6b28a4ce616c847f4b6360ccc4632a3862ca8e
##################################################################################################################
==> Pouring openjdk@21--21.0.5.sonoma.bottle.tar.gz
==> Caveats
For the system Java wrappers to find this JDK, symlink it with
  sudo ln -sfn /usr/local/opt/openjdk@21/libexec/openjdk.jdk /Library/Java/JavaVirtualMachines/openjdk-21.jdk

openjdk@21 is keg-only, which means it was not symlinked into /usr/local,
because this is an alternate version of another formula.

If you need to have openjdk@21 first in your PATH, run:
  echo 'export PATH="/usr/local/opt/openjdk@21/bin:$PATH"' >> ~/.zshrc

For compilers to find openjdk@21 you may need to set:
  export CPPFLAGS="-I/usr/local/opt/openjdk@21/include"
==> Summary
🍺  /usr/local/Cellar/openjdk@21/21.0.5: 600 files, 329.5MB
==> Running `brew cleanup openjdk@21`...
Disable this behaviour by setting HOMEBREW_NO_INSTALL_CLEANUP.
Hide these hints with HOMEBREW_NO_ENV_HINTS (see `man brew`).
```

sudo ln -sfn /usr/local/opt/openjdk@21/libexec/openjdk.jdk /Library/Java/JavaVirtualMachines/openjdk-21.jdk

If you need to have openjdk@21 first in your PATH, run:
echo 'export PATH="/usr/local/opt/openjdk@21/bin:$PATH"' >> ~/.zshrc

For compilers to find openjdk@21 you may need to set:
export CPPFLAGS="-I/usr/local/opt/openjdk@21/include"

Set JAVA_HOME in your **~/.zshrc**

export JAVA_HOME=`/usr/libexec/java_home -v 21`

source ~/.zshrc

Validate java installed correctly

java -version

```
meera@Kangs-Home-Mac ~ % java -version
openjdk version "21.0.5" 2024-10-15
OpenJDK Runtime Environment Homebrew (build 21.0.5)
OpenJDK 64-Bit Server VM Homebrew (build 21.0.5, mixed mode, sharing)
```

Step 2: Install Maven

Install Maven using Homebrew:

brew install maven

```
-zsh
meera@Kangs-Home-Mac ~ % brew install maven

==> Downloading https://formulae.brew.sh/api/formula.jws.json

==> Downloading https://formulae.brew.sh/api/cask.jws.json

==> Downloading https://ghcr.io/v2/homebrew/core/maven/manifests/3.9.9
##################################################################################################
==> Fetching maven
==> Downloading https://ghcr.io/v2/homebrew/core/maven/blobs/sha256:019b91415dce288368bd462ebbfa009a262f7d9a4eb05f1bf64a4d
##################################################################################################
==> Pouring maven--3.9.9.sonoma.bottle.tar.gz
🍺  /usr/local/Cellar/maven/3.9.9: 94 files, 10.2MB
==> Running `brew cleanup maven`...
Disable this behaviour by setting HOMEBREW_NO_INSTALL_CLEANUP.
Hide these hints with HOMEBREW_NO_ENV_HINTS (see `man brew`).
meera@Kangs-Home-Mac ~ % mvn -v
Apache Maven 3.8.5 (3599d3414f046de2324203b78ddcf9b5e4388aa0)
Maven home: /Users/meera/tools/apache-maven-3.8.5
Java version: 21.0.5, vendor: Homebrew, runtime: /usr/local/Cellar/openjdk@21/21.0.5/libexec/openjdk.jdk/Contents/Home
Default locale: en_US, platform encoding: UTF-8
OS name: "mac os x", version: "15.2", arch: "x86_64", family: "mac"
```

Pay attention which version is installed and add the below lines into your **~/.zshrc**

export M2_HOME=/usr/local/Cellar/maven/3.9.9
export M2=$M2_HOME/bin
export PATH=$M2:$PATH

Validate Maven installed correctly

mvn -v

```
meera@Kangs-Home-Mac ~ % mvn -v
Apache Maven 3.9.9 (8e8579a9e76f7d015ee5ec7bfcdc97d260186937)
Maven home: /usr/local/Cellar/maven/3.9.9/libexec
Java version: 21.0.5, vendor: Homebrew, runtime: /usr/local/Cellar/openjdk@21/21.0.5/libexec/openjdk.jdk/Contents/Home
Default locale: en_US, platform encoding: UTF-8
OS name: "mac os x", version: "15.2", arch: "x86_64", family: "mac"
```

Project Setup

Open your terminal

mkdir -p copilot/project4
cd copilot/project4

Create a maven default project using the below command

mvn archetype:generate -DgroupId=com.amgen.app -DartifactId=ui-tests -DarchetypeArtifactId=maven-archetype-quickstart -DarchetypeVersion=1.5 -DinteractiveMode=false

```
meera@Kangs-Home-Mac project4 % mvn archetype:generate -DgroupId=com.amgen.app -DartifactId=ui-tests -DarchetypeArtifactId=maven-archetype-quickstart -DarchetypeVersion=1.5
-DinteractiveMode=false

[INFO] Scanning for projects...
Downloading from central: https://repo.maven.apache.org/maven2/org/apache/maven/plugins/maven-install-plugin/3.1.2/maven-install-plugin-3.1.2.pom
Downloaded from central: https://repo.maven.apache.org/maven2/org/apache/maven/plugins/maven-install-plugin/3.1.2/maven-install-plugin-3.1.2.pom (8.5 kB at 17 kB/s)
```

```
[INFO] ----------------------------------------------------------------------------
[INFO] Using following parameters for creating project from Archetype: maven-archetype-quickstart:1.5
[INFO] ----------------------------------------------------------------------------
[INFO] Parameter: groupId, Value: com.amgen.app
[INFO] Parameter: artifactId, Value: ui-tests
[INFO] Parameter: version, Value: 1.0-SNAPSHOT
[INFO] Parameter: package, Value: com.amgen.app
[INFO] Parameter: packageInPathFormat, Value: com/amgen/app
[INFO] Parameter: junitVersion, Value: 5.11.0
[INFO] Parameter: package, Value: com.amgen.app
[INFO] Parameter: groupId, Value: com.amgen.app
[INFO] Parameter: artifactId, Value: ui-tests
[INFO] Parameter: javaCompilerVersion, Value: 17
[INFO] Parameter: version, Value: 1.0-SNAPSHOT
[WARNING] Don't override file /Users/meera/copilot/project4/ui-tests/src/main/java/com/amgen/app
[WARNING] Don't override file /Users/meera/copilot/project4/ui-tests/src/test/java/com/amgen/app
[WARNING] CP Don't override file /Users/meera/copilot/project4/ui-tests/.mvn
[INFO] Project created from Archetype in dir: /Users/meera/copilot/project4/ui-tests
[INFO] ------------------------------------------------------------------------
[INFO] BUILD SUCCESS
[INFO] ------------------------------------------------------------------------
[INFO] Total time:  6.675 s
[INFO] Finished at: 2024-12-16T22:50:07-05:00
[INFO] ------------------------------------------------------------------------
meera@Kangs-Home-Mac project4 %
```

The above command creates bunch of folders and the default maven project

Open the project4 in VSCode, edit the pom.xml and add the below dependencies in the existing pom.xml before the closing </dependencies>

.gitignore project1 | pom.xml U | AppTest.java U

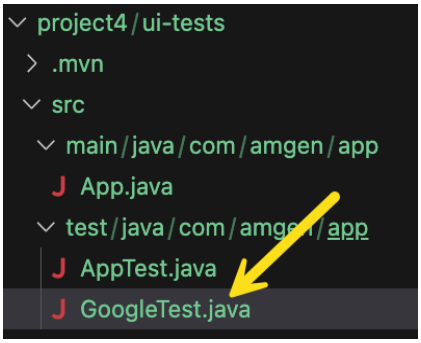
project4 > ui-tests > pom.xml > project > dependencies

```
32
33  <dependencies>
34    <dependency>
35      <groupId>org.junit.jupiter</groupId>
36      <artifactId>junit-jupiter-api</artifactId>
37      <scope>test</scope>
38    </dependency>
39    <!-- Optionally: parameterized tests support -->
40    <dependency>
41      <groupId>org.junit.jupiter</groupId>
42      <artifactId>junit-jupiter-params</artifactId>
43      <scope>test</scope>
44    </dependency>
45
46    <!-- Selenium WebDriver -->
47    <dependency>
48      <groupId>org.seleniumhq.selenium</groupId>
49      <artifactId>selenium-java</artifactId>
50      <version>4.14.0</version>
51    </dependency>
52
```

```
<!-- Selenium WebDriver -->
<dependency>
  <groupId>org.seleniumhq.selenium</groupId>
  <artifactId>selenium-java</artifactId>
  <version>4.14.0</version>
</dependency>

<!-- TestNG for testing -->
<dependency>
  <groupId>org.testng</groupId>
  <artifactId>testng</artifactId>
  <version>7.8.0</version>
  <scope>test</scope>
</dependency>

<!-- WebDriver Manager to simplify driver management -->
<dependency>
  <groupId>io.github.bonigarcia</groupId>
  <artifactId>webdrivermanager</artifactId>
  <version>5.7.0</version>
</dependency>

<!-- Jackson Databind (for JSON handling if needed) -->
<dependency>
```

```
    <groupId>com.fasterxml.jackson.core</groupId>
    <artifactId>jackson-databind</artifactId>
    <version>2.15.2</version>
  </dependency>

  <!-- Logging (SLF4J and Logback) -->
  <dependency>
    <groupId>org.slf4j</groupId>
    <artifactId>slf4j-api</artifactId>
    <version>2.0.7</version>
  </dependency>
  <dependency>
    <groupId>ch.qos.logback</groupId>
    <artifactId>logback-classic</artifactId>
    <version>1.4.11</version>
  </dependency>
```

In the VSCode goto the folder project4/ui-tests/src/test/java/com/amgen/app directory
Create GoogleTest.java



Add the below code in the GoogleTest.java

```
package com.amgen.app;


import org.testng.annotations.Test;
import org.openqa.selenium.WebDriver;
import org.openqa.selenium.chrome.ChromeDriver;
import org.testng.Assert;

import io.github.bonigarcia.wdm.WebDriverManager;
```

```java
public class GoogleTest {
    @Test
    public void validatePageTitle() {
        System.out.println("validatePageTitle");
        WebDriverManager.chromedriver().setup();
        WebDriver driver = new ChromeDriver();
        driver.get("https://google.com");
        System.out.println("Page title is: " + driver.getTitle());
        Assert.assertEquals(driver.getTitle(), "Google");
        driver.quit();
    }
}
```

In the terminal run the below mvn command

cd project4/ui-tests
mvn test

All the dependencies will get downloaded and then the build will be success as shown below

```
meera@Kangs-Home-Mac ui-tests % pwd
/Users/meera/copilot/project4/ui-tests
meera@Kangs-Home-Mac ui-tests % mvn test
[INFO] Scanning for projects...
[INFO]
[INFO] -----------------------< com.amgen.app:ui-tests >-----------------------
[INFO] Building ui-tests 1.0-SNAPSHOT
[INFO]   from pom.xml
[INFO] --------------------------------[ jar ]---------------------------------
[INFO]
[INFO] --- resources:3.3.1:resources (default-resources) @ ui-tests ---
[INFO] skip non existing resourceDirectory /Users/meera/copilot/project4/ui-tests/src/main/resources
[INFO]
[INFO] --- compiler:3.13.0:compile (default-compile) @ ui-tests ---
[INFO] Nothing to compile - all classes are up to date.
[INFO]
[INFO] --- resources:3.3.1:testResources (default-testResources) @ ui-tests ---
[INFO] skip non existing resourceDirectory /Users/meera/copilot/project4/ui-tests/src/test/resources
[INFO]
[INFO] --- compiler:3.13.0:testCompile (default-testCompile) @ ui-tests ---
[INFO] Nothing to compile - all classes are up to date.
[INFO]
[INFO] --- surefire:3.3.0:test (default-test) @ ui-tests ---
[INFO] Using auto detected provider org.apache.maven.surefire.junitplatform.JUnitPlatformProvider
[INFO]
[INFO] -------------------------------------------------------
[INFO]  T E S T S
[INFO] -------------------------------------------------------
[INFO] Running com.amgen.app.AppTest
[INFO] Tests run: 1, Failures: 0, Errors: 0, Skipped: 0, Time elapsed: 0.043 s -- in com.amgen.app.AppTest
[INFO]
[INFO] Results:
[INFO]
[INFO] Tests run: 1, Failures: 0, Errors: 0, Skipped: 0
[INFO]
[INFO] ------------------------------------------------------------------------
[INFO] BUILD SUCCESS
[INFO] ------------------------------------------------------------------------
[INFO] Total time:  1.705 s
[INFO] Finished at: 2024-12-16T23:19:42-05:
[INFO] ------------------------------------------------------------------------
```

Note: In your organization if you need **settings.xml** to download the artifact, get that file and copy into /Users/meera/.m2

/Users/$USER/.m2
Check with your DevOps team for more information.

Project 5: Serverless ETL Pipeline

Step 1: Install Python

Ensure Python 3 is installed (preferably version 3.8 or higher).

Install Python using Homebrew (check All Projects section how to install Homebrew):

brew install python

Verify the Python installation:

python3 --version

```
meera ) python3 --version
Python 3.9.6
```

pip3 --version

```
-zsh
meera@Kangs-Home-Mac copilot % pip3 --version
pip 24.3.1 from /Users/meera/Library/Python/3.9/lib/python/site-packages/pip (python 3.9)
```

Step 2: Install AWS CLI

Use the below link to install

https://docs.aws.amazon.com/cli/v1/userguide/install-macos.html

pip3 install awscli --upgrade --user

```
meera@Kangs-Home-Mac ~ % pip3 install awscli --upgrade --user
Collecting awscli
  Using cached awscli-1.36.23-py3-none-any.whl.metadata
Requirement already satisfied: botocore==1.35.82 in ./Library/Python/3.9/lib/python/site-packages (from awscli) (1.35.82)
Requirement already satisfied: docutils<0.17,>=0.10 in ./Library/Python/3.9/lib/python/site-packages (from awscli) (0.16)
Requirement already satisfied: s3transfer<0.11.0,>=0.10.0 in ./Library/Python/3.9/lib/python/site-packages (from awscli) (0.10.4)
Requirement already satisfied: PyYAML<6.1,>=3.10 in ./Library/Python/3.9/lib/python/site-packages (from awscli) (6.0.1)
Requirement already satisfied: colorama<0.4.7,>=0.2.5 in ./Library/Python/3.9/lib/python/site-packages (from awscli) (0.4.6)
Requirement already satisfied: rsa<4.8,>=3.1.2 in ./Library/Python/3.9/lib/python/site-packages (from awscli) (4.7.2)
Requirement already satisfied: jmespath<2.0.0,>=0.7.1 in ./Library/Python/3.9/lib/python/site-packages (from botocore==1.35.82->aw
Requirement already satisfied: python-dateutil<3.0.0,>=2.1 in ./Library/Python/3.9/lib/python/site-packages (from botocore==1.35.8
Requirement already satisfied: urllib3<1.27,>=1.25.4 in ./Library/Python/3.9/lib/python/site-packages (from botocore==1.35.82->aws
Requirement already satisfied: pyasn1>=0.1.3 in ./Library/Python/3.9/lib/python/site-packages (from rsa<4.8,>=3.1.2->awscli) (0.6.
Requirement already satisfied: six>=1.5 in /Library/Developer/CommandLineTools/Library/Frameworks/Python3.framework/Versions/3.9/l
awscli) (1.15.0)
Using cached awscli-1.36.23-py3-none-any.whl (4.5 MB)
Installing collected packages: awscli
Successfully installed awscli-1.36.23
```

Project Setup

Create the project folder

mkdir -R copilot/project5
cd copilot/project5

Initialize node project

npm init -y

```
meera@Kangs-Home-Mac ~ % cd copilot
meera@Kangs-Home-Mac copilot % cd project5
meera@Kangs-Home-Mac project5 % pwd
/Users/meera/copilot/project5
meera@Kangs-Home-Mac project5 % npm init -y
Wrote to /Users/meera/copilot/project5/package.json:

{
  "name": "project5",
  "version": "1.0.0",
  "main": "index.js",
  "scripts": {
    "test": "echo \"Error: no test specified\" && exit 1"
  },
  "keywords": [],
  "author": "",
  "license": "ISC",
  "description": ""
}
```

Install necessary packages

npm install aws-sdk @prisma/client prisma dotenv

```
meera@Kangs-Home-Mac project5 % npm install aws-sdk @prisma/client prisma dotenv
npm warn deprecated querystring@0.2.0: The querystring API is considered Legacy.

added 49 packages, and audited 50 packages in 10s

17 packages are looking for funding
  run `npm fund` for details

found 0 vulnerabilities
```

Install Prisma CLI globally
npm install -g prisma

```
meera@Kangs-Home-Mac project5 % npm install -g prisma

added 6 packages in 4s
```

Project 6: Developing Microservices Architecture with Docker and K8s

MacOS Install Guide

Step 1: Install Homebrew

See install instructions provided under All Projects section

Step 2: Install Node.js and npm

See Install instructions provided under All Projects section

Step 3: Install Docker and Docker Compose

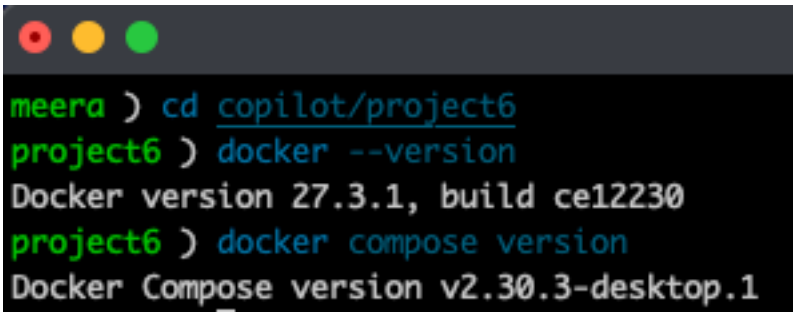
1. Download Docker Desktop from the official Docker website.

https://docs.docker.com/desktop/setup/install/mac-install/
https://docs.docker.com/desktop/setup/install/windows-install/

2. Follow the installation steps based on your OS.

docker --version
docker compose version
(for older version use docker-compose --version)

Note: Docker Desktop includes Docker Compose



Step 4: Install Kubernetes CLI (kubectl)

Use the below link and follow the installation for your OS
https://kubernetes.io/docs/tasks/tools/

brew install kubectl

```
project6 ) brew install kubectl
==> Auto-updating Homebrew...
Adjust how often this is run with HOMEBREW_
HOMEBREW_NO_AUTO_UPDATE. Hide these hints w
==> Auto-updated Homebrew!
Updated 2 taps (homebrew/core and homebrew/
==> New Formulae
bender         glaze          gurk
==> New Casks
soundsource@test
```

Verify kubectl installation

kubectl version –client

```
meera@Kangs-Home-Mac ~ % kubectl version --client
Client Version: v1.32.0
Kustomize Version: v5.5.0
```

Step 5: Install Minikube (for Local Kubernetes Cluster)

Follow the below link to install MiniKube for your OS
https://minikube.sigs.k8s.io/docs/start/?arch=%2Fmacos%2Fx86-64%2Fstable%2Fbinary+download

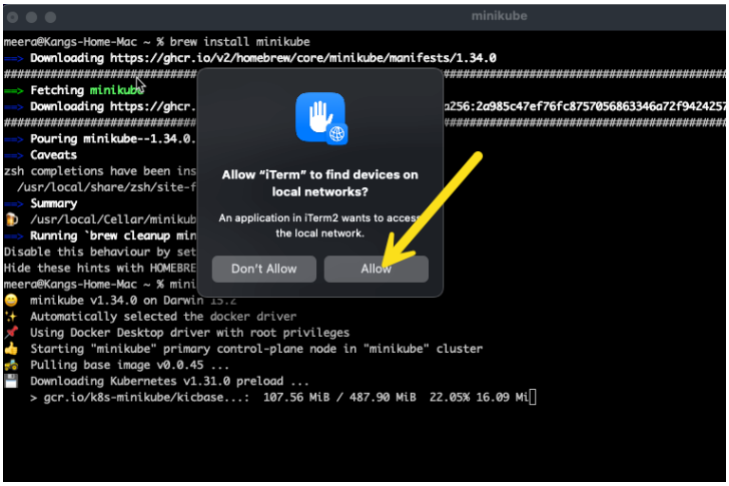
For macOS:

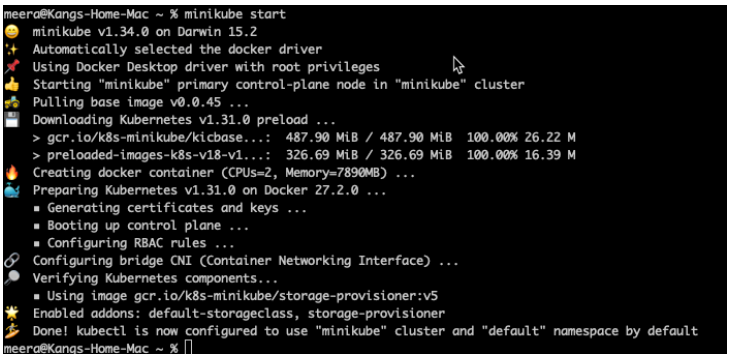
brew install minikube

```
-zsh
meera@Kangs-Home-Mac ~ % brew install minikube
==> Downloading https://ghcr.io/v2/homebrew/core/minikube/manifests/1.34.0
##################################################################################
==> Fetching minikube
==> Downloading https://ghcr.io/v2/homebrew/core/minikube/blobs/sha256:2a985c47
##################################################################################
==> Pouring minikube--1.34.0.sonoma.bottle.tar.gz
==> Caveats
zsh completions have been installed to:
  /usr/local/share/zsh/site-functions
==> Summary
🍺  /usr/local/Cellar/minikube/1.34.0: 10 files, 101.6MB
==> Running `brew cleanup minikube`...
Disable this behaviour by setting HOMEBREW_NO_INSTALL_CLEANUP.
Hide these hints with HOMEBREW_NO_ENV_HINTS (see `man brew`).
meera@Kangs-Home-Mac ~ %
```

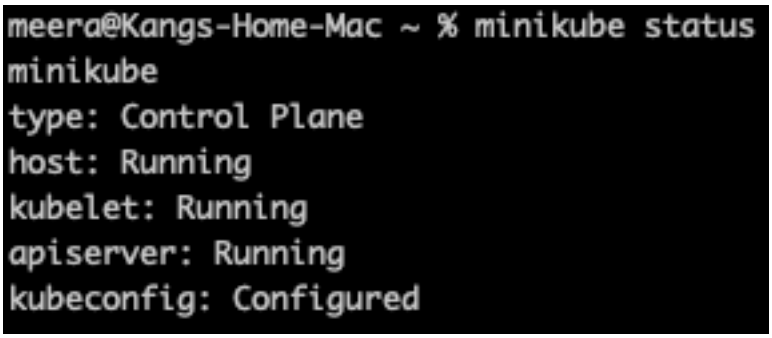
Start minikube:

minikube start





minikube status



Project Setup

Create the project folder

mkdir -p copilot/project6
cd copilot/project6

Initialize a new Node.js project

npm init -y

```
fish /Users/meera/copilot/project6
project6 ) pwd
/Users/meera/copilot/project6
project6 ) npm init -y
Wrote to /Users/meera/copilot/project6/package.json:

{
  "name": "project6",
  "version": "1.0.0",
  "main": "index.js",
  "scripts": {
    "test": "echo \"Error: no test specified\" && exit 1"
  },
  "keywords": [],
  "author": "",
  "license": "ISC",
  "description": ""
}
```

Install Fastify CLI globally

npm install --global fastify-cli

```
project6 ) npm i -g fastify-cli
npm warn deprecated inflight@1.0.6:
d way to coalesce async requests by
npm warn deprecated glob@8.1.0: Glo

added 110 packages in 3s
```

fastify version

```
project6 ) fastify version
7.2.0
```

Install fastify locally for your project

npm i -D fastify

```
project6 ) npm i -D fastify

added 46 packages, and audited 47 packages in 3s

2 packages are looking for funding
  run `npm fund` for details

found 0 vulnerabilities
```

Verify Fastify installation

```
project6 ) npm list fastify
project6@1.0.0 /Users/meera/copilot/project6
└── fastify@5.2.0
```