Machine Learning

Laboratory on scikit-learn

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Set-up on Google Colab

If you prefer to run the notebook in the cloud, use the `Google Colab` link provided in the repository or scan the QR code below.

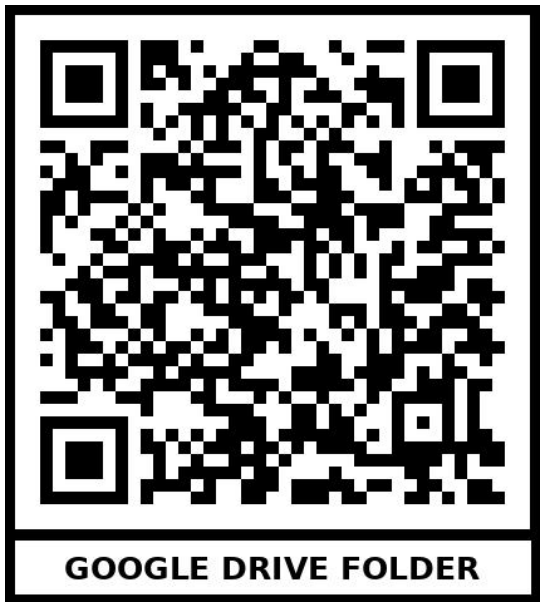

Figure 1: QR code to open Colab

No local installation is required; everything runs in your browser.

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Preliminaries (on your PC)

1. Download the Material

Download or clone the course repository from:

https://github.com/samuelebortolotti/machine-learning-lab

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Preliminaries (on your PC)

2. Install Jupyter Notebook

Open your terminal and install Jupyter using `pip`:

```
pip install jupyter-notebook
```

Note: If you are using Anaconda, Jupyter is already included.

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Preliminaries (on your PC)

3. Navigate to the Project Folder

Use the terminal to move into the `scikit` directory:

```
cd path/to/scikit
```

Then launch Jupyter Notebook:

```
jupyter-notebook
```

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4. Open Jupyter in Your Browser

Once Jupyter starts, your browser will open automatically showing the current working directory.

Locate and open the notebook file:

`scikit-learn.ipynb`

(Example view of the Jupyter file browser)

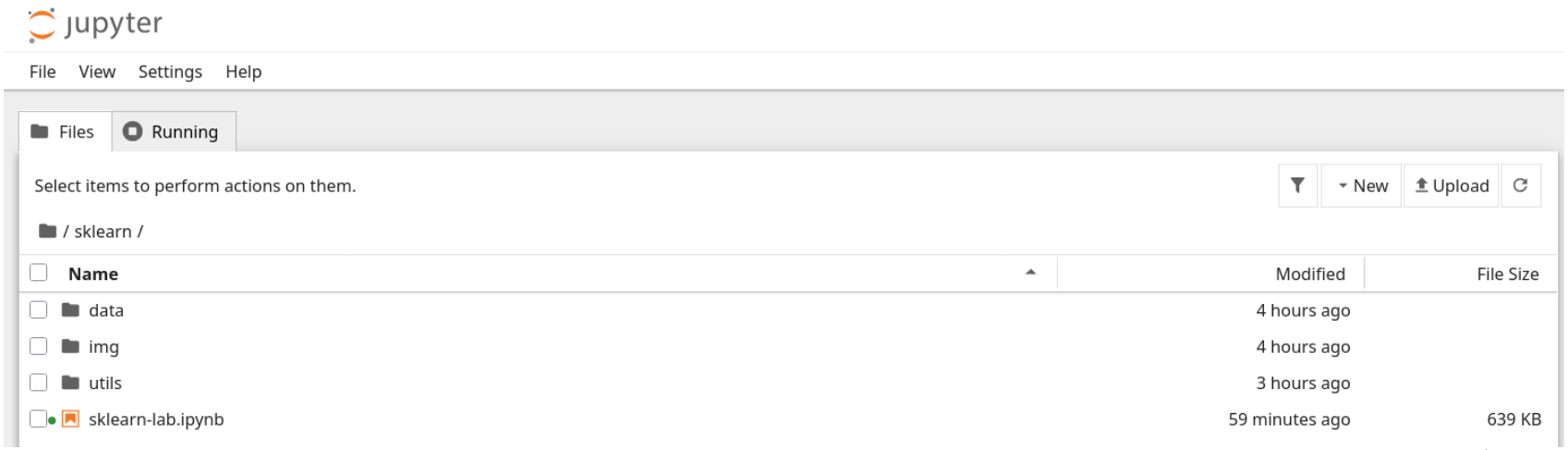

Figure 2: Jupyter file browser

Running Cells in Jupyter

To execute a cell, you can either:

- Click the **Run** button in the toolbar, or
- Press **Shift** + **Enter** on your keyboard.

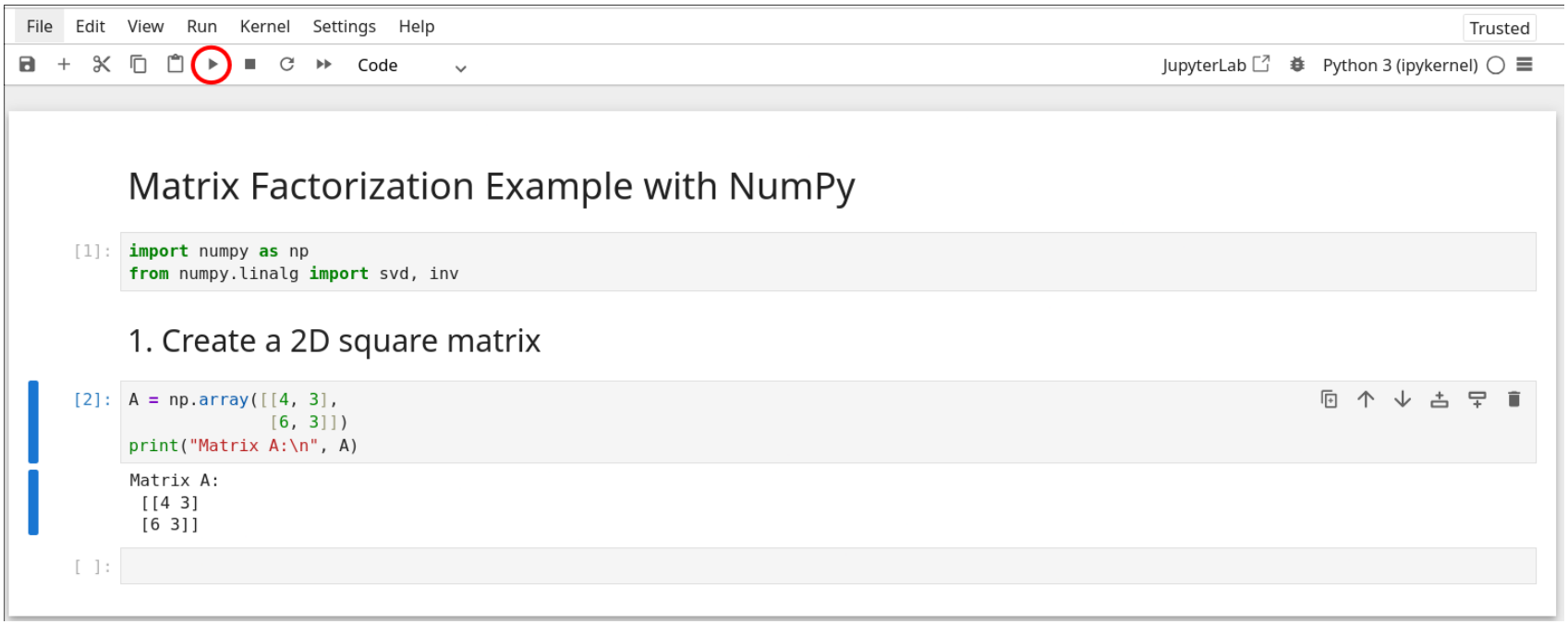

Figure 3: Running a cell in Jupyter

Take-home Exercise

As a self-assessment exercise, complete a classification task using **Scikit-Learn**.

Steps:

1. Choose a dataset.
2. Train and tune a classifier (e.g., perform hyperparameter optimization).
3. Evaluate the model on the test set.
4. Compare performance across different classifiers.

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Suggested Datasets

You can find datasets in the UCI Machine Learning Repository:

- Spambase
- Optical Recognition of Handwritten Digits
- Abalone
- Additional datasets available at https://archive.ics.uci.edu/

Model Comparison

Compare the performance of multiple classifiers such as:

- Decision Tree
- Random Forest
- SVM

Perform hyperparameter tuning and report the evaluation metrics (e.g., accuracy, precision, recall, F1-score).

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