

Statistical and Mathematical Methods for Machine Learning

Course Presentation

A.Y. 2024 - 2025

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Useful Informations

- **Exam:** Check professor Elena Loli Piccolomini course presentation
- **Office Hour:** Wednesday hour 9am-12am. Reserve an appointment via email at:
`davide.evangelista5@unibo.it`
- **Books:**
 - Jupyter Notebooks on Virtuale
 - My personal website (check following slides)
 - Optimization: *Numerical Optimization* di Nocedal e Wright

Lectures slides

- The material for the course is available at my website:

<https://devangelista2.github.io/statistical-mathematical-methods>

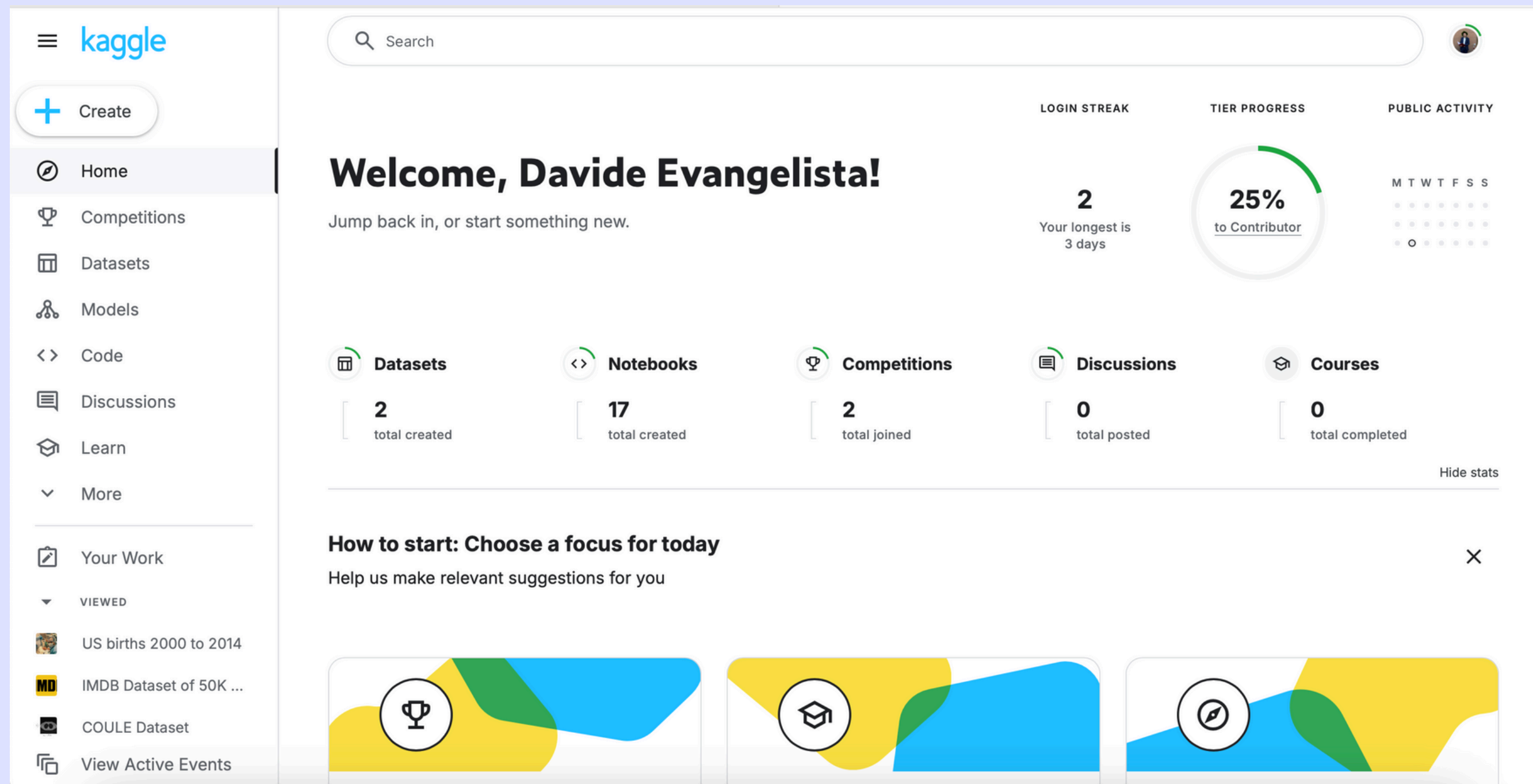
- Also available on Virtual
- **Note:** Lectures are new and may contain errors. If you spot any error, please tell me by e-mail so that I can improve them.



SCAN ME

Useful website (for datasets)

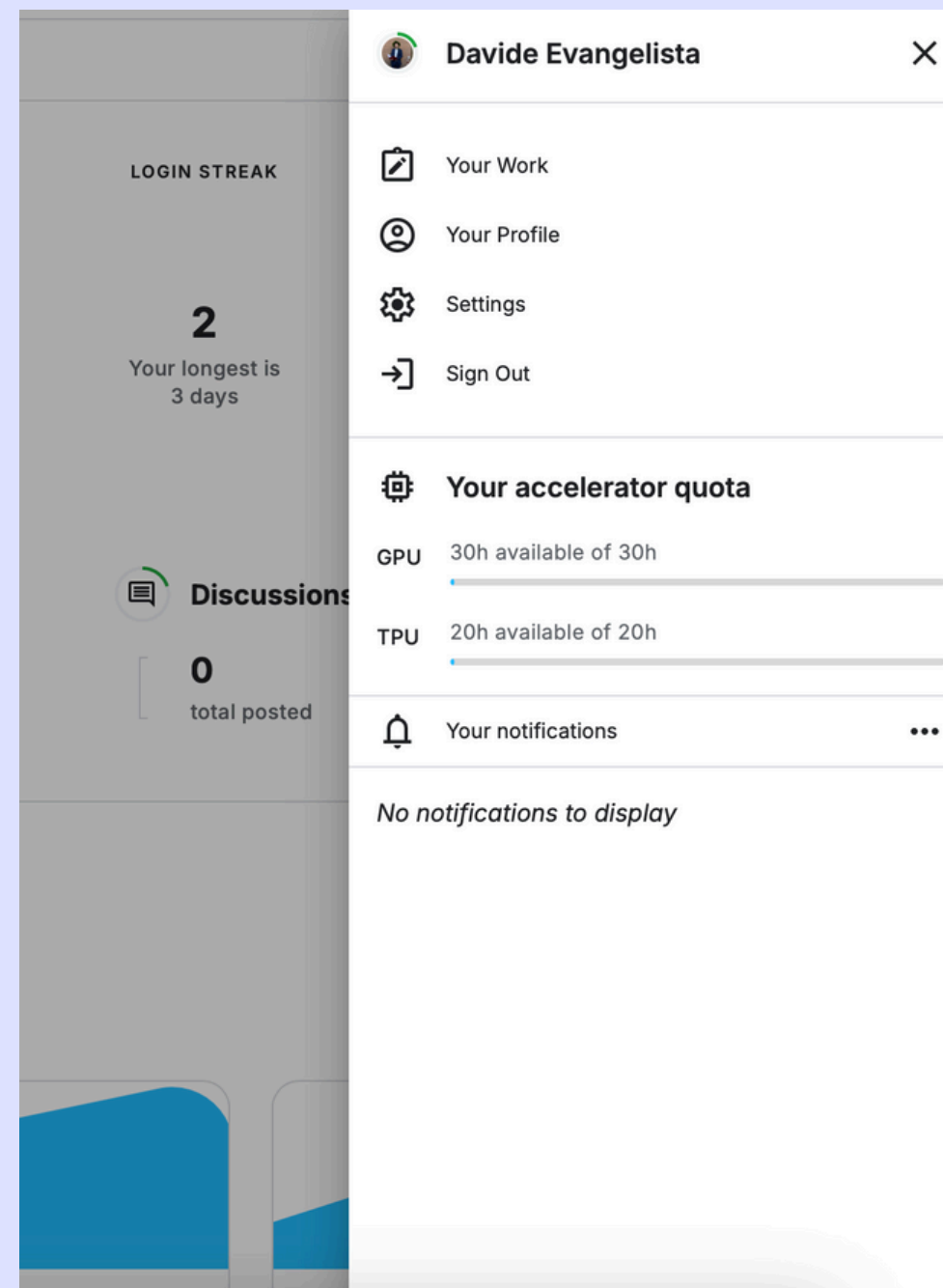
- **Kaggle:** <https://www.kaggle.com>



Useful website (for datasets)

- **Kaggle:** <https://www.kaggle.com>

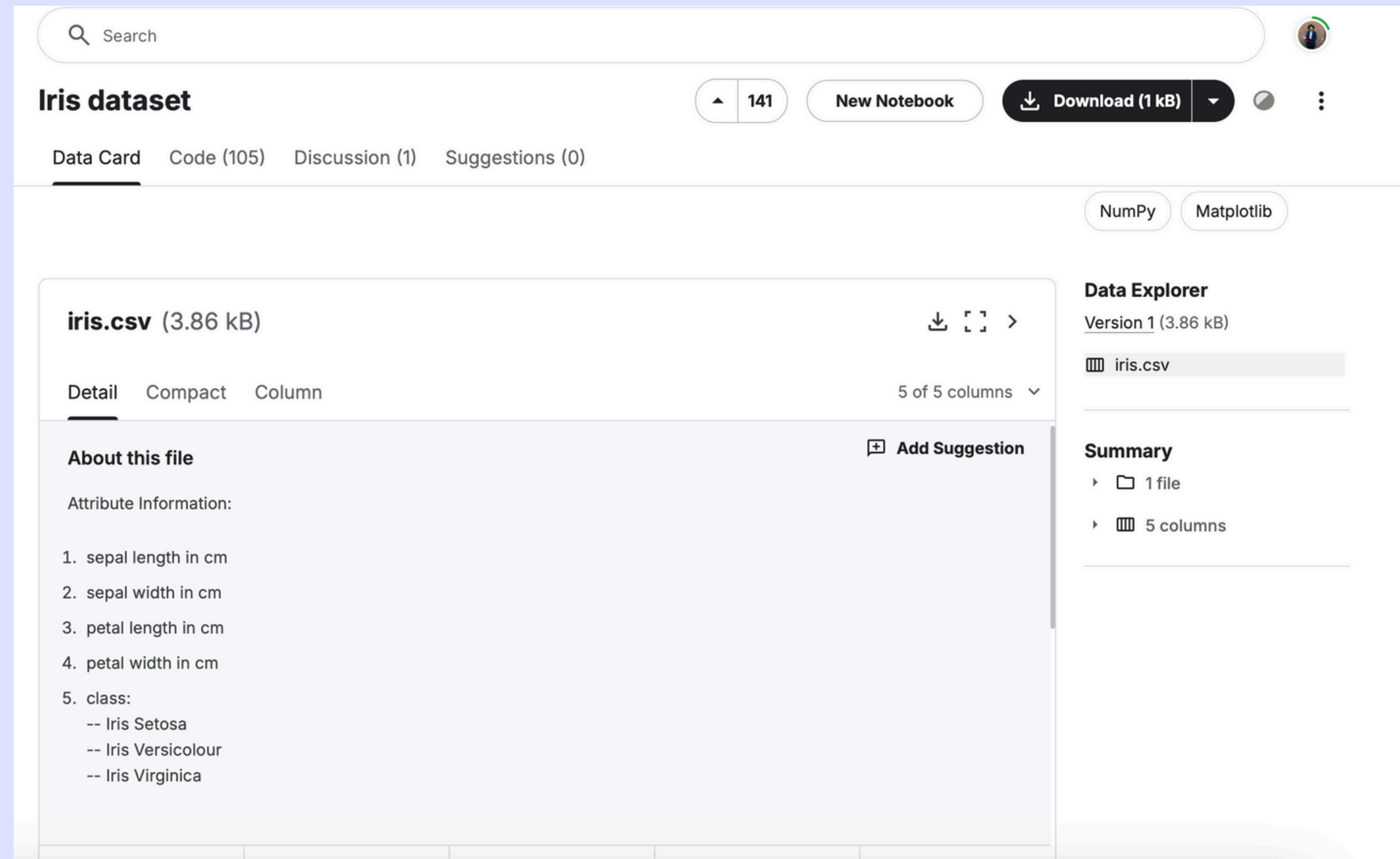
Login



Useful website (for datasets)

- **Kaggle:** <https://www.kaggle.com>

Dataset info



The screenshot shows the Kaggle interface for the 'Iris dataset'. At the top, there is a search bar and a user profile icon. Below the search bar, the title 'Iris dataset' is displayed, followed by a tab bar with 'Data Card' (selected), 'Code (105)', 'Discussion (1)', and 'Suggestions (0)'. To the right of the title, there are buttons for 'New Notebook', 'Download (1 kB)', and a settings menu. Below the tab bar, there are tabs for 'NumPy' and 'Matplotlib'. The main content area is divided into two sections. The left section, titled 'iris.csv (3.86 kB)', has tabs for 'Detail' (selected), 'Compact', and 'Column'. It shows '5 of 5 columns' and an 'Add Suggestion' button. The 'About this file' section lists the attributes: 1. sepal length in cm, 2. sepal width in cm, 3. petal length in cm, 4. petal width in cm, and 5. class: -- Iris Setosa, -- Iris Versicolour, -- Iris Virginica. The right section, titled 'Data Explorer', shows 'Version 1 (3.86 kB)' and a list of files: 'iris.csv'. Below this is a 'Summary' section showing '1 file' and '5 columns'.

Python installation on your personal device (only if you need to install it on your device)

Python Installation

The screenshot shows the Anaconda website's 'Distribution' page. The header includes the Anaconda logo and navigation links: Products, Solutions, Resources, Partners, and Company. In the top right corner, there are three buttons: 'Free Download' (circled in red with an arrow labeled [1]), 'Sign Up', and 'Sign In'. The main heading is 'Distribution' with the subheading 'Free Download*'. Below this, a paragraph states: 'Register to get everything you need to get started on your workstation including Cloud Notebooks, Navigator, AI Assistant, Learning and more.' A list of four benefits follows, each preceded by a green checkmark: 'Easily search and install thousands of data science, machine learning, and AI packages', 'Manage packages and environments from a desktop application or work from the command line', 'Deploy across hardware and software platforms', and 'Distribution installation on Windows, MacOS, or Linux'. At the bottom left, a footnote reads: '*Use of Anaconda's Offerings at an organization of more than 200 employees requires a Business or Enterprise license. See Pricing'. A modal form titled 'Provide email to download Distribution' is overlaid on the right. It contains an 'Email Address' input field, a checkbox for agreeing to communication, and a green 'Submit >' button. Below the submit button, the text 'Skip registration' is circled in red with an arrow labeled [2]. A small chatbot icon with a red notification bubble is in the bottom right corner.

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Distribution

Free Download*

Register to get everything you need to get started on your workstation including Cloud Notebooks, Navigator, AI Assistant, Learning and more.

- ✓ Easily search and install thousands of data science, machine learning, and AI packages
- ✓ Manage packages and environments from a desktop application or work from the command line
- ✓ Deploy across hardware and software platforms
- ✓ Distribution installation on Windows, MacOS, or Linux

*Use of Anaconda's Offerings at an organization of more than 200 employees requires a Business or Enterprise license. [See Pricing](#)

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You're becoming a regular around here! How can I help you today?

Python Installation

Anaconda Installers



Windows

Python 3.12

📄 64-Bit Graphical Installer (912.3M)



Mac

Python 3.12

📄 64-Bit (Apple silicon) Graphical Installer (704.7M)

📄 64-Bit (Apple silicon) Command Line Installer (707.3M)

📄 64-Bit (Intel chip) Graphical Installer (734.7M)

📄 64-Bit (Intel chip) Command Line Installer (731.2M)



Linux

Python 3.12

📄 64-Bit (x86) Installer (1007.9M)

📄 64-Bit (AWS Graviton2 / ARM64) Installer (800.6M)

📄 64-bit (Linux on IBM Z & LinuxONE) Installer (425.8M)

Python Installation

WINDOWS USER:
**Recommend to add to PATH during
installation.**

Anaconda Installers



Windows

Python 3.12

↓ 64-Bit Graphical Installer (912.3M)



Mac

Python 3.12

↓ 64-Bit (Apple silicon) Graphical
Installer (704.7M)

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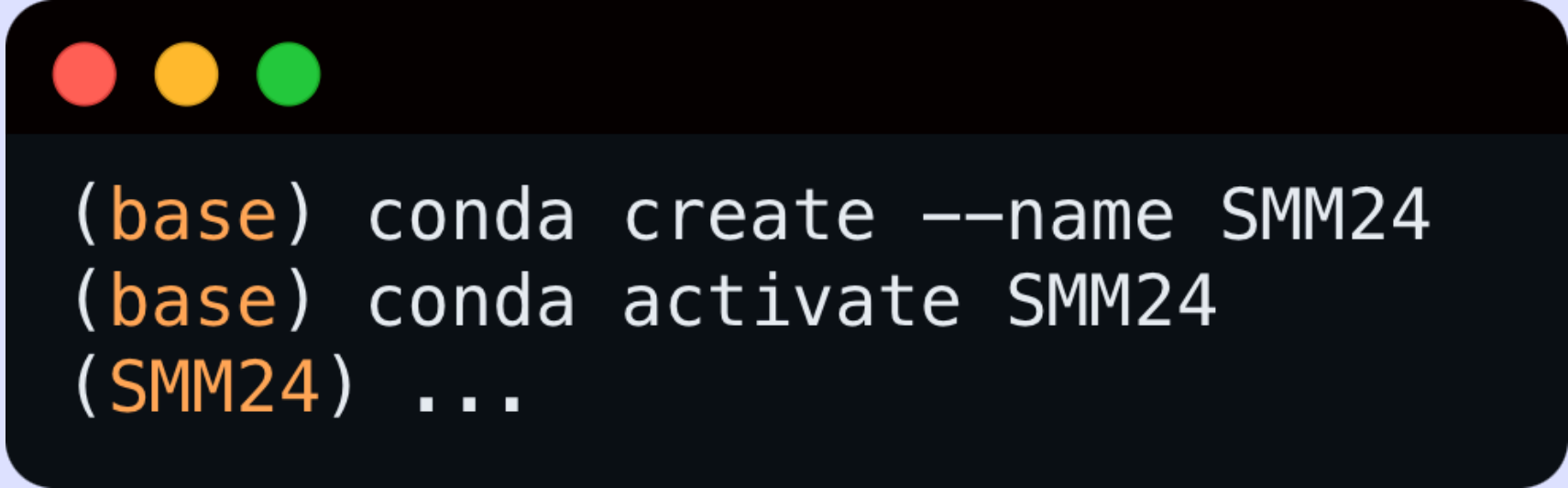
Creating Virtual Environment

*A **virtual environment** in Python is an isolated workspace that allows you to install and manage packages for specific projects without affecting the global Python installation or other projects. This ensures that different projects can have different dependencies, package versions, and configurations.*

You should **always** work on virtual environment, so that you can easily fix any compatibility issues without interfere with others existing Python installations.

Creating Virtual Environment

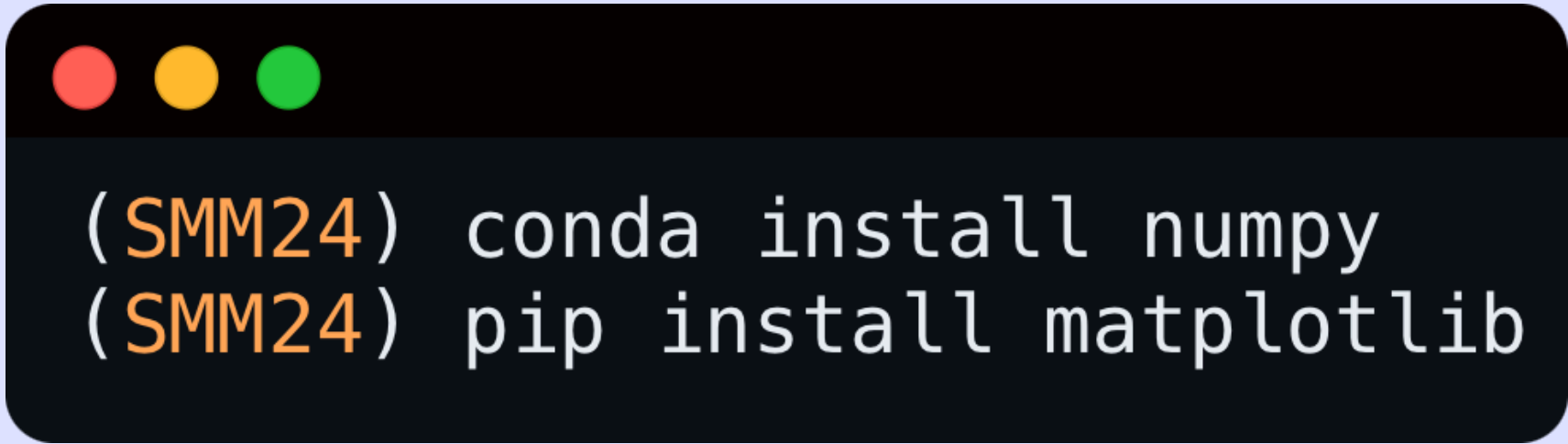
- On terminal (or CMD, for Windows users):



```
(base) conda create --name SMM24  
(base) conda activate SMM24  
(SMM24) ...
```

← create venv
← activate venv

- To install packages:



```
(SMM24) conda install numpy  
(SMM24) pip install matplotlib
```

Creazione Virtual Environment


- Packages **required** for the course:
 - `numpy`
 - `scipy`
 - `pandas`
 - `matplotlib`
 - `scikit-image`
 - `scikit-learn`
- Install with **pip** or **conda**

Code Editor


- Types of Python files:
 - `.py` > script
 - `.ipynb` > notebook (Jupyter notebook)
- Editor:
 - VSCode (Visual Studio Code)
 - PyCharm
 - Spyder

Visual Studio Code

[Download page](#)

 **Visual Studio Code**

[Docs](#) [Updates](#) [Blog](#) [API](#) [Extensions](#) [FAQ](#)



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EXPLORER

MY-APP

- components
- actionbar
- breadcrumbs
- button
- # button.css
- TS button.ts
- countBadge
- dialog
- dropdown
- findinput
- grid
- hover
- inputBox
- .gitignore
- .mailmap
- .mention-bot
- .yarnrc
- yarn.lock

TS button.ts

```
1 interface ButtonProps {
2   onClick: () => void;
3   text: string;
4 }
5
6 const Button: React.FC<Props> = ({ onClick, text }) => {
7   return <button onClick={onClick}>{text}</button>;
8 };
9
10 export default Button;
```

PROBLEMS


OUTPUT

TERMINAL

```
[09:44:50] [monaco.d.ts] Starting monaco.d.ts generation
[09:44:56] [monaco.d.ts] Finished monaco.d.ts generation
[09:44:56] Finished compilation with 557 errors after 80542 ms
```

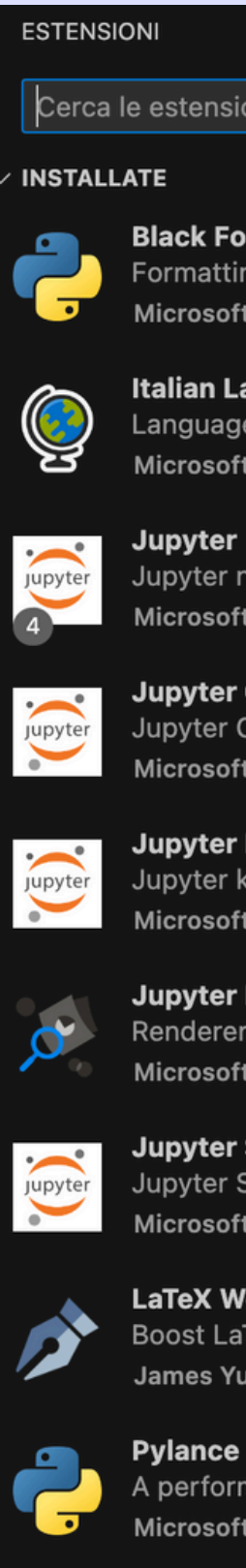
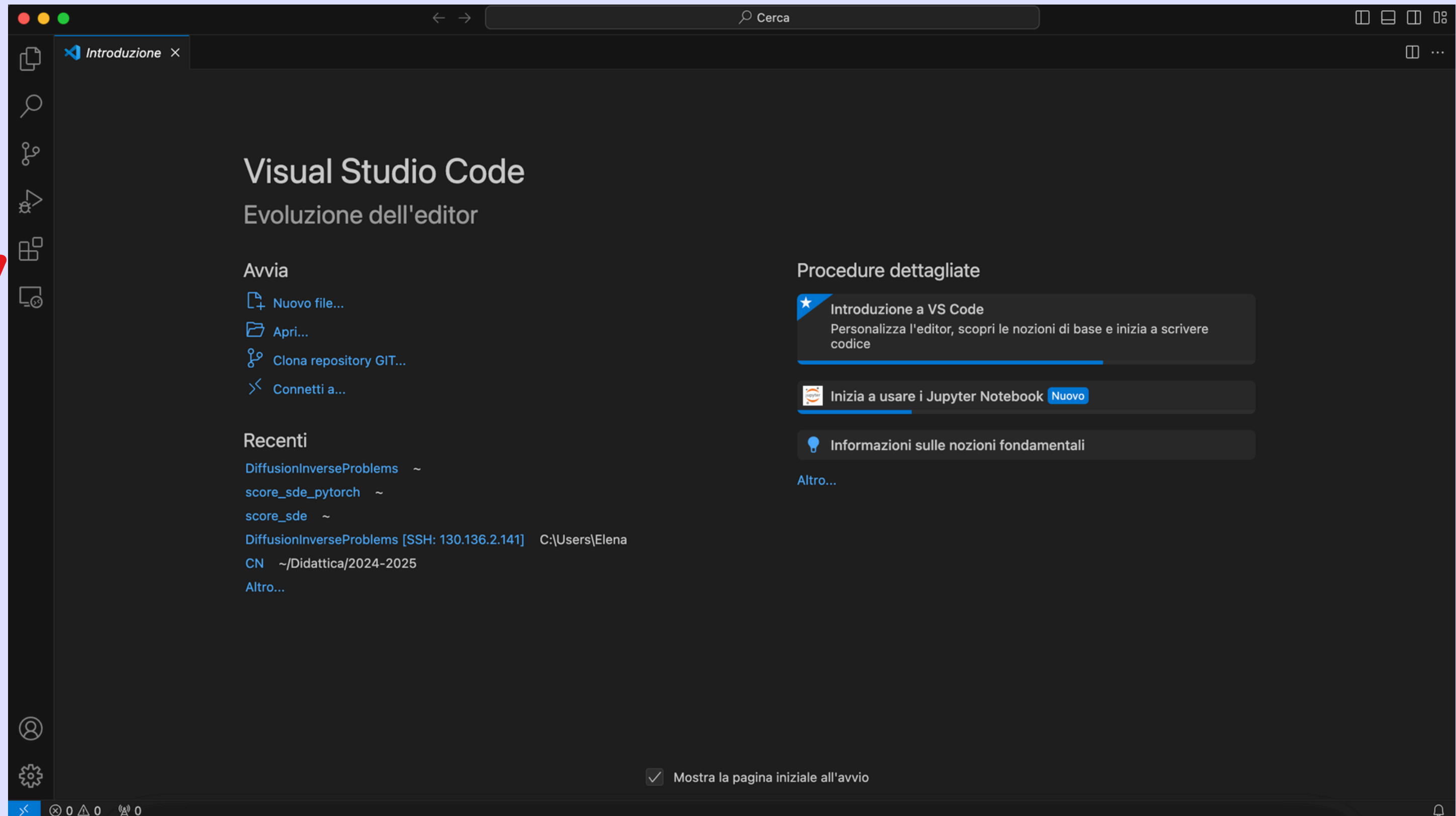
my-app

Create a new button component

[Accept](#) [Discard](#) 

Changed 9 lines

Plugins

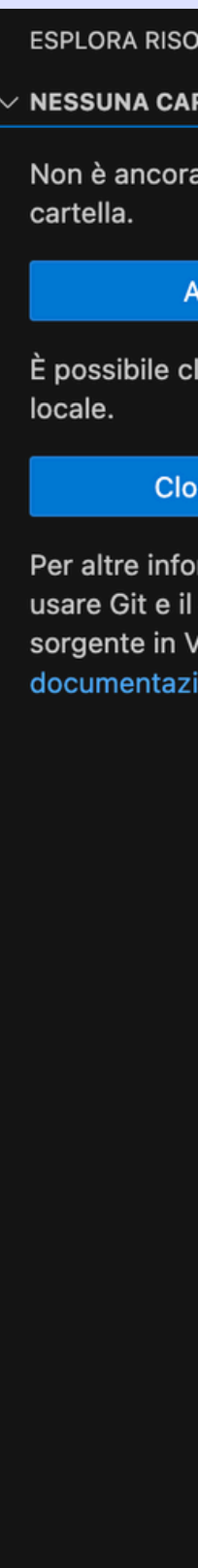
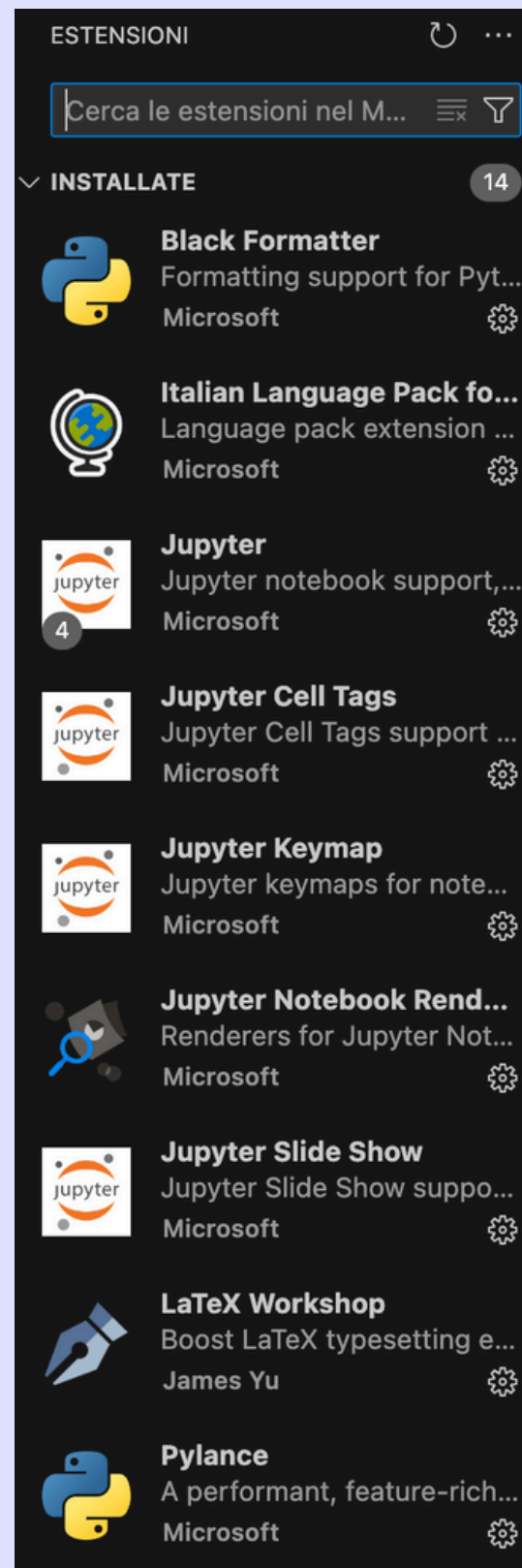
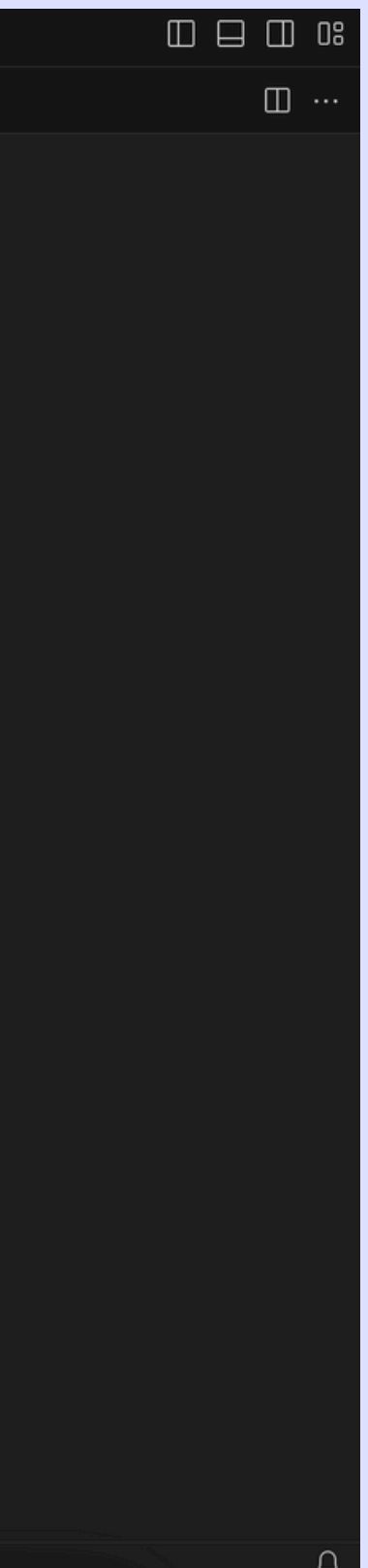


Plugins

Required plugins

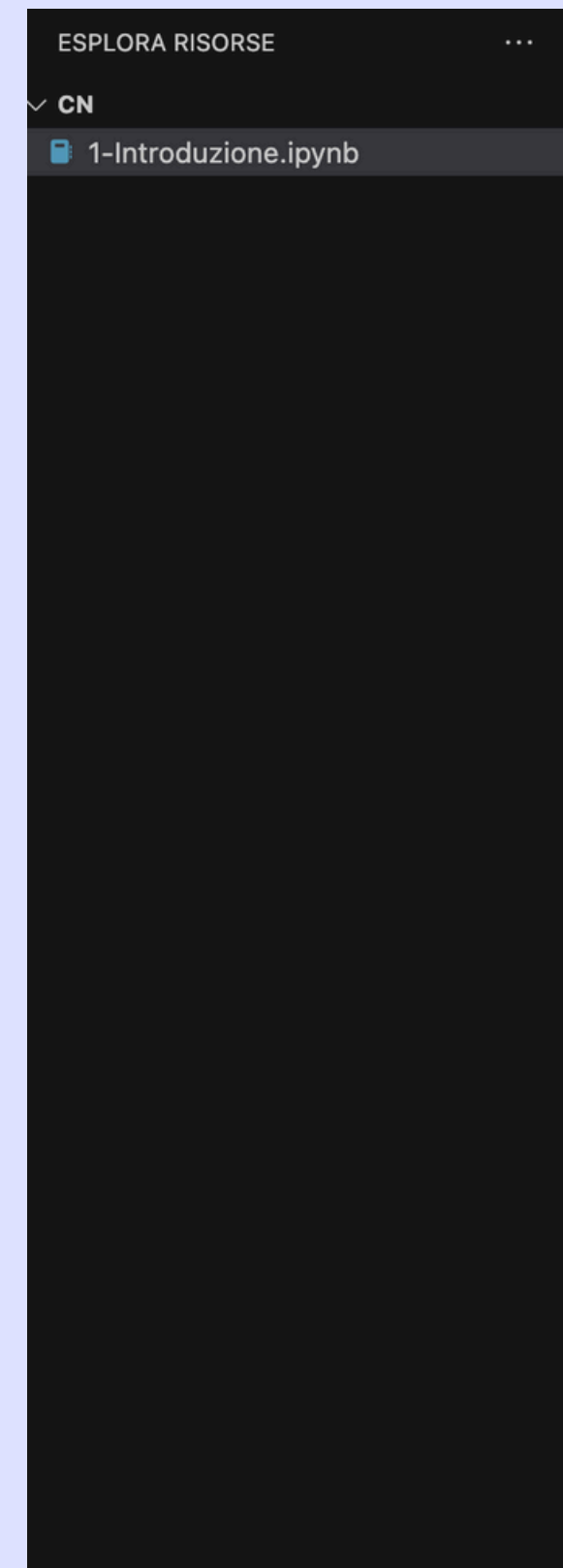
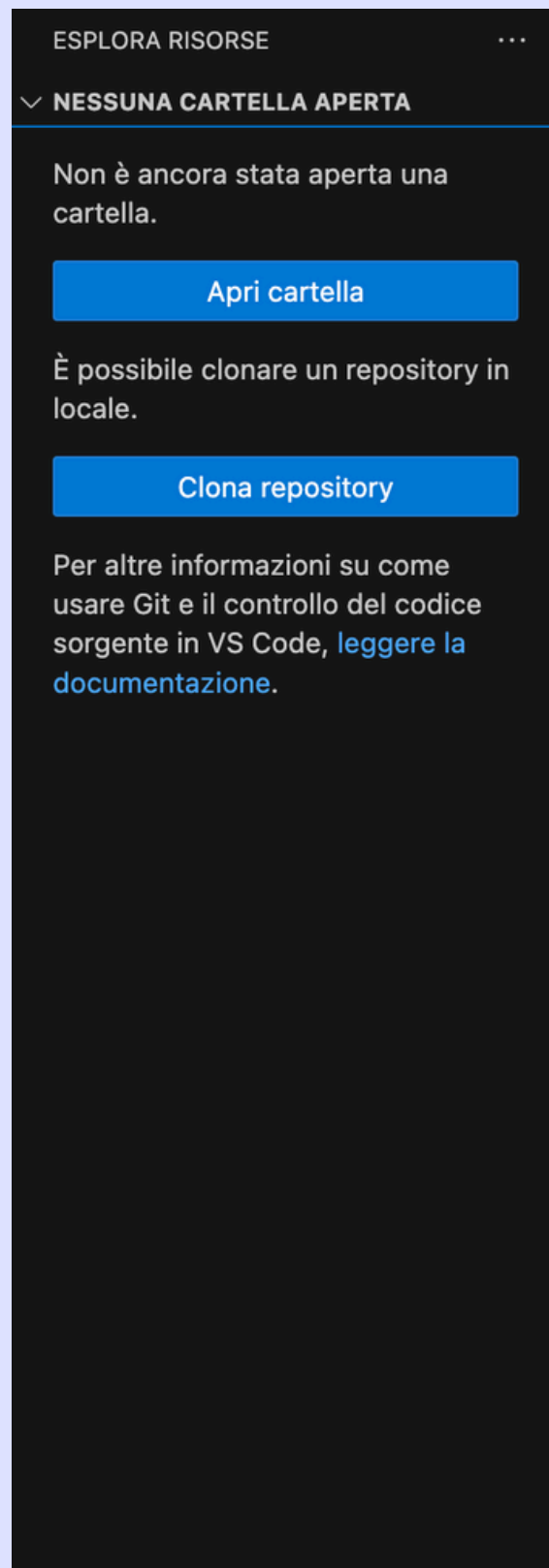
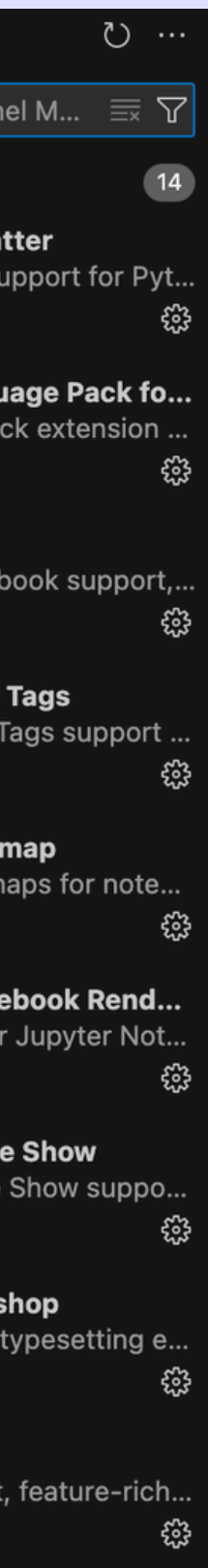
Python

Jupyter



Plugins

Always open the folder on which you are working on, so that the predefined PATH will be setted as the current PATH.



Conclusions

In case of problems, please contact me by e-mail