Python

IDEs & Jupyter Notebooks

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Outline

1. Motivations for IDEs
2. Popular IDEs
   - Python
     - VS Code
     - PyCharm
   - Data Sciences
     - Jupyter Notebooks
3. Jupyter Ecosystem
4. Using Jupyter Notebooks in virtual environment

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Motivation for IDEs

- Complex real life applications and computational problems
  - Lot of lines of code
  - Impossible to build/solve on Terminal or Console or Python shell
- Computational process
  - Develop
  - Test
  - Document
  - Executing code
  - Communicate the results
- Integrated Development Environment (IDE) maximizes productivity to write code, and build applications quickly.

Popular IDEs

IDEs for Python:

VSCode: https://code.visualstudio.com/

PyCharm: https://www.jetbrains.com/pycharm/download

IDE for Data Sciences

Jupyter Notebooks: https://jupyter.org/

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Jupyter Ecosystem

Free software, open standards, and web services for interactive computing across all programming languages

1. Jupyter Notebooks
    - Provides a web-based application suitable for capturing the whole computation process:
        - developing,
        - documenting,
        - executing code,
        - communicating the results.
2. Jupyter Lab
3. Jupyter Hub

Jupyter Notebooks

- **Two Components**
  1. **A web application**
     - ✓ a browser-based tool
     - ✓ interactive authoring of documents
     - ✓ combine explanatory text, mathematics, computations and rich media output.
  2. **Notebook documents**:
     - ✓ a representation of all content visible in the web application
     - ✓ Contains
       - ■ inputs and outputs of the computations
       - ■ explanatory text,
         mathematics,
       - ■ images, and rich media representations of objects.

Jupyter Notebooks: Web Application

- ✓ In-browser editing for code
  - ❑ automatic syntax highlighting,
  - ❑ indentation, and
  - ❑ tab completion/introspection.
- ✓ Execute code from the browser,
  - ❑ Shows the results of computations attached to the code
- ✓ Displaying the result of computation over HTML, LaTeX, PNG, SVG, etc.
- ✓ In-browser editing
  - ❑ for text using the Markdown markup language
    - ❑ Acts as a commentary for the code
  - ❑ includes mathematical notation within markdown cells using LaTeX

Jupyter Notebook Documents

- ✓ Contains the inputs and outputs of a interactive session as well as additional text that accompanies the code
- ✓ Internally JSON files and are saved with the **.ipynb** extension.
  - ❏ JSON is a plain text format,
  - ❏ version-controlled and
  - ❏ can be shared with colleagues for collaboration.
- ✓ Exported to a range of static formats (using the nbconvert command)
  - ❏ HTML,
  - ❏ reStructuredText,
  - ❏ LaTeX,
  - ❏ PDF
  - ❏ slide shows

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Working with Jupyter Notebook

1. Create a virtual environment
2. Activate virtual environment
3. Install Jupyter notebook
    1. Run: **pip install notebook**
4. Open the Jupyter notebook
    1. Go to the folder on command prompt (Windows) or Terminal (Mac/Linux)
    2. Run: **jupyter notebook**
5. Jupyter notebook is opened on your default browser at this URL: http://127.0.0.1:8888
6. Open new notebook
    1. **For text**: use the text cell
    2. **For code**: use the code cell to type and run the code

Markdown Basics

1. Italic text
2. Bold text
3. Itemized or enumerated lists
4. Block quotes
5. Headings
6. Code blocks (non-executable) for text
7. Latex equations
8. Tables
9. Local files

Practice:
Jupyter Notebook 101.ipynb

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References

- https://jupyter-notebook.readthedocs.io/en/stable/notebook.html
- https://www.markdownguide.org/