Laboratory Work 1: Jupyter Notebook Basics

Course: Python Data Processing

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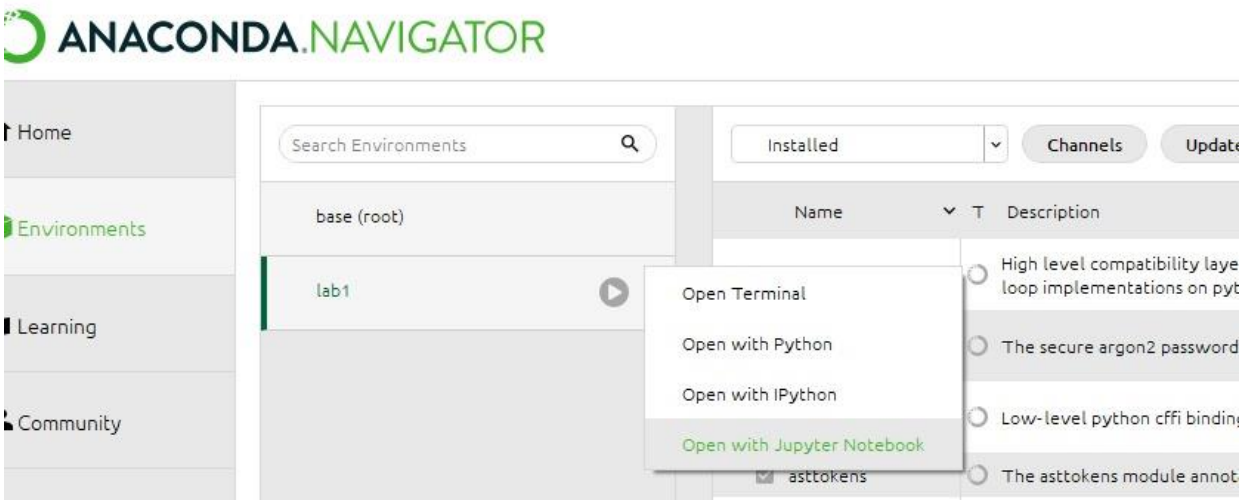
1. Introduction

Topic: Jupyter Notebook Basics

Goal: The purpose of this laboratory work is to learn how to use the Jupyter Notebook environment and perform basic tasks using Python. This involves familiarizing oneself with markdown, HTML tags, installing Python environments, and implementing basic Python algorithms, like the Euclidean algorithm for finding the greatest common divisor (gcd).



Picture 1 – Create a Python 3 environment

The default folder where Jupyter starts can be customized by modifying the configuration file.

2. Markdown and HTML Usage in Jupyter Notebook

Markdown Structure for Burkina Faso

Markdown is used to format and present data. HTML tags enhance its capabilities, enabling the use of styles, colors, tables, and embedded images. For the assignment, we used Markdown to provide structured information about Burkina Faso.

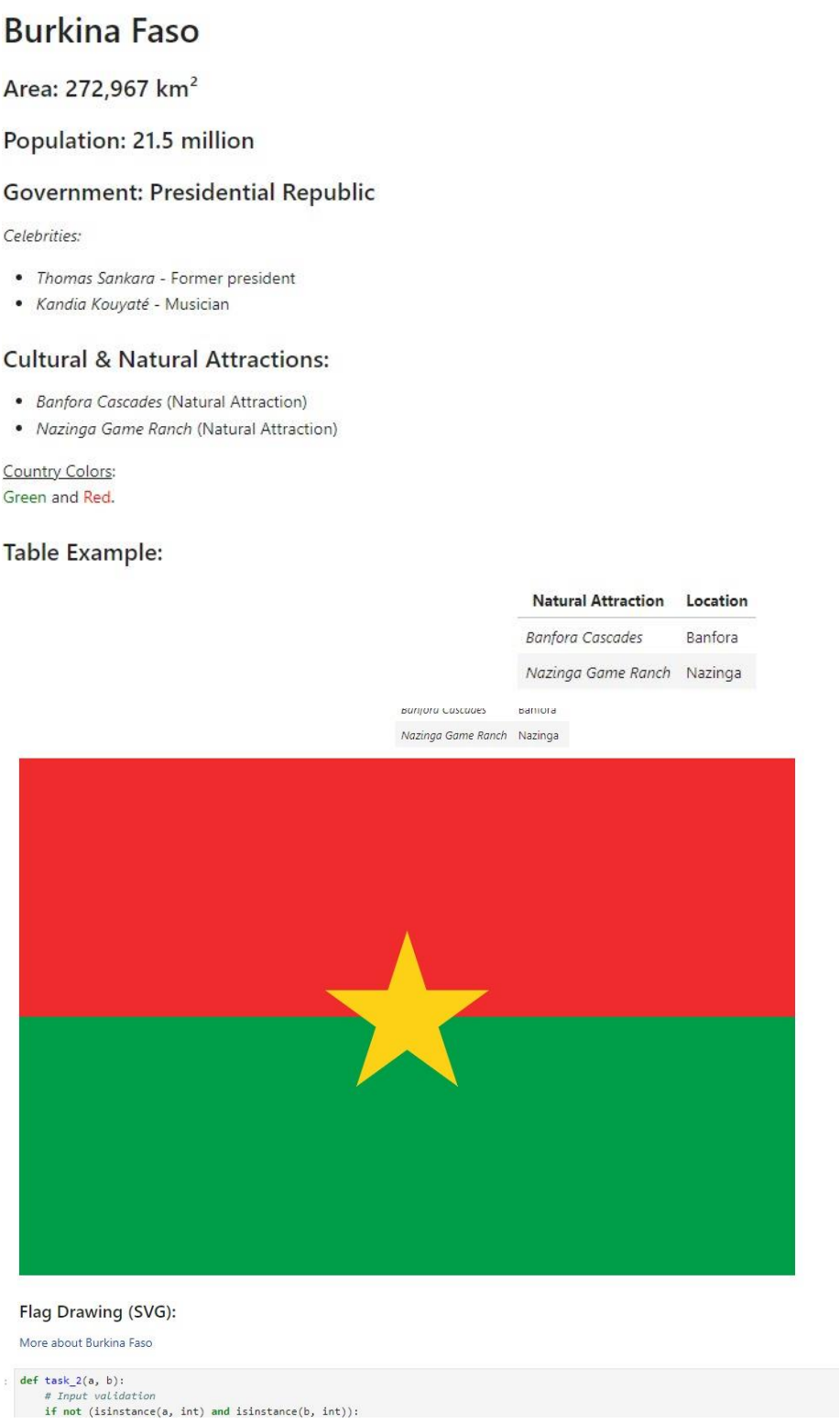
Ind. task	Assignment 4	Assignment 5
2	Burkina Faso	Implementation of the Euclidean algorithm to find the greatest common divisor (gcd) using division and subtraction.

Assignment 4: Using Markdown and HTML Tags

For the country Burkina Faso, I created a markdown cell that contains information using various HTML and markdown formatting features:

```
# Burkina Faso
### Area: 272,967 km²
### Population: 21.5 million
### Government: Presidential Republic

*Celebrities:*
- *Thomas Sankara* - Former president
- *Kandia Kouyaté* - Musician

### Cultural & Natural Attractions:
- *Banfora Cascades* (Natural Attraction)
- *Nazinga Game Ranch* (Natural Attraction)

<u>Country Colors</u>:
<font color="green">Green</font> and <font color="red">Red</font>.

### Table Example:
| Natural Attraction     | Location     |
|------------------------|--------------|
| *Banfora Cascades*     | Banfora      |
| *Nazinga Game Ranch*   | Nazinga      |

![Burkina Faso Flag](https://upload.wikimedia.org/wikipedia/commons/3/31/Flag_of_Burkina_Faso.svg)

### Flag Drawing (SVG):
[More about Burkina Faso](https://en.wikipedia.org/wiki/Burkina_Faso)


<svg width="300" height="200">
  <rect width="300" height="100" style="fill:green" />
  <rect width="300" height="100" y="100" style="fill:red" />
  <circle cx="150" cy="100" r="40" style="fill:yellow" />
</svg>
```

Picture 2 – Markdown and HTML Tags



Picture 3 – Result of Markdown / HTML Code

In addition to the above, the following Markdown and HTML features were incorporated:

- **Headings** of different levels (#, ##, ###)
- **Bold**, *italic*, and ***underline*** text

- **Lists** (both ordered and unordered)
- **Tables** and **borders**
- **Links and embedded images**

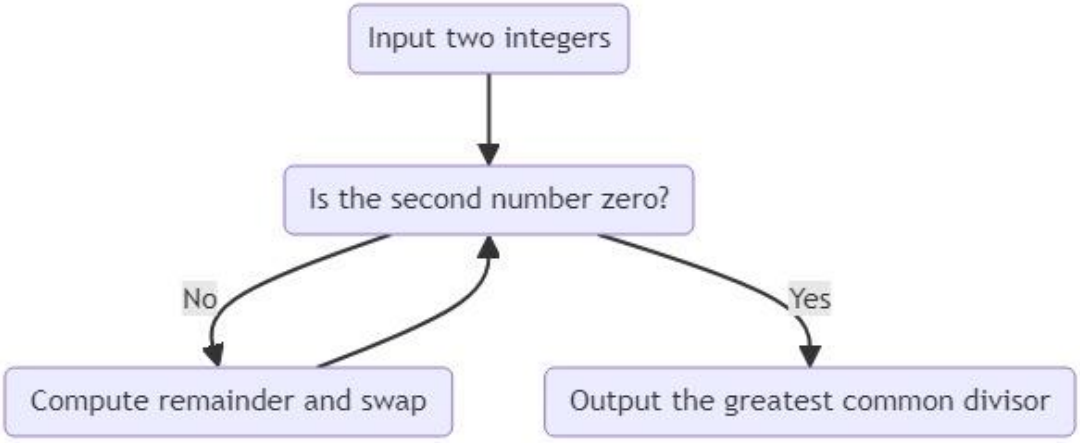
Assignment 5: Implementing the Euclidean Algorithm

The goal of this assignment is to implement the Euclidean algorithm for finding the greatest common divisor (gcd):

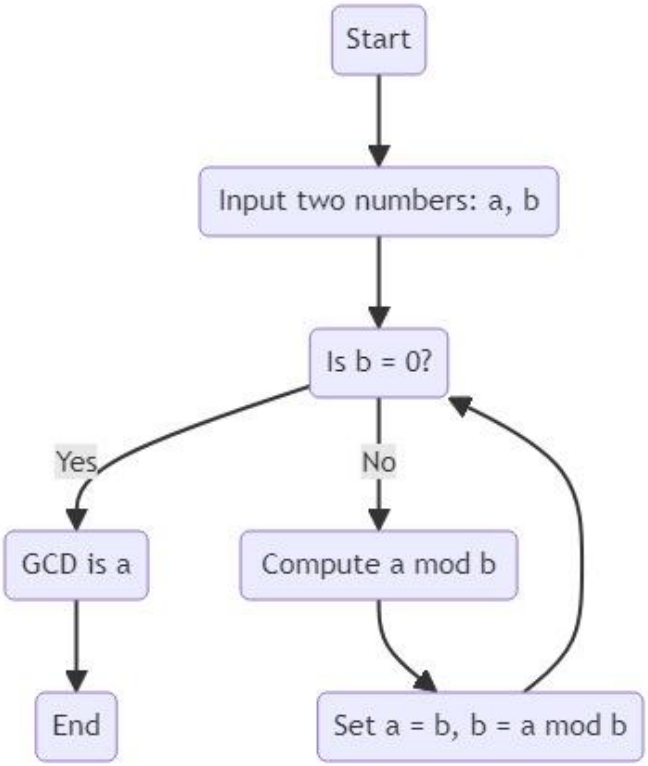
```
def task_2(a, b):
    if not (isinstance(a, int) and isinstance(b, int)):
        raise ValueError("Both numbers must be integers.")
    if a < 0 or b < 0:
        raise ValueError("Numbers must be non-negative.")
    while b != 0:
        a, b = b, a % b
    return a
print(f"GCD of 16 and 36 is {task_2(16, 36)}")
print(f"GCD of 12 and 54 is {task_2(12, 54)}")
```

3. Activity Diagram for Assignment 5

Here is the activity diagram describing the flow of the Euclidean Algorithm.



Picture 4 – Flowchart diagram illustrating the Euclidean Algorithm for finding the GCD



Picture 5 – Flowchart diagram illustrating the Euclidean Algorithm Activity

4. Screenshots with Inputs and Outputs

Below are the key inputs and outputs observed while running the code.

```
]: def task_2(a, b):
    # Input validation
    if not (isinstance(a, int) and isinstance(b, int)):
        raise ValueError("Both numbers must be integers.")
    if a < 0 or b < 0:
        raise ValueError("Numbers must be non-negative.")

    # Euclidean algorithm
    while b != 0:
        a, b = b, a % b
    return a

#Test cases
print(f"GCD of 16 and 36 is {task_2(16, 36)}")
print(f"GCD of 12 and 54 is {task_2(12, 54)}")
```

```
GCD of 16 and 36 is 4
GCD of 12 and 54 is 6
```

```
]:
```

Picture 6 – Python Code for Euclidean Algorithm

Test Cases:

- GCD of 16 and 36 → Output: 4
- GCD of 12 and 54 → Output: 6

5. GitHub Repository and Notebook Link

The Jupyter Notebook containing all the code and documentation has been committed to GitHub. https://github.com/BaharBerra/jupyter-notebook-lab1

6. Conclusion

In this laboratory work, the following objectives were successfully achieved:

- Installed Anaconda and created a Python 3 environment.
- Changed the Jupyter startup folder.
- Used Markdown and HTML to present information about Burkina Faso, utilizing various formatting options such as lists, tables, and SVG for flag drawing.
- Implemented the Euclidean algorithm for finding the greatest common divisor using both division and subtraction methods.
- Provided test cases for both methods, which returned accurate results.
- Linked the Jupyter notebook to GitHub .

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