CE/CZ1104 Linear Algebra for Computing

Lab 0 – Jupyter Notebook and Python

(No submission is required for this lab)

This lab must be completed by the end of Week 2 during your own time, i.e., there are no lab hours allotted for this lab. The aim of this lab is to familiarize yourself (i) with Jupyter notebook, which is the environment in which you will code, as well as (ii) with Python, the language that you will use to code in this course and with the IPython programming environment. All subsequent labs will involve coding in Python within Jupyter and submission of Jupyter notebooks in pdf format.

I. Jupyter Notebook

A notebook integrates code and its output into a single document that combines visualizations, narrative text, mathematical equations, and other rich media. This intuitive workflow promotes iterative and rapid development, making notebooks an increasingly popular choice at the heart of contemporary data science, analysis, and increasingly science at large. (from https://www.dataquest.io/blog/jupyter-notebook-tutorial/).

The Jupyter Notebook is an open-source web application that allows you to create and share documents that contain live code, equations, visualizations and narrative text. Uses include: data cleaning and transformation, numerical simulation, statistical modeling, data visualization, machine learning, and much more. (from jupyter.org)

Installing Jupyter notebook

While Jupyter runs code in many programming languages, **Python** is a requirement (Python 3.3 or greater) for installing the Jupyter Notebook.

We will use the Anaconda distribution to install Python and Jupyter. Anaconda conveniently installs Python, the Jupyter Notebook, and other commonly used packages for scientific computing and data science.

Use the following installation steps:

1. Download Anaconda. Download Anaconda's latest Python 3 version (currently Python 3.7). For Windows, choose 64-bit/32-bit version according to your laptop/desktop.

2. Install the version of Anaconda which you downloaded, following the instructions on the download page.

3. Congratulations, you have installed Jupyter Notebook.

Running Jupyter notebook

Start the notebook server from the command line (using Terminal on Mac/Linux, Command Prompt on Windows) by running:

```
jupyter notebook
```

More details at https://jupyter.readthedocs.io/en/latest/running.html#running.

II. IPython

IPython is an interactive shell environment <u>to execute python code</u> in REPL (Read Eval Print Loop). It makes it more interactive by adding features like syntax highlighting, code completion etc.

A **read–eval–print loop** (**REPL**), also termed an **interactive toplevel** or **language shell**, is a simple, interactive computer programming environment that takes single user inputs (i.e., single expressions), evaluates (executes) them, and returns the result to the user; a program written in a REPL environment is executed piecewise. A REPL can become an essential part of learning a new language as it gives quick feedback to the novice.

Preparation for the course

This lab is not about learning the Python language. Programming in Python is discussed in the course CE/CZ 1103 Introduction to Computational Thinking & Programming. You would have already taken that course or might be taking it this semester. Therefore, you have to use the time <u>before </u>your lab sessions start to revise or pick up the main points in Python.

If you are new to Python, there are many resources available to learn the language. You can also get a quick snapshot of Python that is relevant to Linear Algebra here (please ignore the discussions on Colab). You are encouraged to run the code snippets available there in your Jupyter notebook. Additional information is available here and here.