Jupyter-Notebooks for Numerical Analysis

Introduction

The course of Numerical Analysis should teach both the mathematical theory of numerical analysis and the craft of implementing numerical algorithms. Unfortunately, usually, only the mathematical theory is mentioned in the course syllabus/textbook. This is the reason and motivation for creating these jupyter-notebooks. The Jupyter-notebook provides a single medium in which mathematics, explanations, executable code, and visualizations can be combined. The student can interact with learning both the theory and the craft of numerical algorithms.

This repository includes jupyter-notebooks and python codes for the classic topics coved in a numerical analysis course.

Important Note:

> Crafts are not generally taught through lectures and textbooks: rather, one learns a craft by *doing*.

Contents

  - Power Iteration
- Interpolation
  - Polynomial Interpolation
  - Piecewise Linear Interpolation
  - Cubic Spline
- Least Squares
- Numerical Methods for ODEs
  - Euler Methods
  - Application: Lorenz System

Where

- These notebooks and python codes are published on [*Github*] (https://github.com/xiaozhouli/numerical_analysis) for public usages.
  - git clone https://github.com/xiaozhouli/numerical_analysis.git
  - or download as a zip file [*zip file*]
- For users from Mainland China, where visiting github.com is relatively slow, there is a mirror repository published on [*gitee*] (https://gitee.com/xiaozhouli/numerical_analysis).
  - git clone https://gitee.com/xiaozhouli/numerical_analysis.git
  - or download as a zip file from the above link.
- If you only want to have a view of the notebooks, you can just go to the following [*Nbviewer link*]

How to use

You are welcome to download the notebooks and play with them yourself. Of course, then you need a local or cloud installation of python and jupyter-notebook to run them.

Local installation:

- The simplest way to have a local installation of all needed packages is to install the [*Anaconda platform*]. It is free and open-source. It has more than 1500 python/R data science packages which includes all of the Python packages likely to be used in a scientific computing (or machine learning) course. More importantly, it supports Linux, Mac, and Windows systems.
- If you prefer to install everything manually, the requirement list is given as follows:

- python
- jupyter notebook / jupyter lab
- numpy, scipy, matplotlib, ipywidgets

Cloud platforms:

In order to avoid potential installation issues altogether, or as a secondary option, notebooks can be run using only cloud services.

- [*Cocalc*] (formerly called SageMathCloud)
- [*Colab*] (VPN needed for Mainland China)

Update Information

Time	Content
2020.10.10	complete the README information
2020.10.09	create a gitee.com mirror repository for fast access in China mainland
2020.10.09	move from github.com/Jupyter repository to github.com/numerical_analysis
2020.09.07	update along with 2020 Fall course
2020.06.29	update ReadMe file
2020.06.25	start record :joy: