MA 7121: Topics in Scientific Computing I Syllabus and Introduction

Suh-Yuh Yang (楊肅煜)

Department of Mathematics, National Central University
Jhongli District, Taoyuan City 320317, Taiwan

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Syllabus

- **Instructor:** Prof. Suh-Yuh Yang (楊肅煜)
  - Office: M315, Hong-Jing Hall
  - Phone: 03-4227151 ext. 65130

- **Office hours**: Tuesday 10:00 ∼ 12:00 am or by appointment

- **Prerequisites**: Some knowledge of numerical differential equations, optimization methods, and the software MATLAB: https://portal.ncu.edu.tw/
  校園授權軟體服務網裡面有關於Matlab的下載方式説明！

- **Textbook**: No textbook, but provide slides and journal papers

- **Assignments**: each student must complete and demonstrate a research topic on scientific computing

- **Grading policy:** *project presentations 20%+20%, project implementation and final report 20%+20%, and others 20%*

Course objectives

(1) This course will introduce some content with applications on numerical solutions of partial differential equations, nonlinear optimization, and variational methods.

(2) Students are expected to be able to use the theory and algorithms to solve at least one of the actual problems in computational and applied mathematics.

(3) This course emphasizes the practice and programming of problems, and each student must complete and demonstrate a research topic on scientific computing.

Important dates

- The period for adding and dropping: February 14-29, 2024
- The period for withdrawing: April 01-May 10, 2024
- **First presentation:** March 18-19, 2024 (5th week)
- **Second presentation:** April 29-30, 2024 (11th week)
- Dragon Boat Festival: June 10 (Tue), 2024, *no class!*
- **Final presentation:** June 11, 17, 18, 2024
- **Final project report and poster due:** June 18, 2024

Outline of the course

This course will cover the following topics of scientific computing:

1. Numerical methods for PDEs with applications to variational image processing

2. Principal component pursuit problem for low-rank textures

3. Sparse representation and dictionary learning

4. Projection methods for the incompressible Navier-Stokes equations

5. Some selected topics in data science: dimensionality reduction, support vector machine, etc.