Lab 2 + Project 2

1 Requirement

- Apply pattern recognition and machine learning methods from the course to a dataset of your choice, or explore the theory or implementation details of an algorithm that interests you from the course. There are no restrictions on the data or task.

- Since you are starting to work on your undergraduate thesis, you can consider studying some sub-tasks from the project in your undergraduate thesis using methods from this course (if applicable).

- You can use and compare methods you learn elsewhere, but you **must** practice at least one method within the scope of course, which includes but is not limited to:

  - Convex optimization, semi-definite programming, proximal methods, ADMM algorithm.
  - Sparse models, compressed sensing, matrix recovery, matrix factorization, robust PCA, sparse coding, sparse auto-encoder.
  - Probabilistic graphical models, message-passing algorithms, hidden Markov models, state space model, Kalman filtering, Hopfield network.
  - Community detection, spectral methods, graph signal processing.
  - Semi-supervised learning, self-supervised learning.
  - Graph neural networks, graph transformers.
  - Kernel methods, Gaussian processes, Bayesian optimization.

- You do not need to pursue state-of-the-art performance in this lab project, but if the method doesn't work as expected, try to explore the possible reasons behind it.

- Submitting previous reports you have completed (e.g., from past mathematical modeling contests) is **not** allowed.

- Outline what you have done and summarize your findings. You can submit either of the following

  - A formal project report.
  - A poster + a short video describing your work.

- Submission in group (max size = 4) is allowed.

- Deadline: 23:59, 1 Dec 2024.