W. DAI

EE4.66 LARGE DATA PROCESSING EXERCISE

IMPERIAL COLLEGE LONDON

Contents

1
Learn and Tell Coursework Guideline

The purpose of this coursework is to encourage students to

- Explore the literature, find interesting or useful stuff to study and present;
- Learn from each other and broaden horizons;
- Practice skills of project management, decision-making, team-playing, leadership, and presentation.

1.1 Coursework Format

Students will work in groups and present a technical topic that they have learned. The topic must be relevant to the module but should go beyond the taught materials. It can be on application or/and theory. Coursework will be marked by peer students, GTAs, and the instructor.

The **milestones** for this coursework are as follows.

1. Time slot registration: Each group uses the QnA channel to report their time constraint/preference by Friday 18 Nov. 2022. We will allocate a presentation session to each group. We plan to publicize the presentation timetable by 21 Nov. 2022.
2. Topic selection and reading. Each group decides a technical topic for their presentation. Put your group's tentative title for presentation in the Excel file by 28 Nov. 2022.
3. Upload your presentation materials by midnight 11 Dec. 2022. The materials include your presentation slides in pdf format, and the key reference papers.
4. Presentation:
    - Each group will have 15 minutes for presentation and 5 minutes for questions.

- The group is required to attend all the presentations in the session where they present.
- All the groups in a session are required to arrive 10 minutes before the session starts for the setup.

1.1.1 *Presentation Sessions*

- 12 December, 2022
  - 13:20-14:40
  - 15:00-16:20
  - 16:40-18:00
- 13 December, 2022
  - 9:30-10:50
  - 11:10-12:30
- 14 December, 2022
  - 9:30-10:50
  - 11:10-12:30
  - 13:20-14:40

1.2 *Marking Scheme*

The presentation marking is group-based, meaning that in typical case the whole group gets a single mark for everyone in the group.

- 50% peer marking: Each student is supposed to mark all the presentations given by other groups. The peer marks will be aggregated.

  Every student is required to mark other groups from at least two sessions.
- 50% 'authoritative' marking: GTAs and instructor will mark presentations as well.

1.2.1 *Marking criteria*

- Technical topic and contents (40%): Timeliness, relevance, depth, and breadth. (Something interesting and useful)
- Presentation and delivery (40%): Clearness, conciseness, and easiness to follow. Time control. (Audience can learn something)
- Q&A (15%): Accuracy and conciseness. Time control.

Peer marking (5%): Every student is required to mark 7 other groups.

1.3 Topic Selection

- Every group finds their own topic to present. The topic can be theory, methodology, or applications.
- The reading materials can be academic papers, book chapters, published articles, etc.
- Typical questions to be answered by reading a paper include
  - What is the problem under study? Why is the problem relevant/important?
  - What are the approaches/methods to address the problem?
  - What are the pros and cons?

1.3.1 Possible Topics

The following list of topics is only for your references. You can go beyond.

- Sparsity related problems
  - Blind deconvolution 
  - Blind image deblurring
  - Blind source separation
  - Causality analysis
  - Channel estimation for massive MIMO
  - Collaborative filtering for recommender systems
  - Convolutional dictionary learning 
  - Compressed sensing and physics informed deep Learning 
  - Dictionary learning 
  - Graph neural networks
  - Graph signal processing
  - Group Lasso and network Lasso
  - Landscape of neural networks
  - MRI imaging via compressed sensing / deep learning
  - Non-negative matrix factorization
  - Pagerank in practice
  - Prototypical learning (part-based prototypes)
  - Resource allocation for wireless communications
  - Sparse logical models: decision trees, decision lists, and decision sets

  - Sparse PCA
  - Super resolution
  - SVM regression
- Optimization
  - Conic programming
  - Conjugate gradient method
  - Minimax optimization

    Razaviyayn M, Huang T, Lu S, Nouiehed M, Sanjabi M, Hong M. Nonconvex min-max optimization: Applications, challenges, and recent theoretical advances. IEEE Signal Processing Magazine. 2020 Sep 3;37(5):55-66.
  - Mirror descent
  - Nesterov accelerated algorithms
  - Newton type proximal gradient methods
  - Optimizers for neural networks
  - Proximal algorithms
  - Semidefinite programming
  - Stochastic optimization
  - Trust region methods
  - Zero-order optimization

2

Bibliography