SI231 - Matrix Computations, Fall 2020-21

Projects

Prof. Yue Qiu and Prof. Ziping Zhao

SI231 projects are meant to be substancial and are, in fact, the most significant part of the final grade in the course. They should contain an overview of a particular problem and some independent work.

1 Specifications

Some specifications for the project:

- The length should be at leat 8 single-column pages with 10pt font. Be brief and to the point.
- The project should be written using LaTeX (use an IEEE paper style or similar) and submitted in PDF format (do not use Word!).
- Keep a pdf copy of all the cited references (as you will have to send them to me with the final project).
- The project should contain individual work by at most two students as a group.
- The student should read around 8 research papers on the chosen topic.
- The project should start with a description of the problem (citing at least 8 related papers): this should not be a separate overview of each of the papers one after another; instead, it should contain a unified problem formulation, explaining how each of the related papers fits within the general formulation.
- The related papers should be criticized: you should have an opinion on the papers that you read, you should be able to comment on the contribution and difficulty of each paper.
- Independent research: after the problem formulation and overview of the state of the art, the student should try to propose something new that improves on the existing approaches based on the contents learnt from this course.
- No plagiarism or self-plagiarism is allowed. (The student is never allowed to reuse his/her own published papers as the final project.)

2 Structure of the written report

In order to make the evaluation of the project as objective as possible, the written report should stricly adhere to the following structure with the sections (a penalty will be applied if the report is not organised according to the guideline):

1. Introduction: 10% grade
2. Overview of existing work (with unified notation): 20% grade
3. Criticism of the existing work: 20% grade
4. New contribution (if any): 20% grade
5. Numerical results: 10% grade
6. Conclusions: 10% grade

References: 10% grade

3 Schedule and submission

Please follow the deadlines below. They are strict deadlines and there will be penalties for not respecting them. In particular, the final reports late by 1 day will be penalized with 20% of the grade, late by 2 days will be penalized with 40% of the grade, and late by 3 days is most likely a Fail.

1. *Topic:* By Oct. 17th, the student should choose a topic (either inspired on the list of topics below or not, preferably the student will come up with a topic of his/her interest) with a brief plan on what he/she wants to do and email the instructors to get a confirmation.
2. *Initial proposal:* By Nov. 10th 11pm, the student should submit an initial proposal (2-3 pages) containing the title, introduction, preliminary ideas, and references. Submit the proposal with filename LASTNAME1-Firstname1-LASTNAME2-Firstname2-proposal.pdf to the link: http://pan.shanghaitech.edu.cn/cloudservice/outerLink/decode?c3Vnb24xNjAwMTY0NzI1OTYxc3Vnb24=
3. *Final pre-report:* One week before Dec. 25th (i.e., Dec. 18th 11pm), submit your pre-report with filename LASTNAME1-Firstname1-LASTNAME2-Firstname2-prereport1week.pdf to the link: http://pan.shanghaitech.edu.cn/cloudservice/outerLink/decode?c3Vnb24xNjAwMTY0NzcwNDAwc3Vnb24=
4. *Final report:* By Dec. 25th 11pm, submit your final report with all the cited references and codes (optional) with filename LASTNAME1-Firstname1-LASTNAME2-Firstname2-finalreport.zip to the link: http://pan.shanghaitech.edu.cn/cloudservice/outerLink/decode?c3Vnb24xNjAwMTY0ODA1NTQzc3Vnb24=

4 List of topics

Some potential general topics for the projects include (be creative and come up with your own project):

- Applications on machine learning, classification, and SVM
- Applications on deep learning
- Applications on natural language processing (NLP)
- Applications on computer vision and graphics
- Applications on robotics and UAV
- Applications on sparsity and/or low-rank matrix decomposition
- Applications on image processing
- Applications on circuit design
- Applications on biomedical applications (e.g., DNA analysis)
- Applications on finance
- Applications on industrial engineering and logistics
- Applications on communications and networking
- Applications on outliers modeling
- One specific idea: develop a method to identify students who cheat in an exam given the location of their seats and their points for each problem.