EECS4414 Information Networks (Cross-listed EECS5414)

Project Description

The most important learning component of the class consists of a substantial course project. The project will offer you an opportunity to develop a quantitative and qualitative intuition of network analysis methods and algorithms, and to obtain practical experience working with software and tools for large-scale social and information network analysis. This can prepare you for applying state-of-the-art network analysis and algorithms in real-world settings and data. If you are interested in research, it will also equip you with necessary skills and knowledge to perform network science research.

There can be *three types* of course projects:

- **Type I**: Experimental evaluation of algorithms and models on an interesting dataset.
- **Type II**: A theoretical project that considers a model, an algorithm or a network property (measure) and derives a rigorous result about it.
- **Type III**: An efficient implementation of an algorithm that can scale to massive graphs.

Ideally, projects will be a combination of the three types of projects outlined above. All project should contain some experimentation on real or synthetic data, and some amount of mathematical analysis.

Projects will be evaluated based on:

- *Significance/Novelty*. Is the problem "real" and "interesting", or just a "toy" problem? How original, important and well defined are the questions posed? How novel is the approach? Is the work likely to be useful and/or have impact? Are there any novel/interesting applications of the problem and/or algorithms?
- *Technical Quality*. Is the approach and the methods appropriate and well described? Are sufficient details provided? Is the technical material correct? Are the proposed algorithms or applications creative and interesting? Are the methods and algorithms reproducible? Is the interpretation (discussion and conclusion) well balanced and supported by the data?
- *Organization*: Is the report well organized? Is the write-up clear and the language adequate? Are results presented in the most appropriate manner? Are figures and tables used appropriately?

Project Deliverables

The table below presents the breakdown of the project deliverables, weights and due dates.

Project Deliverables	Weight	Due Date
Proposal (~2 pages)	10%	Fri, May 17
Milestone report (~5 pages)	20%	Fri, May 31
Final presentation	20%	Thu, Jun 13
Final report (~7 pages)	50%	Fri, Jun 14

Datasets

Check the course website, under resources.

Software Tools and Libraries

Check the course website, under resources.

Deliverable 1: Project Proposal (10%)

The project proposal should build on a number of related research papers. The idea is to survey the related work and identify what are strengths and weaknesses of the paper(s) you read and how they may be addressed. The proposal should then focus on what are some promising further research directions and questions. You should try to provide a concrete proposal for a model or algorithm that potentially extends or improves the topics discussed in the papers you've read.

The header of the project should include the course title and an indication that this is a project proposal, the title of the project, your name and contact information. The content of the project should have the following parts:

- **Motivation and Problem Definition**: What is the goal of your project? What is the problem you are trying to solve? What are the questions you want to answer? Why the problem is important? What are a few potential applications?
- **Methodology**: How will you address the problem? What are the steps you need to take? Try to be as specific as possible.
- **Evaluation**: How will you evaluate your work? What experiments you plan to do? What dataset will be used?
- **References**: The proposal should include the full reference of the papers that you want to base your project ideas on (full citation).

Formatting and Style

The suggested length of the project proposal is **2 pages** and it must be in PDF format. All reports should be formatted according to the ACM SIG conference proceedings template in LaTex and prepared using on Overleaf, a free cloud-based, collaborative authoring tool. The template can be accessed here:

https://www.overleaf.com/latex/templates/association-for-computing-machinery-acm-sig-proceedings-template/bmvfhcdnxfty

How to Submit?

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% submit 4414 project proposal.pdf team.txt
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Deliverable 2: Project Progress Report (20%)

The project progress report should represent a first (incomplete) draft of your final report. The expectation is that almost 50% of the work has been completed. At this stage, you should be able to provide a complete outline of the project, even if certain key parts have not yet been implemented/solved and any major results are not available. The header of the report should include the course title and an indication that this is a project progress report, the title of the project, your name and contact information. The outline of the report should be structured as follows:

- **Introduction/Motivation**: What is the project about? What is the problem you are trying to solve? What are the questions you want to answer? Why the problem is important? What are a few potential applications?
- **Problem Definition:** Introduce notation, provide formal definitions as needed, define any constraints or restrictions, define what you try to optimize (e.g., maximize or minimize an optimization function, or an accuracy/error function). Describe the problem in a formal way. Describe the hardness of the problem in a formal way.
- **Related Work:** Position the problem among the body of existing research. How does your project relate to previous research? How is your project replicating/different/complimentary to previous research? References to papers you cite should be explicit, followed by a comment that describes how it is relevant.
- **Methodology**: How you aim to address the problem? What are the steps you had to take? Describe the data collection process. Provide any mathematical background necessary for the methods. Describe any algorithms or variations of the methods. Describe limitations or difficulties with your approach. Formally describe any important algorithms used from literature. Try to be as specific as possible.
- **Evaluation**: How will you evaluate your work? What experiments you plan to do? What dataset will be used? Describe any initial findings or summary statistics from your dataset.
- **Conclusions**: What are the conclusions of your work? Are there any highlights. Is there need to discuss or interpret the results? What are some ideas for future work?
- **References**: The proposal should include the full reference of the papers that you want to base your project ideas on or your approach to solve the problem. Full citation is required. References should be specific and found inside the text, as appropriate.

Parts of the above outline will (probably) be filled at a later stage, especially the ones that relate to the details of the methods, the evaluation and the conclusions. At this phase, you should try to fill in as many parts of the outline as possible so that it is clear what you plan to do for the final version.

Formatting and Style

The suggested length of the project proposal is **5 pages** and it must be in PDF format. All reports should be formatted according to the ACM SIG conference proceedings template in LaTex and prepared using on Overleaf, a free cloud-based, collaborative authoring tool. The template can be accessed here:

https://www.overleaf.com/latex/templates/association-for-computing-machinery-acm-sig-proceedings-template/bmvfhcdnxfty

How to Submit?

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Deliverable 3: Project Final Report (50%)

The final report should represent all the completed work. The expectation is that most of the work has been completed and any major results are available. At this stage you should be able to provide a complete description of the project, even if a few smaller parts have not yet been implemented or solved. The header of the report should include the course title and an indication that this is the project's final report, the title of the project, your name and contact information. The sections of the report should be structured (as close to) as follows:

- **Abstract**: The abstract (limited to **150-200** words) should be a comprehensive but concise description of your project that aims to attract potential readers. It should briefly discuss the motivation, problem of interest, approach to solve it and main results of your work.
- **Introduction/Motivation**: What is the project about? What is the problem you are trying to solve? What are the questions you want to answer? Why the problem is important? What are a few potential applications?
- **Problem Definition:** Introduce notation, provide formal definitions as needed, define any constraints or restrictions, define what you try to optimize (e.g., maximize or minimize an optimization function, or an accuracy/error function). Describe the problem in a formal way. Describe the hardness of the problem in a formal way.
- **Related Work:** Position the problem among the body of existing research. How does your project relate to previous research? How is your project replicating/different/complimentary to previous research? References to papers you cite should be explicit.
- **Methodology**: How did you address the problem? What are the steps you had to take? Describe the data collection process. Provide any mathematical background necessary for the methods. Describe any algorithms or variations of the methods. Describe limitations or difficulties with your approach. Are there any interesting trade-offs (accuracy/efficiency)? Formally describe any important algorithms used from literature. Try to be as specific as possible.
- **Evaluation**: How did you evaluate your work? What experiments did you perform? What datasets were used? Provide a roadmap of evaluation. How your evaluation provides support (or not) of your methods. Are there any highlights? Discuss and try to interpret the results.
- **Conclusions**: What are the conclusions of your work? What are some ideas for future work?
- **References**: The final report should include the full reference of the papers that you based your project ideas on or your approach to solve the problem. Full citation is required. References should be specific and found inside the text, as appropriate.

It is plausible that some of you might not have gone as-far as you'd wish in the project. As a result, parts of the outline might not be fully filled, especially parts that relate to the details of the methods and the evaluation. You should try to fill in as many parts of the outline as possible.

Formatting and Style

The length of the final report should be **7-8 pages** and it must be in PDF format. All reports should be formatted according to the ACM SIG conference proceedings template in LaTex and prepared using on Overleaf, a free cloud-based, collaborative authoring tool. The template can be accessed here:

https://www.overleaf.com/latex/templates/association-for-computing-machinery-acm-sig-proceedings-template/bmvfhcdnxfty

Final Report Evaluation

The final report will be evaluated based on the following mark breakdown.

Final Report Component	Weight	Due Date
Introduction/Problem Definition	20%	Clear motivation that encourages the reader to read on; clear problem definition including input and desirable output
Related Work	10%	Important references are not missing; explicit citations
Model/Methodology/Algorithms	30%	Clear and well written so that we can fully understand what you did
Evaluation/Results	30%	Comprehensive evaluation plan; clear and conclusive set of experiments
Style and Language	10%	Overall organization, language, and style

How to Submit?

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Deliverable 4: Project Final Presentation (20%)

The final presentation should be seen as your opportunity to present your hard work in class, challenge your ideas, get feedback from peers and discuss methods and algorithms. The expectation is that most of the work has been completed and any major results are available to share with an audience. At this stage you should be able to tell a story about your project, even if parts of it have not yet been completely implemented or solved. The title of the presentation should include the course title and an indication that this is the project's final presentation, the title of the project, your name and contact information. The following are some guideline, tips and advice for preparing your presentation.

- You (or your group) will have **x** minutes to present their work in the classroom. Another **y** minutes will be allocated for questions and discussion. **x**, **y** to be determined by email closer to the date.
- You should prepare a slide deck given a slide should take a minute to talk about (on average).
- Presentations should be organized into thematic units. A typical outline includes:
    - Motivate of the problem, its importance and potential applications.
    - Definition of the problem, including input, constraints, desirable output and its hardness
    - Main idea to approach the problem and the fundamental algorithms proposed
    - Highlight of the results (experimental, theoretical or both)
    - Interesting variations and limitations of the approach
    - Concluding remarks
- The talk should be self-sufficient, meaning that you should not make any assumption about prior knowledge of the audience or previous well-known results. All concepts should be introduced and appropriate notation should be used consistently throughout the presentation.
- Focus on the essential parts of the project and avoid too-many technical details. The goal is to give a summary of the project and convey the contribution of your work to other people. At the same time, you should make sure that important content is adequately covered.
- Prepare the slides carefully. Text should be easily readable and slides should not too be overloaded with content. Avoid full text sentences and use of math symbols, unless necessary.
- Practice the talk several times, and time yourself to make sure you are within the time bounds.

More Advice & Tips

Some interesting advice on how to give a bad talk by David A. Patterson (UC Berkeley):
https://people.eecs.berkeley.edu/~pattrsn/talks/BadTalk.pdf
Some design tips for beautiful presentations:
https://visage.co/11-design-tips-beautiful-presentations/

PowerPoint Templates

Please find below links to PowerPoint Templates. These are designed with the York brand's primary and secondary colours and fonts embedded for ease of use and can be customized. Template files are available in a widescreen (16:9) format. Branded layouts featuring the York colours and campus photos are also included for title and section slides. This PowerPoint template is AODA compliant (last updated January 2021)

Widescreen with built-in instruction (.potx)

Widescreen without built-in instruction (.potx)

How to Submit?

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% submit 4414 project final-presentation.pptx final-presentation.pdf team.txt
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