Project

APL 405 - 2023W (Machine Learning for Mechanics)

The project **must be chosen** within the purview of civil, mechanical or material engineering sciences.

1 Proposal (2 marks)

- **Submit electronically on the Teams by 12th of February (11:59 pm)**
- At most one page (excluding references)
- Which option did you pick?
- Option A (Literature survey):
  - What is the problem?
  - Cite 6 to 10 papers that you plan to survey
- Option B (Empirical evaluation):
  - What is the problem?
  - What machine learning techniques do you plan to experiment with?
  - Cite 3 to 6 related papers that you plan to review
- Option C (Algorithm design):
  - What is the problem?
  - Why are there no satisfying approaches?
  - What is the intuition behind the new technique that you plan to develop?
  - Cite 3 to 6 related papers that you plan to review

2 Suggested structure of mid-semester report

- **Option A** (Literature survey):
  - Introduction
    - What is the problem?
    - Why is it an important problem?
  - Survey
    - Summarize the range of techniques by highlighting their strengths and weaknesses (i.e., the 4-6 papers that you read)
    - Tip: this summary should not be a laundry list of techniques with an independent paragraph for each technique
    - Suggestion: organize your summary based on desirable properties of the techniques
  - Analysis
    - What is the state of the art?
- **Option B** (Empirical evaluation):
  - Introduction
    - What is the problem?
    - Why is it an important problem?
  - Techniques to tackle the problem
    - Brief review of previous work concerning this problem (i.e., the 3-6 papers that you read)
    - Brief description of the techniques chosen and why are they chosen
  - Empirical evaluation
    - Show result using atleast one technique
- **Option C** (Algorithm design):
  - Introduction
    - What is the problem?
    - Why can't any of the existing techniques effectively tackle this problem?
    - What is the intuition behind the technique that you have developed?
  - Techniques to tackle the problem
    - Brief review of previous work concerning this problem (i.e., the 3-6 papers that you read)
    - Some idea of the technique that you are developing
    - Brief description of the existing techniques that you will compare to
  - Evaluation
    - Some initial results with your new approach and comparison to existing approaches

3 Suggested Structure of the final report

- **Option A** (Literature survey):
  - Introduction
    - What is the problem?
    - Why is it an important problem?
  - Survey
    - Summarize the range of techniques by highlighting their strengths and weaknesses (i.e., the 6-10 papers that you read)
    - Tip: this summary should not be a laundry list of techniques with an independent paragraph for each technique
    - Suggestion: organize your summary based on desirable properties of the techniques
  - Analysis
    - What is the state of the art?
    - Any open problem?
  - Conclusion
    - What have you learned?
    - What future research do you recommend?
- **Option B** (Empirical evaluation):
  - Introduction
    - What is the problem?
    - Why is it an important problem?
  - Techniques to tackle the problem
    - Brief review of previous work concerning this problem (i.e., the 3-6 papers that you read)
    - Brief description of the techniques chosen and why are they chosen
  - Empirical evaluation
    - Compare empirically the techniques for complexity, performance, ease of use, etc.
  - Conclusion
    - What is the best technique?
    - Is any technique good enough to declare the problem solved?
    - What future research do you recommend?
- **Option C** (Algorithm design):
  - Introduction
    - What is the problem?
    - Why can't any of the existing techniques effectively tackle this problem?
    - What is the intuition behind the technique that you have developed?

  - Techniques to tackle the problem
    * Brief review of previous work concerning this problem (i.e., the 3-6 papers that you read)
    * Describe the technique that you developed
    * Brief description of the existing techniques that you will compare to
  - Evaluation
    * Analyze and compare (empirically or theoretically) your new approach to existing approaches
  - Conclusion
    * Can your new technique effectively tackle the problem?
    * What future research do you recommend?

4 Report writing

- No limit on the number of pages but minimum 8 pages is expected.
- Use the JMLR format
- Explain the big picture and any necessary detail