

MATH-5211-FA LARGE LANGUAGE MODELS
FALL 2025

Instructor: Prof. Xin Yang LU
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Classes: reading course
Office Hours: by appointment via email

DESCRIPTION

- **Textbook:** *Foundations of Large Language Models*, by Tong Xiao and Jingbo Zhu. We will cover:
 - Pre-training.
 - * Pre-training NLP Models.
 - * Self-supervised Pre-training Tasks.
 - * Example: BERT. Applying BERT models.
 - Generative Models.
 - * Introduction to LLMs.
 - * Training at Scale.
 - * Long sequence modeling.
 - Prompting.
 - * General prompting design.
 - * Advanced prompting methods.
 - * Learning on prompt.
 - Alignment.
 - * An Overview of LLM Alignment.
 - * Instruction Alignment.
 - * Human Preference Alignment: RLHF.
 - * Improved Human Preference Alignment.
 - Inference.
 - * Prefilling and Decoding.
 - * Efficient Inference Techniques.
 - * Inference-time Scaling.
- **Midterm:** 1 midterm exam counting for 35% of the final grade.
- **Final Exam:** There will be a final exam which will count for 65% of the final grade. There will be *NO* 100% final option.
- **Academic Dishonesty:** All cases of academic dishonesty will be dealt with according to the university's Code of Student Behavior and Disciplinary Procedures, copies of which are available from the university's web-site.
- **Accommodations:** Lakehead University is committed to achieving full accessibility for persons with disabilities. Part of this commitment includes arranging academic accommodations for students with disabilities to ensure they have an equitable opportunity to participate in all of their academic activities. If you think you may need accommodations, you are strongly encouraged to contact Student Accessibility Services (SAS) and register as early as possible. For more information, please visit:
<http://studentaccessibility.lakeheadu.ca>