CSCE 585: Machine Learning Systems

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Course Description

Machine Learning Systems (MLSys) explores the intersection of machine learning, systems, and software engineering. Students will learn to critically read MLSys papers, design reproducible experiments, and implement scalable, efficient, and trustworthy ML systems. This version emphasizes LLM systems, agentic AI, and modern production challenges.

Learning Objectives

By the end of the course, students will be able to:

- Critically evaluate MLSys research and impactful papers
- Design and analyze reproducible ML experiments
- Understand production challenges in ML (MLOps, LLMOps, monitoring)
- Explore modern frontiers: LLM serving, agentic AI, sustainability, privacy
- Communicate findings in technical reports and presentations

Tentative Weekly Schedule

1. Lecture 1: Course Overview & Motivation
2. Lecture 2: ML in Production (MLOps foundations)
3. Lecture 3: Designing Agentic AI Systems (patterns)
4. Lecture 4: Case Study – Designing LLM/Agentic Systems
5. Lecture 5: LLMs in Production Systems (LLMOps, vLLM, Ray Serve)
6. Lecture 6: Data, Evaluation & Monitoring for LLM Systems
7. Lecture 7: Efficiency & Sustainability in ML Systems
8. Lecture 8: Trustworthy & Safe MLSys (robustness, governance)
9. Lecture 9: Reproducibility & Benchmarking in MLSys
10. Lecture 10: What Makes an Impactful MLSys Paper
11. Lectures 11–12: Capstone Prep, Guest Lectures, Student Presentations