Syllabus: VIP: Responsible AI for Decision Making

Interactive Sessions: M 3:30−4:20

Instructors:

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Catalog Description

Multidisciplinary course supporting undergraduate research. Students can participate multiple semesters. Students will familiarize themselves with project, gain knowledge/skills, and begin making meaningful contributions.

Course Description

Develop AI tools that enable responsible decision-making in engineering and healthcare, with a focus on user-inspired research projects.The advent of AI has transformed numerous fields by enabling efficient analysis of vast and complex datasets. However, integrating AI into decision-making processes poses challenges, particularly in high-stakes areas where incorrect decisions can have serious consequences. This emphasizes the need for trustworthy AI tools that are confidence-aware, robust and reliable, interpretable and explainable, and adaptable to domain shifts. Our objective is to develop trustworthy AI methods that support decision-making across diverse domains. This includes: Specialized Language Models: Tailoring language models to extract domain-specific knowledge, improving the efficiency and accuracy of information retrieval. Multi-modal Data Analysis: Creating AI systems capable of integrating data from various sources (e.g., text, images, sensors) to provide comprehensive insights for complex decisions. Time Series Forecasting: Developing robust models to predict future trends using historical data, aiding in proactive decision-making. AI-based Optimization: Leveraging AI to solve complex optimization problems, enhancing operational efficiency. These tools will be applied across sectors such as supply chain, manufacturing, e-commerce, mobility, power systems, and healthcare. Our research, driven by industrial case studies, aims to create significant societal impact.

Methods and Technologies

- ML
- Multi-Modal Learning
- Deep Learning
- Time Series Forecasting

- LLMs
- Uncertainty Quantification
- Optimization

Preferred Interests and Preparation

We welcome individuals from all majors and backgrounds who are passionate about applying AI in engineering and healthcare. Ideal candidates are eager to learn and engage in challenging and impactful projects. Experience with Python and PyTorch, along with a basic understanding of Linear Algebra, Statistics, and Probability Theory, is a plus.