



Thesis Defense

Computer Science Master's Program

“Accelerating Relationship Discovery in Chronic Lower Back Pain Through Knowledge Graph and Ontology Enhanced Large Language Models”

By **Damon Lin**

Abstract:

Chronic lower back pain (cLBP) is a widespread public health burden linked to anxiety, depression, and opioid addiction. Interventions aimed at treating cLBP have shown minimal improvements in pain outcomes, leading researchers to reexamine our understanding of cLBP through constructing a causal model. However, constructing causal models through Randomized Controlled Trials are often unfeasible, and relying on domain expertise requires extensive and time-consuming research, posing a serious bottleneck for designing effective treatments. To accelerate this process, we apply Knowledge Graphs, Ontologies, and Large Language Models (LLMs) to aid researchers in determining possible causal relationships. First, we demonstrate how LLMs can be harnessed to improve the construction of robust Knowledge Graphs. We illustrate how to effectively utilize LLMs for Entity Resolution, highlighting how textual context can improve performance. Then, we demonstrate how combining Knowledge Graphs and LLMs as a Retrieval Augmented Generation (RAG) system can effectively augment traditional data-driven approaches, showcasing how LLMs can complement traditional machine learning methods by bridging the gap between data and domain constraints. Finally, we present a comprehensive analysis of how ontologies can be constructed for aiding RAG systems, showing how the specificity of an ontology can significantly impact RAG systems.

Date: Friday, November 21st, 2025

Time: 1:00 PM – 2:00 PM

Location: 14-232b

Committee: Dr. Anderson, Dr. Davidson, Dr. Theresa Migler

