CSCE 6215: Graph-based Natural Language Processing and Deep Learning

3 Semester Credit Hours; 3 Lecture Hours

Course Coordinator: Paul Tarau
Textbook: none
Other materials: academic papers, open source software.

Catalog description: Students explore advanced topics in graph and deep-learning based natural language processing. The course will overview current research trends and open-source tools in the field and provide a solid foundation on key theoretical methods and practical applications integrating deep learning and graph-based techniques focused on advanced natural language understanding tasks. A research project will apply the techniques learned for automatic summary, keyphrase and relation extraction from text documents.

Prerequisites: CSCE CSCE 5290 or CSCE 5215 or CSCE 5210

Course outcomes:

1. Familiarity with key directions in recent research in graph and deep-learning based natural language processing
2. Practical knowledge in configuring deep-learning systems used in natural language processing tasks and their hyperparameters
3. Ability to set up and customize graph-based and deep-learning natural language toolkits using their Python-based interfaces
4. Ability to empirically evaluate the performance of summary, keyphrase and relation extraction systems

Brief list of topics to be covered: Dependency parsers, Graph centrality algorithms, Deep-learning neural networks for natural language processing, Working with Tensorflow and Pytorch, Extractive and abstractive summarization, Keyphrase extraction, Subject-verb-object relation extraction, Sentiment and entailment analysis, Graph and deep-learning based question-answering.

Justification for new course: Synergies between graph-based Natural Language Processing and Deep Learning are giving rise to promising research trends in Artificial Intelligence with applications ranging from automatic summary and keyword extraction to question-answering systems and voice-enabled digital assistants. Exposure to advanced techniques in these research fields is likely to make our PhD graduates employable at top companies relying heavily on Artificial Intelligence and Natural Language Processing (e.g., Google, Facebook, Amazon) as well as in tenure track academic positions.