# **UNIVERSITY OF NEBRASKA AT OMAHA**

## STAT 8730: Advanced Statistical Machine Learning

TR 4:00 PM - 5:15 PM | On-Campus | Dr. Xiaoyue Cheng

#### Description:

Advanced Statistical Machine Learning is the second course in machine learning course sequence, following MATH/STAT 4450/8456 (Introduction to Machine Learning). This course will focus on machine learning techniques that investigate variable association, like unsupervised learning and graphical models.

**Tentative topics:** 

- 1. Clustering: k-means, hierarchical clustering, modelbased clustering
- 2. Dimension reduction: principle component analysis, self-organizing maps, multidimensional scaling
- 3. Other unsupervised learning methods: association rules, page rank
- 4. Mixture models and EM algorithm
- 5. Graphical models: Bayesian networks
- 6. Sequential data analysis: Markov models, hidden Markov models
- 7. Sampling methods: rejection sampling, importance sampling

MATH 4750 or permission of instructor.

#### Textbooks:

- The Elements of Statistical Learning: Data Mining, Inference, and Prediction
- Pattern Recognition and Machine Learning
- Bayesian Reasoning and Machine Learning •
- Machine Learning: A Probabilistic Perspective •

#### Teaching presentation:

Students will be assigned academic papers on machine learning topics to read, learn, reproduce the results, and lead a discussion in class.

Machine learning contest:

A regression-based prediction competition will be held. Students will search for the best predictive model and give a presentation.

#### Research project:

Each student will complete a project using machine learning methods on some research topic.

Software: R or Python.

Pre-requisites:





### For More Information: Dr. Cheng | 402.554.2848 | xycheng@unomaha.edu

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