

# CMSC643 Conclusion

# What we saw

- A lot of supervised learning
- Classification/Regression
- Regularized Loss Optimization as central framework
- Gradient Descent and extensions as algorithms for solving these optimization problems
- Decision Trees/Random Forests/Adaboost (Ensemble learning in general)

# What we saw

- Large-scale learning
- Evaluation and other practical matters
- Domain adaptation for train/test set discrepancies
- Unsupervised learning: k-means clustering, PCA, t-SNE
- SKLearn and TensorFlow

# What didn't we see

- Reinforcement Learning
- Multi-armed bandit algorithms
- Semi-supervised, online and other extremely useful learning settings
- Graphical Models and general Bayesian approaches to learning
- Tools: Keras for DL, toolkits for specific applications (e.g., NLTK for natural language processing)

# What next?

- Conceptual:
  - Stats approach: Hastie, Tibshirani and Friedman. “Elements of Statistical Learning.”
  - Probabilistic ML approach: Bishop. “Pattern Recognition and Machine Learning.”
  - Algorithmic approach: Shalev-Swartz, Ben-David. “Understanding Machine Learning”
- New Research: NIPS, AISTATS, CVPR, ICML

# What next?

- Application
  - Revisit O'Reilly book suggested in class
  - Solve real problems!! Kaggle, etc. is a good way to get started
  - Become familiar with, e.g., AWS and how to build and deploy ML models there