**ECE 2195: Learning Objectives**

**Introduction to machine learning**

* Explain when we need machine learning
* Describe workflow of machine learning process
* Describe difference between machine learning types (e.g. supervised and unsupervised learning)
* List applications
* Differentiate between classification and regression
* Assess machine learning accuracy
* Explain the machine learning performance trade-offs
* Describe KNN classification
* Implementation with Python / Jupyter notebook

**Linear regression, regularization, cross-validation**

* Explain how regression can be performed with single and multiple features
* Formulate a linear regression model
* Explain methods for fitting the model
* Derive the least squared fit of linear regression
* Describe how to find features that are associated with the response
* Calculate metrics to assess the learning performance
* Show how to include qualitative features in a linear regression model
* Use linear regression to model non-linear relationships
* Compare K Nearest Neighbor regression method and linear regression method
* Describe why we need regularization
* Explain the differences between Ridge and Lasso regression
* Explain how can we decide on the best model
* Describe how K-fold cross-validation is implemented
* Describe what is the leave one out cross-validation
* Apply regression to real-world examples using Python

**Classifiers and density estimation**

* Model logistic regression, and formulate then optimize its optimize
* Solve density estimation problems
* Show how do LDA and QDA work
* List the main difference between QDA and Naive Bayes Classification.
* Explain when and why error rate may not be sufficient in evaluating classification accuracy
* Describe what is confusion matrix, precision, recall, and ROC