MATH 356–STATISTICAL METHODS IN MACHINE LEARNING

- Weeks 1–2 The idea of parametric vs non parametric models. Demonstrate with classical regression vs. non-parametric regression Kernel Density estimation can be used as another example of a nonparametric method.

- Weeks 3–4 The concept of maximum likelihood and how it is used to estimate parametric models. e.g logistic regression. Compare and contrast with least squares estimation method. Why MLE's are popular and used in many disciplines (other than stats)

- Week 5–7 Segway into the nonparametric world using regression trees and random forests and k-NN. Introduce the idea of overfitting. How we can mitigate it using cross-validation. This is a natural place to talk about the bias-variance trade-off.

- Week 6–8 Concept of supervised v. unsupervised learning; Introduction to PCA and the idea of dimension reduction and its benefits. Introduction to clustering methods.

- Week 9–11 Introduction of linear and nonlinear decision boundaries with LDA and QDA. This will reinforce some matrix algebra skills that they started to see in weeks 6–8.

- Weeks 12-13 More matrix stuff with the introduction of Support Vector Machines (SVM).

- Week 14 I left this slot open; I think the plan above is ambitious so we might need extra time.