ECE 365 **Fall 2019**

September 12, 2019

Quiz 2

Name:

NetID:

1. **[Linear Separability (10 points)]**
   Draw an example of a data set that is linearly separable, and one that is not linearly separable. You can use symbols such as "x" and "o" to denote the data under each class.

   Solution:

2. **[Linear Classifiers (10 points)]**

   (a) Identify which among the following classifiers are linear: k-Nearest Neighbors, Logistic Regression, Naive Bayes, Linear Discriminant Analysis, SVM.

   Solution: Logistic Regression, LDA, SVM.

   (b) Given a linear classifier explain clearly how you might use it to separate data that are not linearly separable.

   Solution: By passing the inputs $\underline{x}$ through a nonlinear-mapping ϕ and applying the linear classifier in the new space. This can be done efficiently using the Kernel trick.

3. **[Naive Bayes and Logistic Regression (10 points)]**

   (a) What assumption does Naive Bayes make about the distribution of the components of the feature vector $\underline{x}$?

   Solution: That they are independent, conditioned on the label y.

   (b) Explain how the parameters β_0 and $\underline{\beta}$ are determined for a logistic regression classifier.

   Solution: By maximizing

$$\prod_{i=1}^{N} p(y_i|\underline{x}_i).$$