

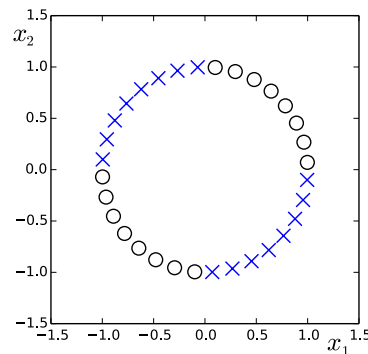
Machine Learning Worksheet 06

Linear Classification

1 Linear separability

Problem 1: Show that for a linearly separable data set, the maximum likelihood solution for the logistic regression model is obtained by finding a vector \mathbf{w} whose decision boundary $\mathbf{w}^T \phi(\mathbf{x}) = 0$ separates the classes and then taking the magnitude of \mathbf{w} to infinity. Assume that \mathbf{w} contains the bias term.

Problem 2: Which basis function $\phi(x_1, x_2)$ makes the data in the example below linearly separable (crosses in one class, circles in the other)?



2 Basis functions

Problem 3: The decision boundary for a linear classifier on two-dimensional data crosses axis x_1 at 2 and x_2 at 5. Write down the general form of this linear classifier model with a bias term (how many parameters do you need, given the dimensions?) and calculate possible coefficients (parameters).

3 Getting your hands dirty!

Problem 4: Solve the first of the four programming exercises (i.e., fill in the blanks) in the file `LinearClassification.ipynb` in piazza's "General Resources". Put the code here.

Problem 5: Solve the second of the four programming exercises (i.e., fill in the blanks) in the file `LinearClassification.ipynb` in piazza's "General Resources". Put the code here.

Problem 6: Solve the third of the four programming exercises (i.e., fill in the blanks) in the file `LinearClassification.ipynb` in piazza's "General Resources". Put the code here.