Machine Learning: Assignment #4

June 13, 2018

1. What are the possible error functions for regression problems besides RMSE?
2. Likewise, find out for classification problems.
3. We said we will use a "1" column vector augmented to the data matrix to avoid \beta_0 as a separate constant. Show how this technique would work in practice.
4. How would you check if the cost function or error function is convex?
5. Draw the error function for linear regression y = mx + c for an arbitrary data set.
6. Generate several random samples from a normal distribution with mu=5.0 and sd = 2.0. Now, try to fit a Gaussian model with just the data where you would identify the model parameters from the data itself. Basically, you should identify the error function e = y - \hat{y} where \hat{y} = N(mu, sigma), where mu and sigma are the parameters to identify.
7. Identify the error function for the following problems:
   (a) Classification of fruits into {apples, oranges, banana, grapes}
   (b) Predicting stock price
   (c) Market basket analysis
   (d) Estimating the human life expectancy
8. When you do parameter search via grid searching, what are the ways by which you could speed up the parameter search process?
9. We saw \beta = X^T Y / X^T X in a linear regression setting. What is the interpretation of "X^T X" and "X^T Y"?
10. When X^TX is singular, the closed form equation for \beta would not work. Learn about the successive orthogonalization method given in ESL.