Stevens Institute of Technology

CS 559 – Machine Learning

Assignment # 1: Probability Theory, Regression, KNN and LDA

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# Probability Theory

1. By using a change of variables, verify that the univariate Gaussian distribution given by  
    satisfies E(x) = µ. Next , by differentiating both sides of normalization condition with respect to , verify that the Gaussian satisfies .
   1. E[x] =

Expected mean can be found using .

* 1. E[x2] =

1. Use to prove . Now using the result two definitions, show that Prove .

Let

Let where



# Linear Regression

1. Consider a linear model of the form together with a sum of square/loss function of the form . Now suppose that Gaussian noise Єi with zero mean and variance is added independently to each of the input variables xi. By making use of and , show that minimizing LD average over the noise distribution is equivalent to minimizing the sum of square error for noise-free input variables with the addition of a weight-decay regularization term, in which the bias parameters w0 is omitted from the regularizer.

Linear model:

Loss Function: