Intelligent Systems: Reasoning and Recognition

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Exercise 4   14 Feb 2019

Regression Analysis with Gradient Descent

Gradient descent can be used ot to estimate a linear model $\hat{y} = f(\bar{X}, \vec{w})$ that predicts the weight as a function of height, where $\hat{y} = Weight$, $\bar{X} = \begin{pmatrix} Height \\ 1 \end{pmatrix}$ and $\vec{w}$ are the model parameters. The task of this exercise is to write the equations for this case:

a) Write out the polynomial for the equation for the model $\hat{y} = f(\bar{X}, \vec{w})$.

b) Write the equation for the error of the model, δ_m, for a data sample $\bar{X}_m$.

c) Write the equation for the "Loss" function, $L(\vec{w})$, as the square of the error.

d) Write the equation for the gradient of the loss function for $\bar{X}_m$.

e) Write the equation for the correction to the model parameters, Δw_{1m} and Δb_m from $\bar{X}_m$.

f) Write the equation to compute the average corrections Δw_1 and Δb.

g) (Optional)Write a Python program to evaluate the above equations. Test your program with the data set on the course web site using initial values of w_1=1, b= −104 and η=0.01.