
Introduction to Gaussian Processes

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Abstract

A wide variety of methods exists to deal with supervised learning, as restrict a class of linear functions of the inputs, as linear regression, or give a prior probability to every possible function, giving high probability to the functions we consider more likely. The second approach is a way to Gaussian process itself. We will make the pathway through a intuitive construction of this framework.

1 Introduction

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2 Linear Regression

Starting with a simple regression problem. Be the dataset $D = \{x_i, y_i | i = 1, \dots, N\}$, where we observe a real-valued input variable x and a measured real-valued variable y . Then, we'll use synthetically generated data for comparison against any learned *model*. And N will be the number of observations of the value y . Our objective is make predictions of the new value \hat{y} for some new input \hat{x} .

For this example, we'll use a simple approach based on curve fitting by the polynomial model, i.e, being the function

$$f(x, \mathbf{w}) = \sum_{j=0}^M w_j x^j \quad (1)$$

where M is the order of the polynomial and $\mathbf{w} = [w_0, \dots, w_M]$ its coefficients. It's important to note that the f isn't linear in x but in \mathbf{w} . These functions which are linear on the unknown

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