A Simulation Example

Estimate the conditional mean of Y given X

$$Y = f(X) + \epsilon$$

Assume probability model:

$$Y = 1 - 2x - 3x^2 + 5x^3 + \epsilon$$
 where $\epsilon \sim N(0, \sigma^2)$

Alternatively:

$$Y \mid X \sim N(1 - 2x - 3x^2 + 5x^3, \sigma^2)$$
 or
$$\mu(x) = E[Y \mid X = x] = 1 - 2x - 3x^2 + 5x^3$$

conditional mean is a linear combination of the feature variables

note: the true probability model and thus also $\mu(x)$ are often not known!

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