Linear Regression via Least Squares

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Supervised learning

Say that you observe n, d-dimensional, *inputs*:

$$\mathbf{x}_{1:n} = \{\mathbf{x}_1, \ldots, \mathbf{x}_n\},$$

and *outputs*:

$$\mathbf{y}_{1:n} = \{y_1, \ldots, y_n\}.$$

The supervised learning problem consits of using the data $\mathbf{x}_{1:n}$ and $\mathbf{y}_{1:n}$ to find the map that connects the inputs to the outputs.

The inputs $\mathbf{x}$ are also called *features*.

The outputs $\mathbf{y}$ are also called *targets*.

The regression problem

When the outputs are continuous variables, e.g., dollars, weight, mass, then we say that we have a *regression* problem.

The classification problem

When the outputs are discrete labels, e.g., 0 or 1, "cat" or "dog", then we say that we have a *classification* problem.

> **Note**
>
> This lecture moves fast. If you have never seen least squares before, please go over the following material from my undergraduate course:
>
> - Lecture 14 - Covariance, Correlation, and Linear Regression with One Variable.
> - Lecture 15 - Linear Regression / Regression with One Variable Revisted.

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