Why

A simple class of predictors when the input and output sets are vector spaces is the class of linear predictors.

Definition

A *linear predictor* (or *linear model* or *deterministic linear model*) is a predictor which is a linear function of its inputs.

Such a model is simple to implement and interpretable, at the cost of flexibility.

$\mathbf{R}^d$ Example

Let $X = \mathbf{R}^d$ be a set of inputs and $Y = \mathbf{R}$ a set of outputs. The linear functions on $\mathbf{R}^d$ are in one-to-one correspondence with vectors in $\mathbf{R}^d$.

A linear function $f : \mathbf{R}^d \to \mathbf{R}$ over the vector space $(\mathbf{R}^d, \mathbf{R})$ has a set of parameters $w \in \mathbf{R}^d$ so that

$$f(x) = \sum_i w_i x_i = w^\top x.$$

The parameters of a linear predictor on $\mathbf{R}^d$ are often called *weights*.

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