

# Class label representation

- Interested in modeling the relationship between some continuous or discrete input and a discrete output.

$\mathbf{y} \in \{0,1\}^K$       one hot encoded vector representation

$y \in \{0,K\}$       scalar representation

where  $K$  number of classes

# Classification as a decision boundary problem

- Classification can be approached from the perspective of building a decision boundary that separates class labels,  $y$ , in the input space.

In this lecture we'll assume a scalar label:

$$y \in \{1, \dots, K\}$$

decision boundary is a hyperplane,  $H$ :

$$H = \{ \mathbf{x} : f(\mathbf{x}; \boldsymbol{\theta}) = \mathbf{0} \}$$

decision boundary is represented by  $f(\cdot)$ :

$$f : \mathbb{R}^N \rightarrow \mathbb{R}^N$$

then our predictor is  $g : f(\mathbf{x}; \boldsymbol{\theta}) \rightarrow y$ :

$$\hat{y} = g(f(\mathbf{x}; \boldsymbol{\theta}))$$