Logistic Regression **Classifier**

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Logistic regression model

x : 1D array of object features.
x is called a data sample, and it contains features of an object
$x = [x_{(1)}, x_{(2)}, \ldots, x_{(M)}]$, it has M features.

w: 1D array of parameters
b: a parameter

A linear function

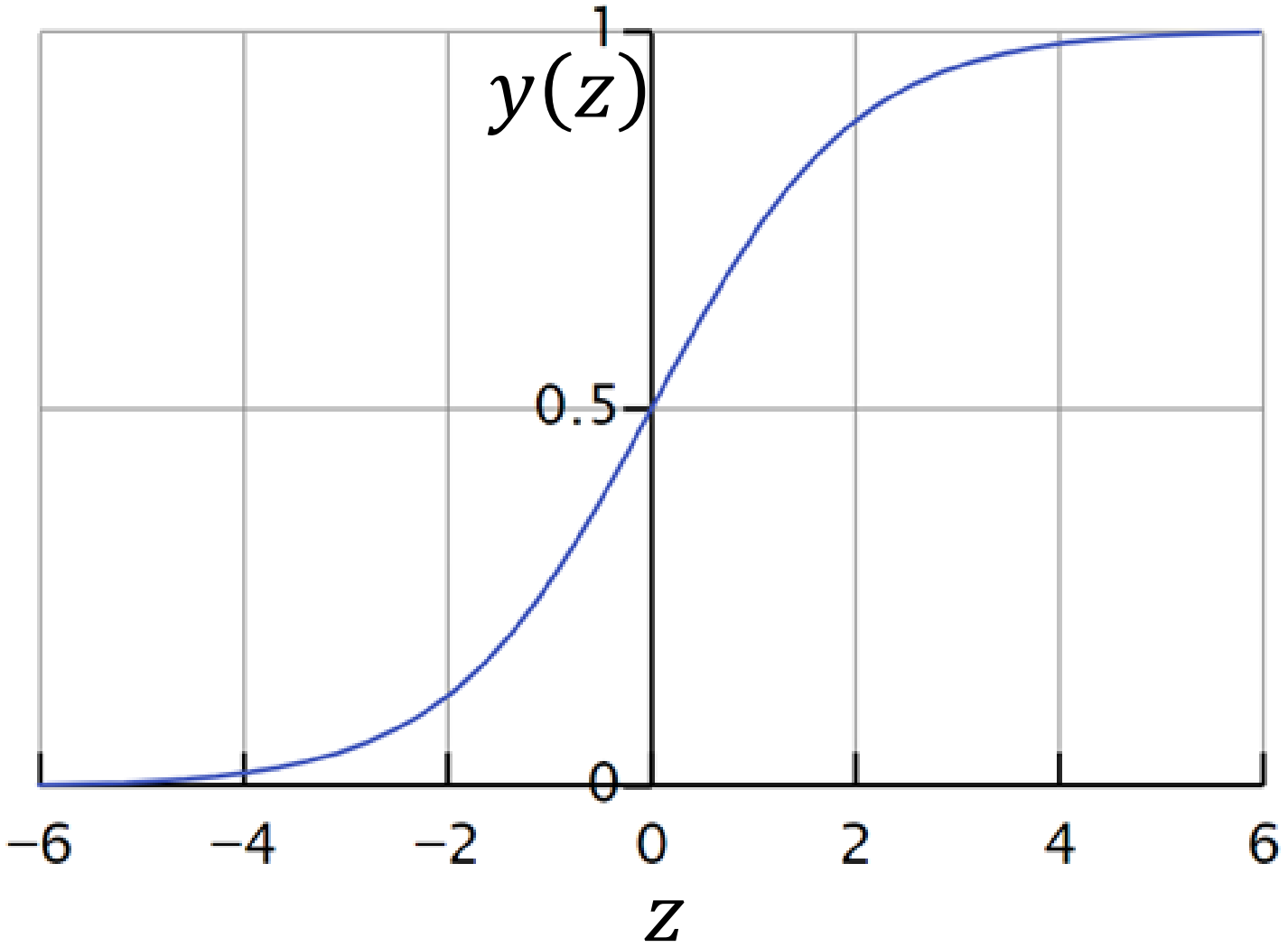
$$z = w_{(1)}x_{(1)} + w_{(2)}x_{(2)} \ldots + w_{(M)}x_{(M)} + b$$

Logistic regression model $y = f(x)$

$$y(z) = \frac{1}{1 + e^{-z}}$$

The sigmoid function

$$y(z) = \frac{1}{1 + e^{-z}}$$



$$y(z = 0) = 0.5$$

$$y(z = \infty) = 1$$

$$y(z = -\infty) = 0$$

Binary Classifier: Linear + Sigmoid

a data point x

Binary Classifier

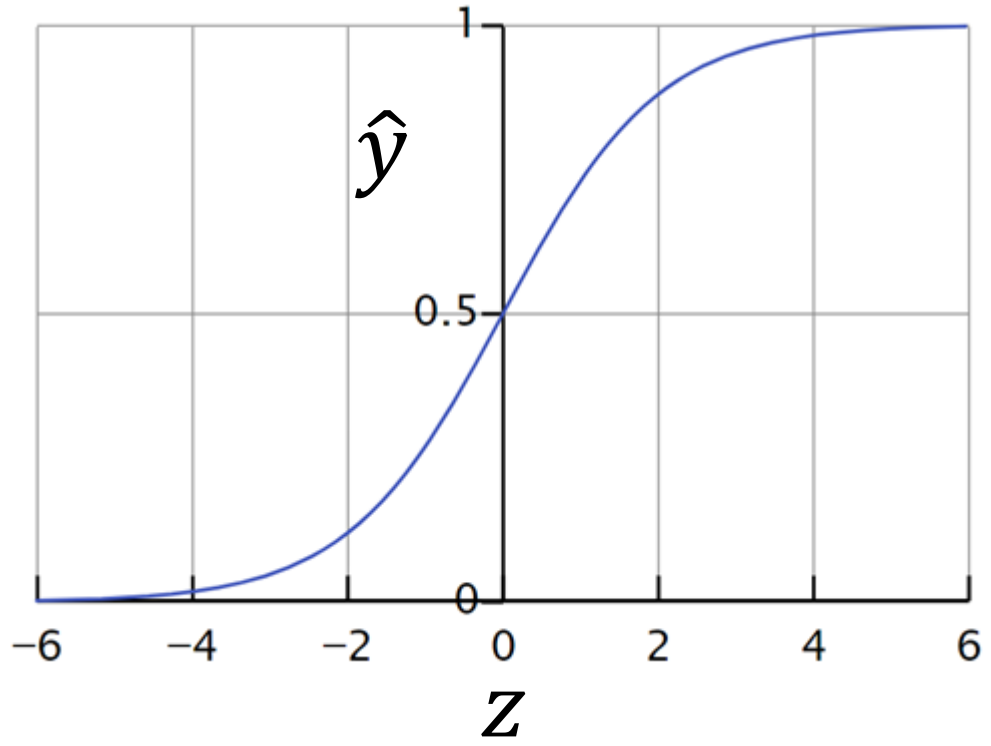
$\hat{y} > 0.5$, it is a cat

$\hat{y} < 0.5$, it is not a cat

$\hat{y}$ predicted soft label

Linear function $z = z(x)$

Sigmoid function $\hat{y} = \dfrac{1}{1 + e^{-z}}$



Pneumonia Detection using X-ray images

- Pneumonia is an infection of the lungs that may be caused by bacteria, viruses, or fungi. The infection causes the lungs' air sacs (**alveoli**) to become inflamed and fill up with fluid or pus.