Hypothesis Representation

Classification and Representation

Logistic Regression

Logistic Regression Model

Want $0 \leq h_\theta(x) \leq 1$

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$$h_\theta(x) = \quad \theta^T x$$

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$$h_\theta(x) = g(\theta^T x)$$

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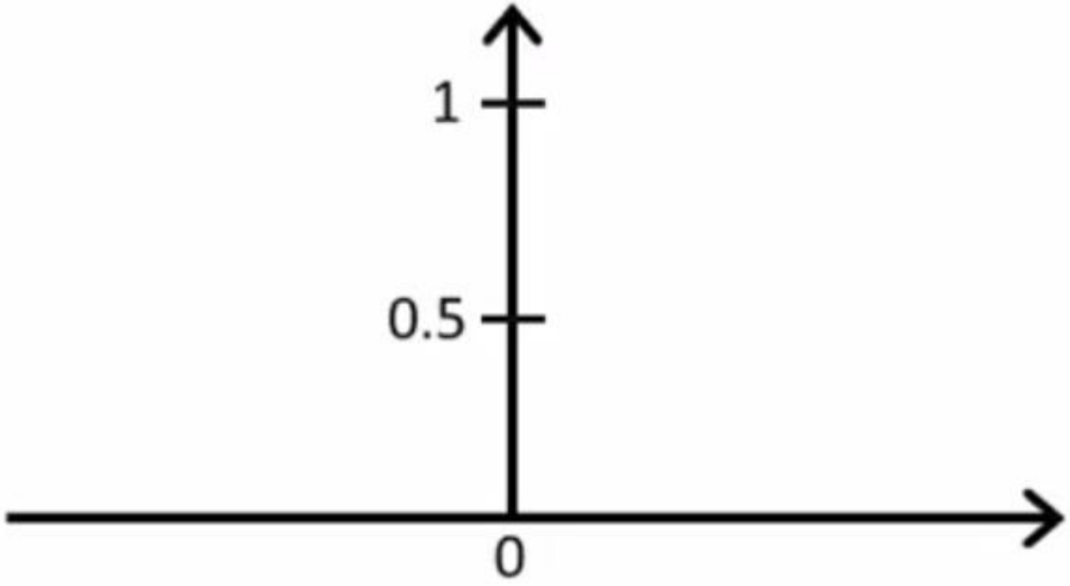
Sigmoid function

Logistic function



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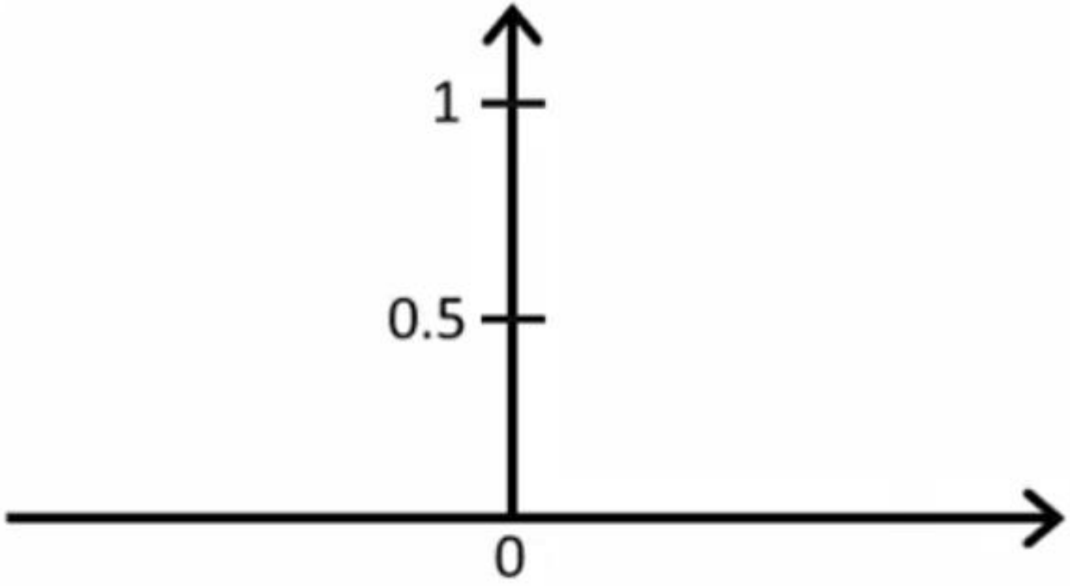

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↳ Logistic function

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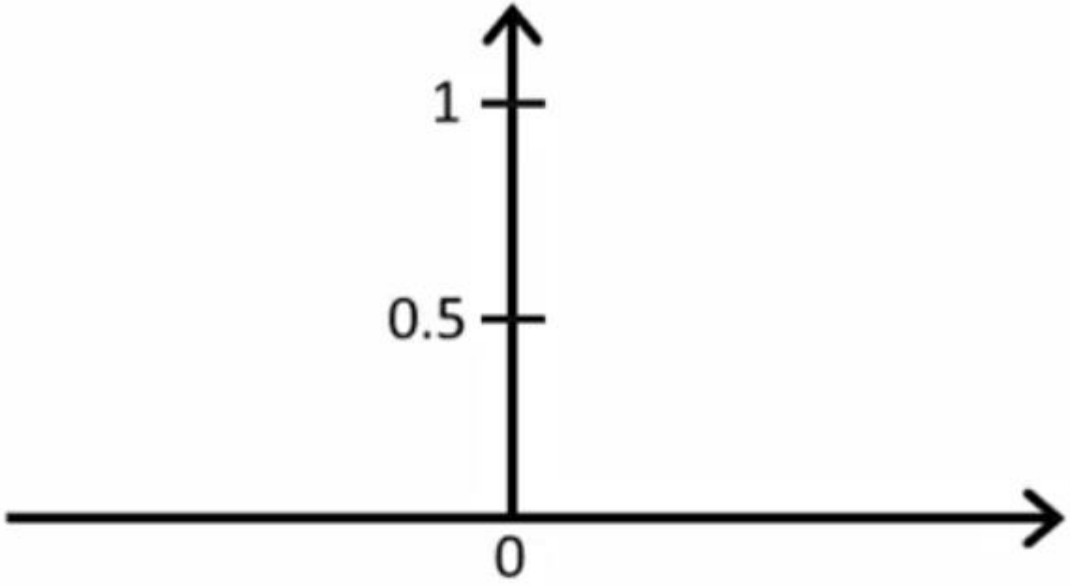

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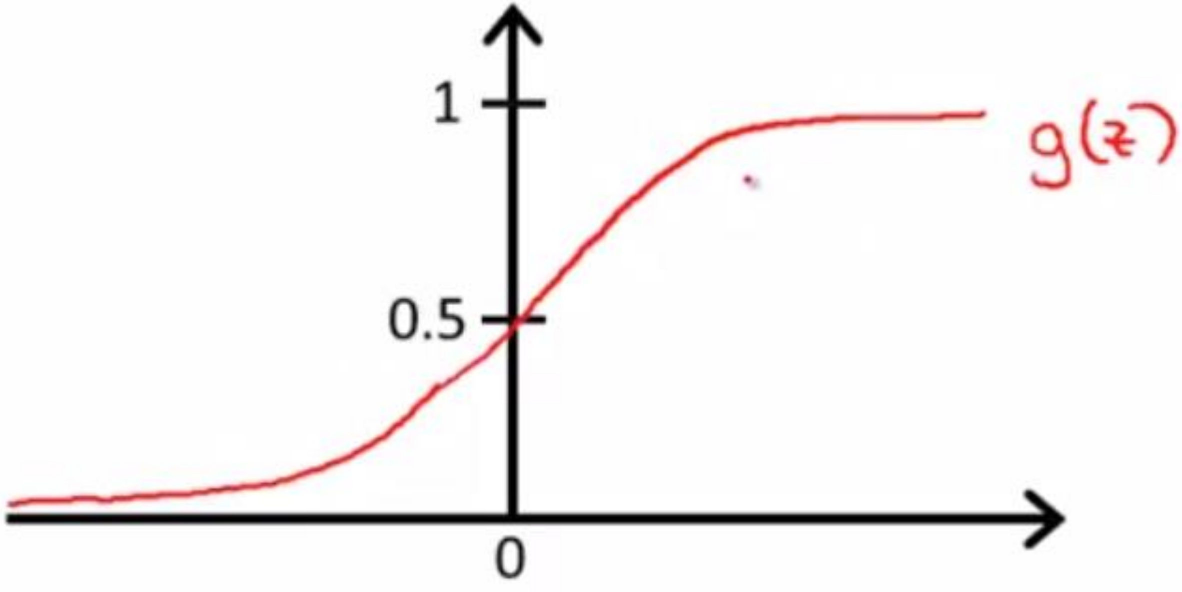

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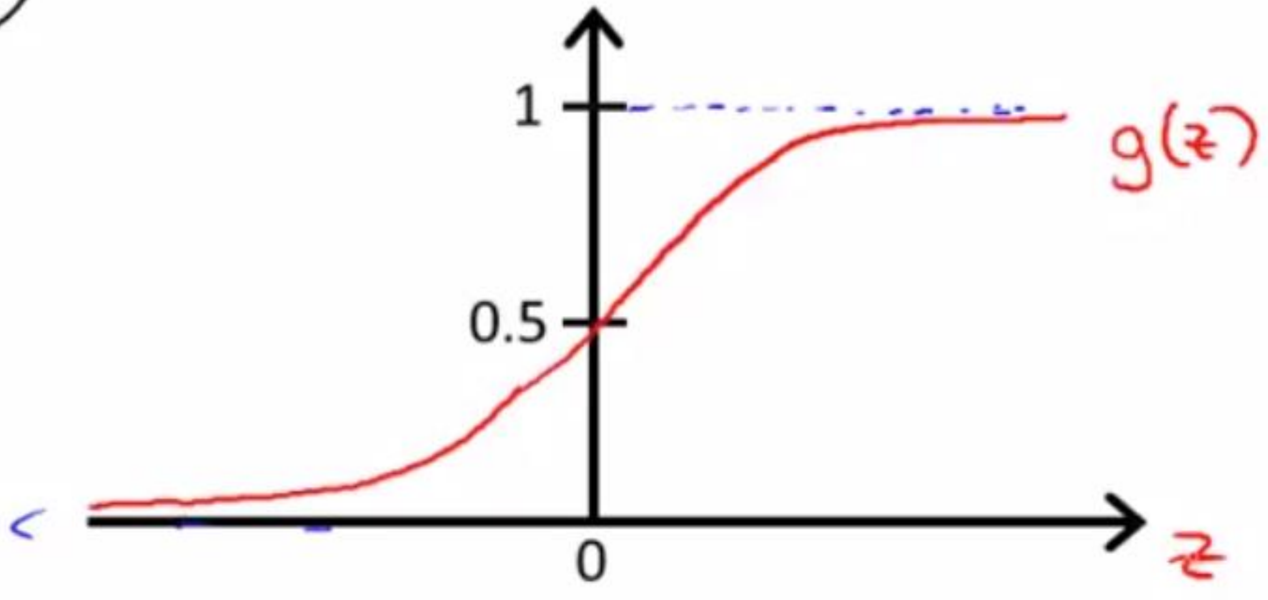

Sigmoid function

Logistic function

Interpretation of Hypothesis Output

$h_\theta(x)$ = estimated probability that y = 1 on input x

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Example: If $x = \begin{bmatrix} x_0 \\ x_1 \end{bmatrix} = \begin{bmatrix} 1 \\ \text{tumorSize} \end{bmatrix}$

$$h_\theta(x) = 0.7$$

$h_\theta(x)$

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Tell patient that 70% chance of tumor being malignant

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$y=1$

Tell patient that 70% chance of tumor being malignant

$h_\theta(x) = P(y=1 \mid x ; \theta)$

"probability that y = 1, given x, parameterized by θ"

Exercise

- Suppose we want to predict, from data *x* about a tumor, whether it is malignant (*y*=1) or benign (*y*=0). Our logistic regression classifier outputs, for a specific tumor, $h_\theta(x) = P(y = 1|x; \theta) = 0.7$, so we estimate that there is a 70% chance of this tumor being malignant. What should be our estimate for the probability the tumor is benign?
- 0.7^2
- 0.7-0.3
- 0.7-0.5
- 0.3

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$y = 0$ or 1

$\rightarrow P(y = 0|x;\theta) + P(y = 1|x;\theta) = 1$

$P(y = 0|x;\theta) = 1 - P(y = 1|x;\theta)$

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