Classification

Test

Grades

Source: Udacity Machine Learning Nano-Degree

BOUNDARY: A LINE $2x_1 + x_2 - 18 = 0$ Score = 2*Test + Grades - 18

PREDICTION: { Score ≥ 0 ACCEPT
Score < 0 REJECT }

Now that you know the equation for the line ($2x_1 + x_2 - 18=0$), and similarly the "score" ($2x_1 + x_2 - 18$), what is the score of the student who got 7 in the test and 6 for grades?

Source: Udacity Machine Learning Nano-Degree

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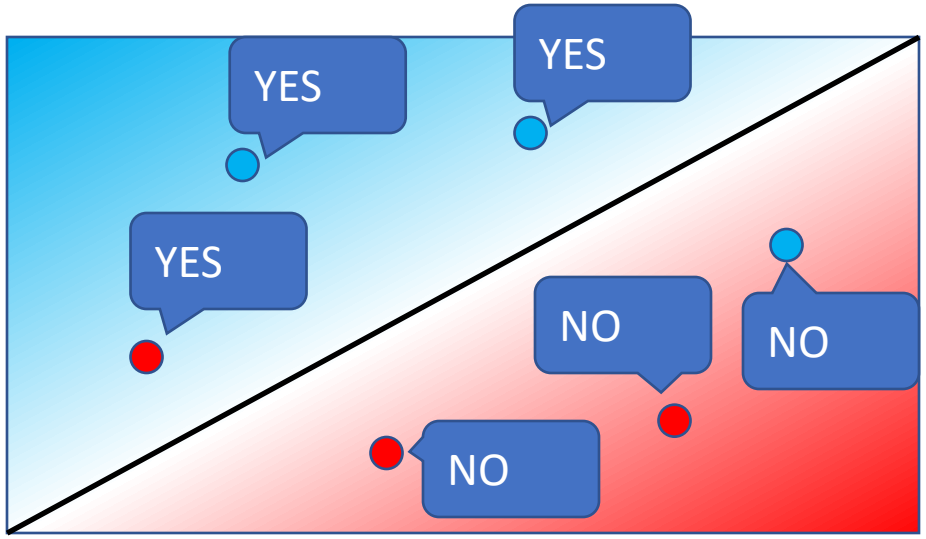
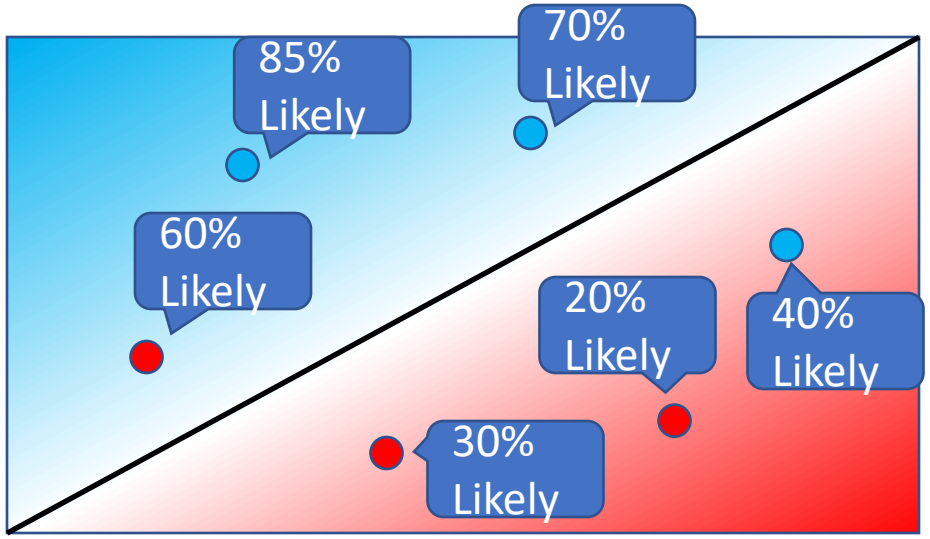
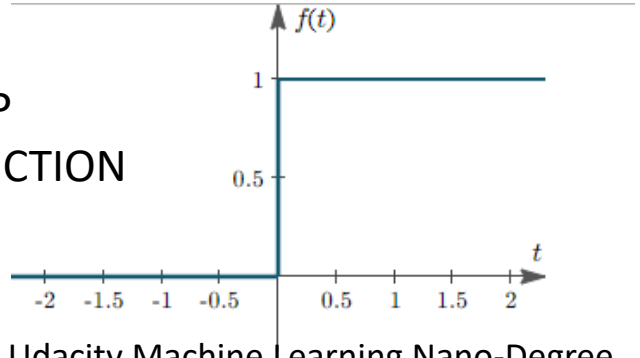
Discrete vs Continuous



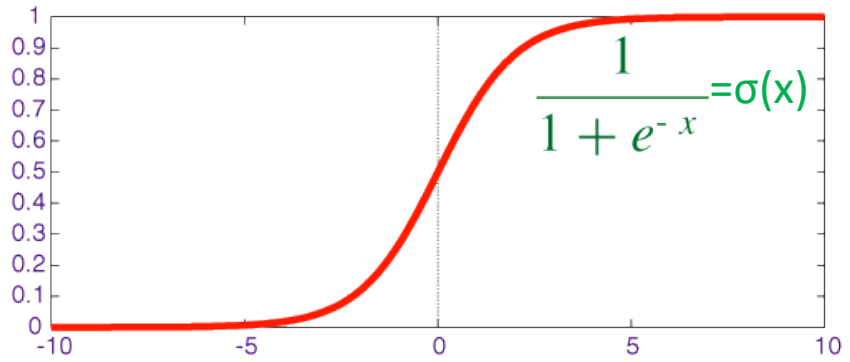


PREDICTION:
- Score ≥ 0 YES
- Score < 0 NO

STEP FUNCTION



SIGMOID FUNCTION



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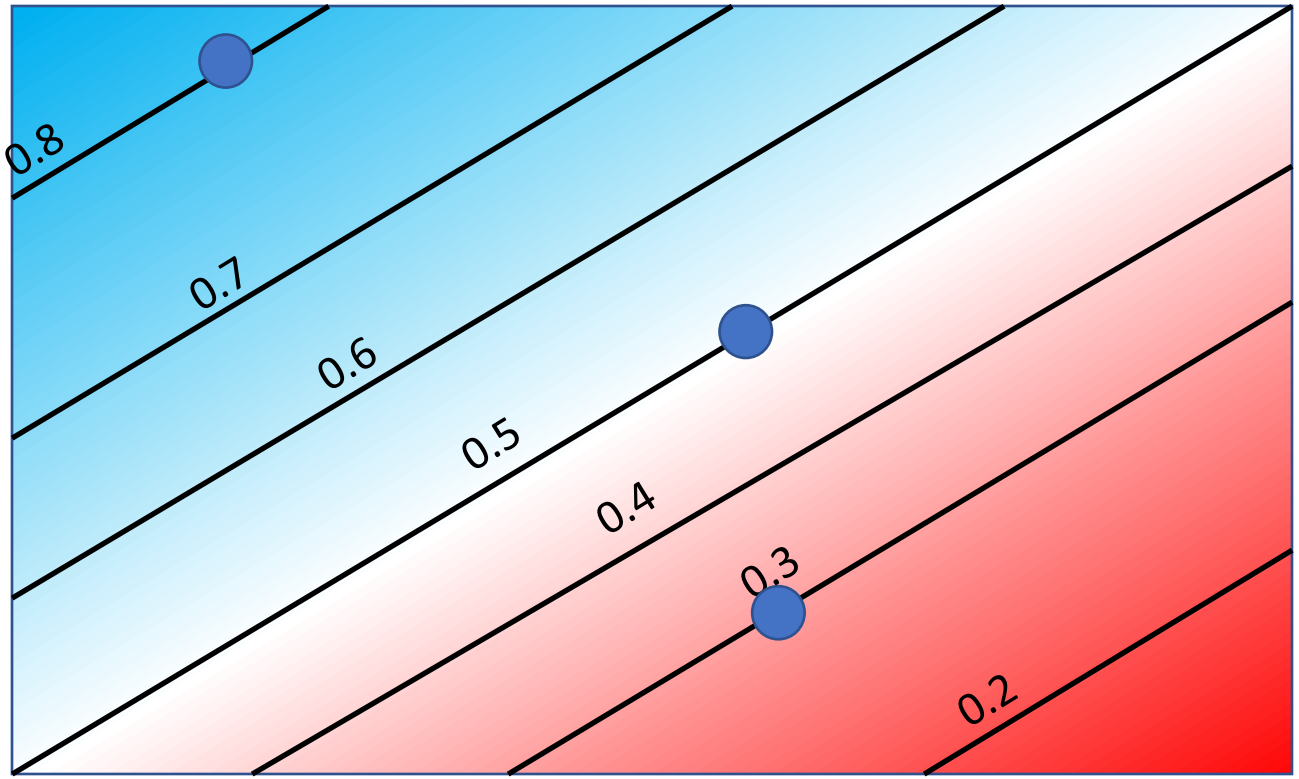
Predictions



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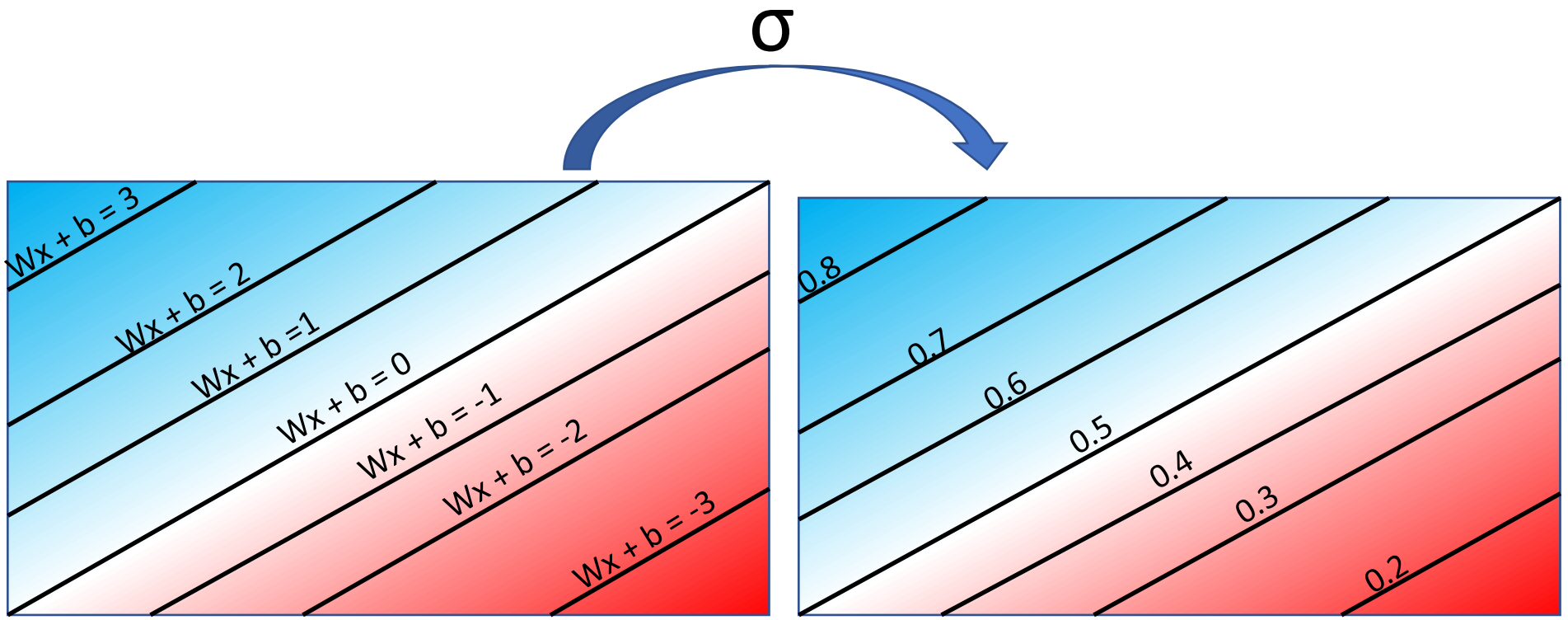
Predictions



Wx + b

y-hat = σ(Wx + b)

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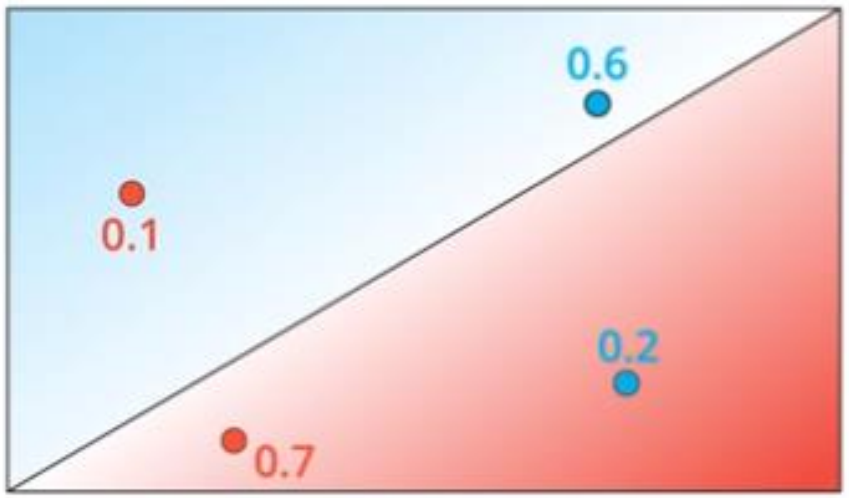
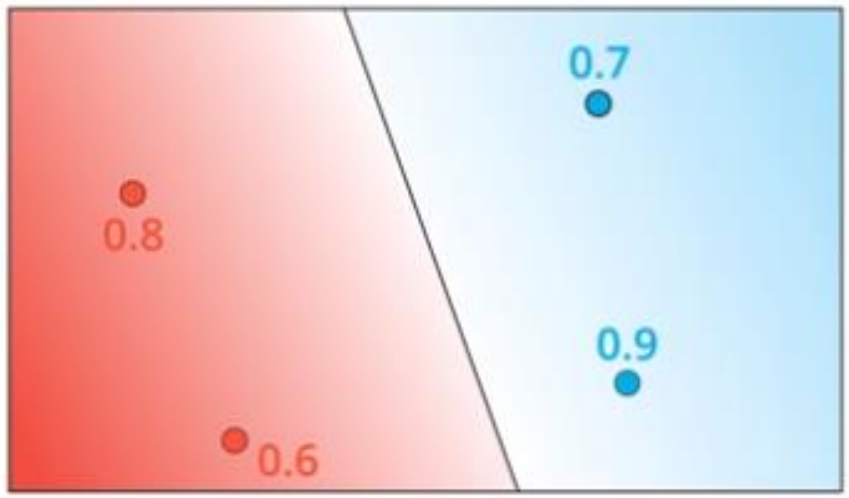
Maximum Likelihood



0.6 * 0.2 * 0.1 * 0.7 = 0.0084



0.7 * 0.9 * 0.8 * 0.6 = 0.3024

Source: Udacity Machine Learning Nano-Degree

Products of Probabilities

$0.6*0.2*0.1*0.7 = 0.0084$

$0.7*0.9*0.8*0.6 = 0.3024$

Quiz:
What function to use?

- sin ○
- cos ○
- log ○
- exp ○

Source: Udacity Machine Learning Nano-Degree

Cross Entropy

$0.6*0.2*0.1*0.7 = 0.0084$

$\ln(0.6) + \ln(0.2) + \ln(0.1) + \ln(0.7)$

$-0.51 \quad -1.61 \quad -2.3 \quad -0.36$

$-\ln(0.6) - \ln(0.2) - \ln(0.1) - \ln(0.7)$

$0.51 \quad 1.61 \quad 2.3 \quad 0.36$

4.8

$0.7*0.9*0.8*0.6 = 0.3024$

$\ln(0.7) + \ln(0.9) + \ln(0.8) + \ln(0.6)$

$-0.36 \quad -0.1 \quad -.22 \quad -0.51$

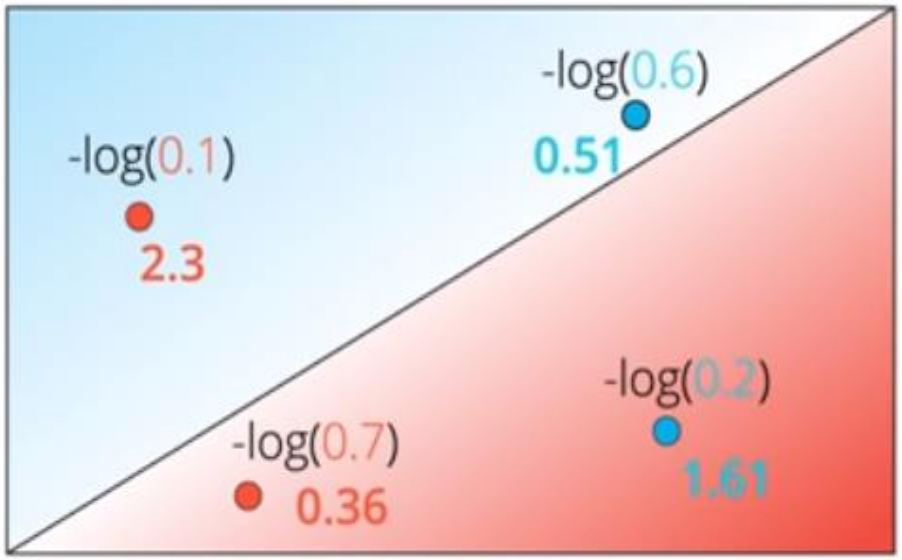
$-\ln(0.7) - \ln(0.9) - \ln(0.8) - \ln(0.6)$

$0.36 \quad 0.1 \quad .22 \quad 0.51$

1.2

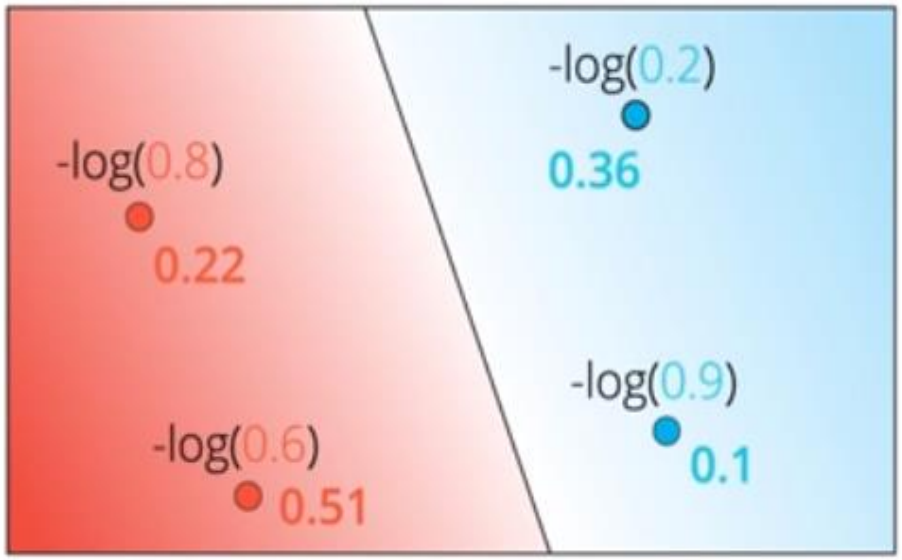
Source: Udacity Machine Learning Nano-Degree

Cross Entropy



$0.6 * 0.2 * 0.1 * 0.7 = 0.0084$

$-\log(0.6) - \log(0.2) - \log(0.1) - \log(0.7) = 4.8$

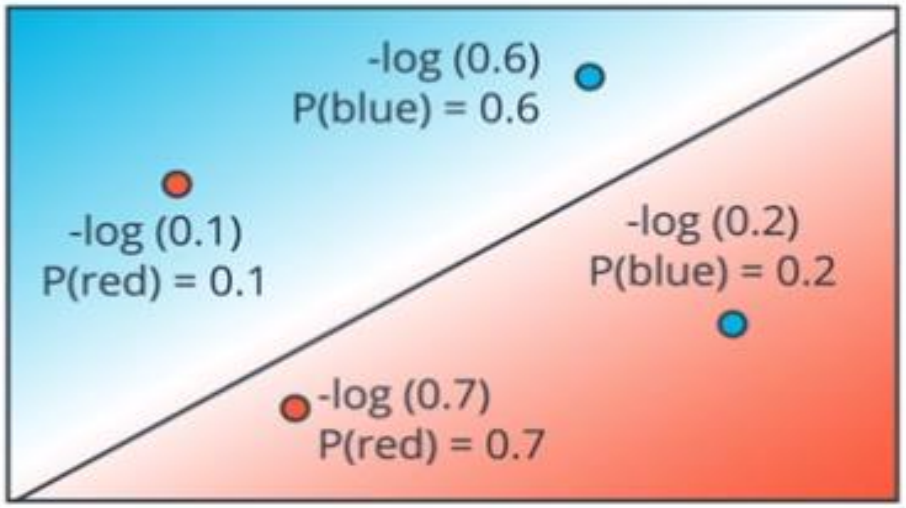


$0.7 * 0.9 * 0.8 * 0.6 = 0.3024$

$-\log(0.7) - \log(0.9) - \log(0.8) - \log(0.6) = 1.2$

Source: Udacity Machine Learning Nano-Degree

Error Function



$$-\log(0.6) - \log(0.2) - \log(0.1) - \log(0.7) = 4.8$$

$$0.51 \qquad 1.61 \qquad 2.3 \qquad 0.36$$

If $y = 1$

$P(\text{blue}) = \hat{y}$

$\text{Error} = -\ln(\hat{y})$

If $y = 0$

$P(\text{red}) = 1 - P(\text{blue}) = 1 - \hat{y}$

$\text{Error} = -\ln(1 - \hat{y})$

$$\text{Error} = -(1-y)(\ln(1-\hat{y})) - y\ln(\hat{y})$$

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$$\text{Error Function} = -\frac{1}{m}\sum_{i=1}^{m}(1-y_i)(\ln(1-\hat{y}_i)) + y_i\ln(\hat{y}_i)$$

$$E(W,b) = -\frac{1}{m}\sum_{i=1}^{m}(1-y_i)(\ln(1-\sigma(Wx^{(i)}+b)) + y_i\ln(\sigma(Wx^{(i)}+b)$$

MOUNT ERRORIST

Source: Udacity Machine Learning Nano-Degree