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Machine Learning and AI in Risk Management

Course
Applied Mathematical Modeling in Banking

Typical tasks

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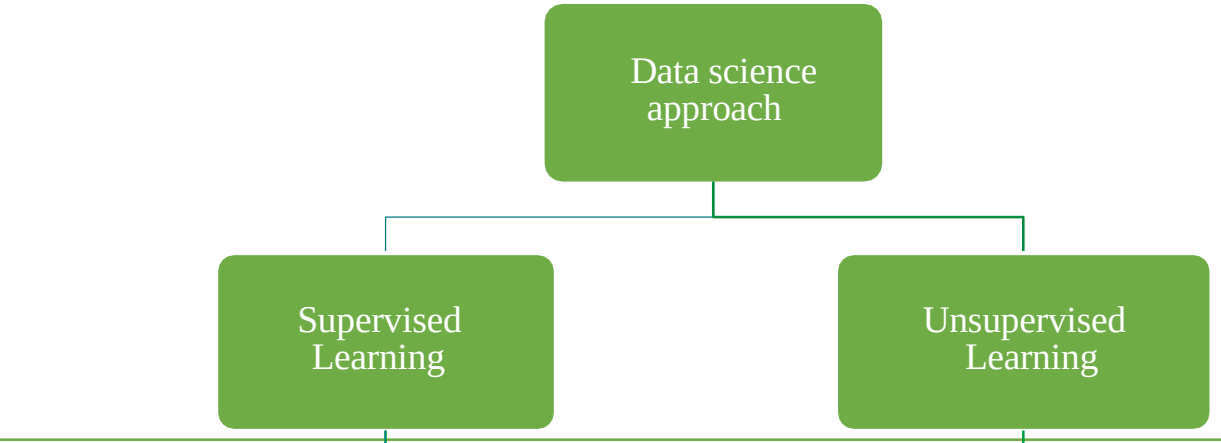
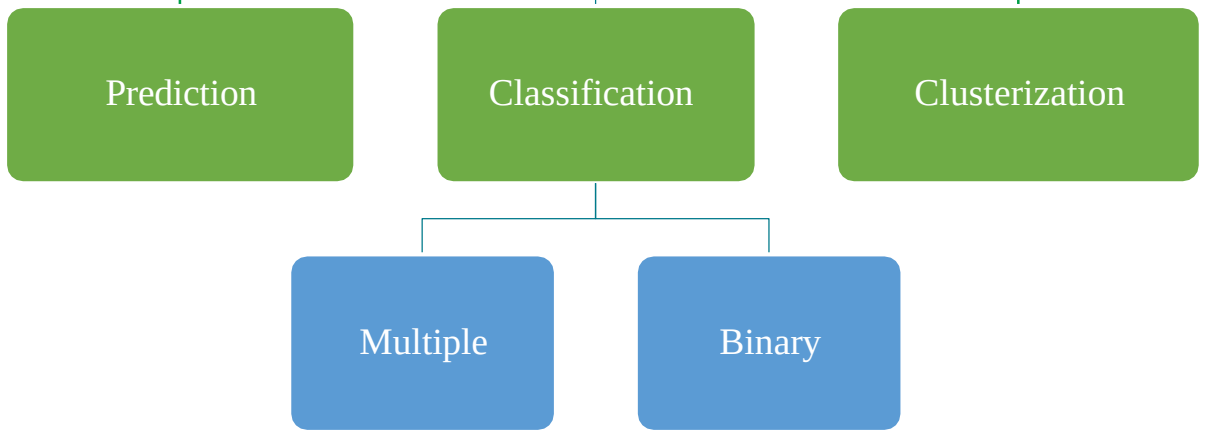
Basic approaches



Tasks



AI – ML - DS

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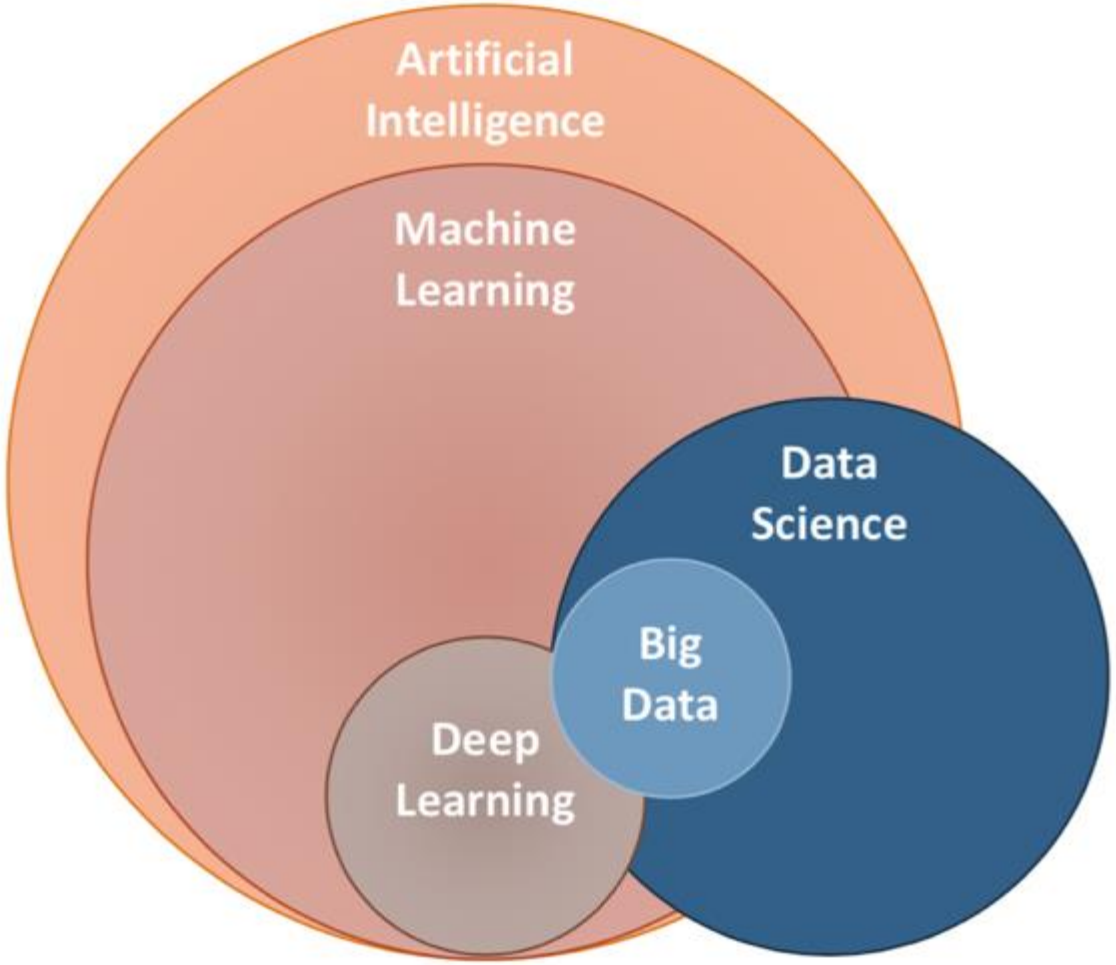

Linear Regression

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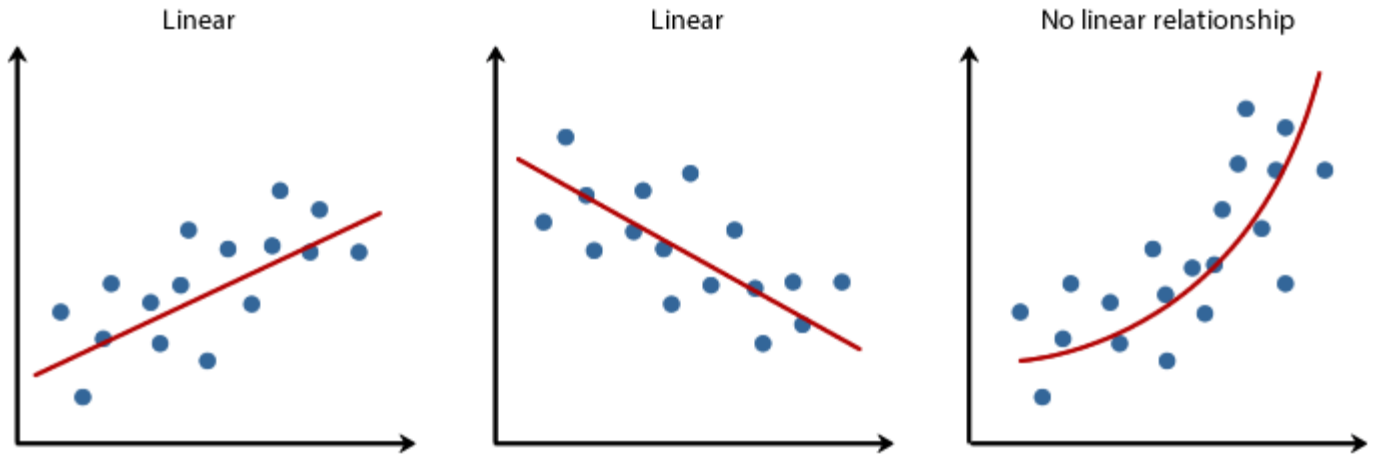

$$Y' = bX + a$$

Logistic Regression

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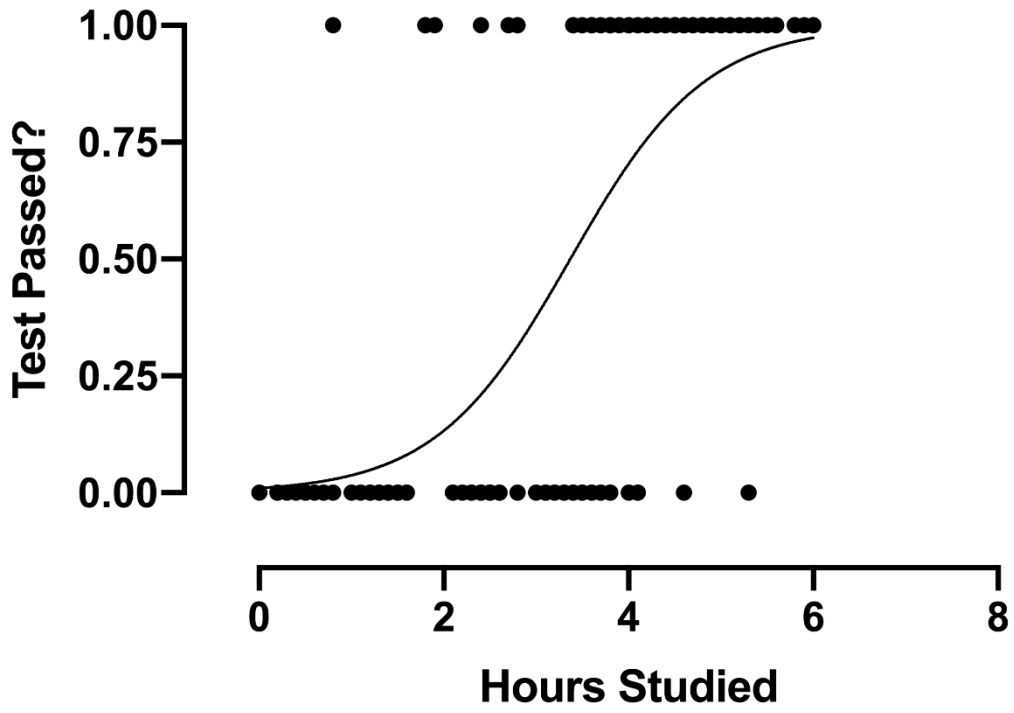

Logistic regression predicts whether something is ***True*** or ***False***, instead of predicting something continuous like ***size***.

$$h(x) = \frac{1}{1 + e^{-f(x)}}$$

Parameter optimization

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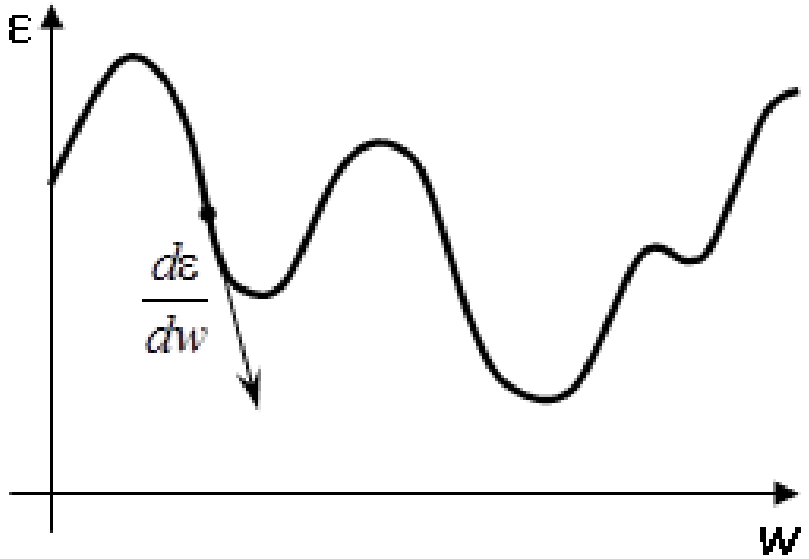

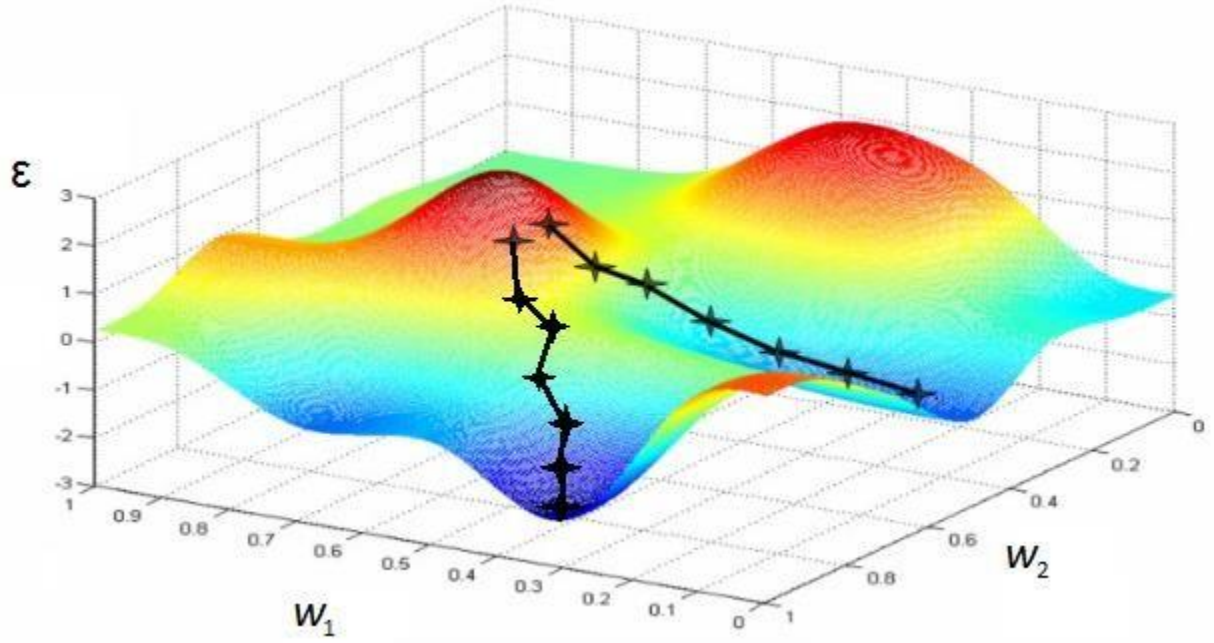

Neural Network Perceptron

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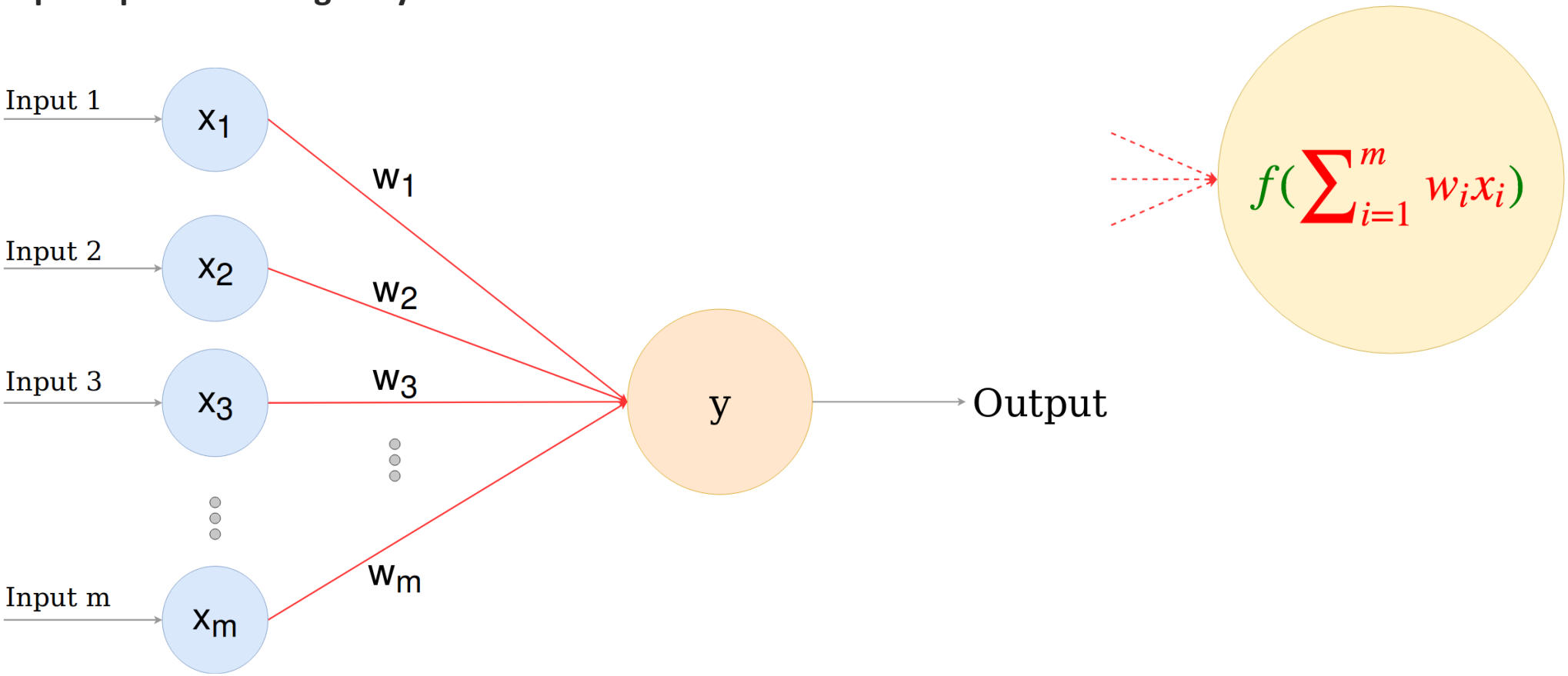
A perceptron is a single layer neural network



Multi layer Perceptron (MLP)

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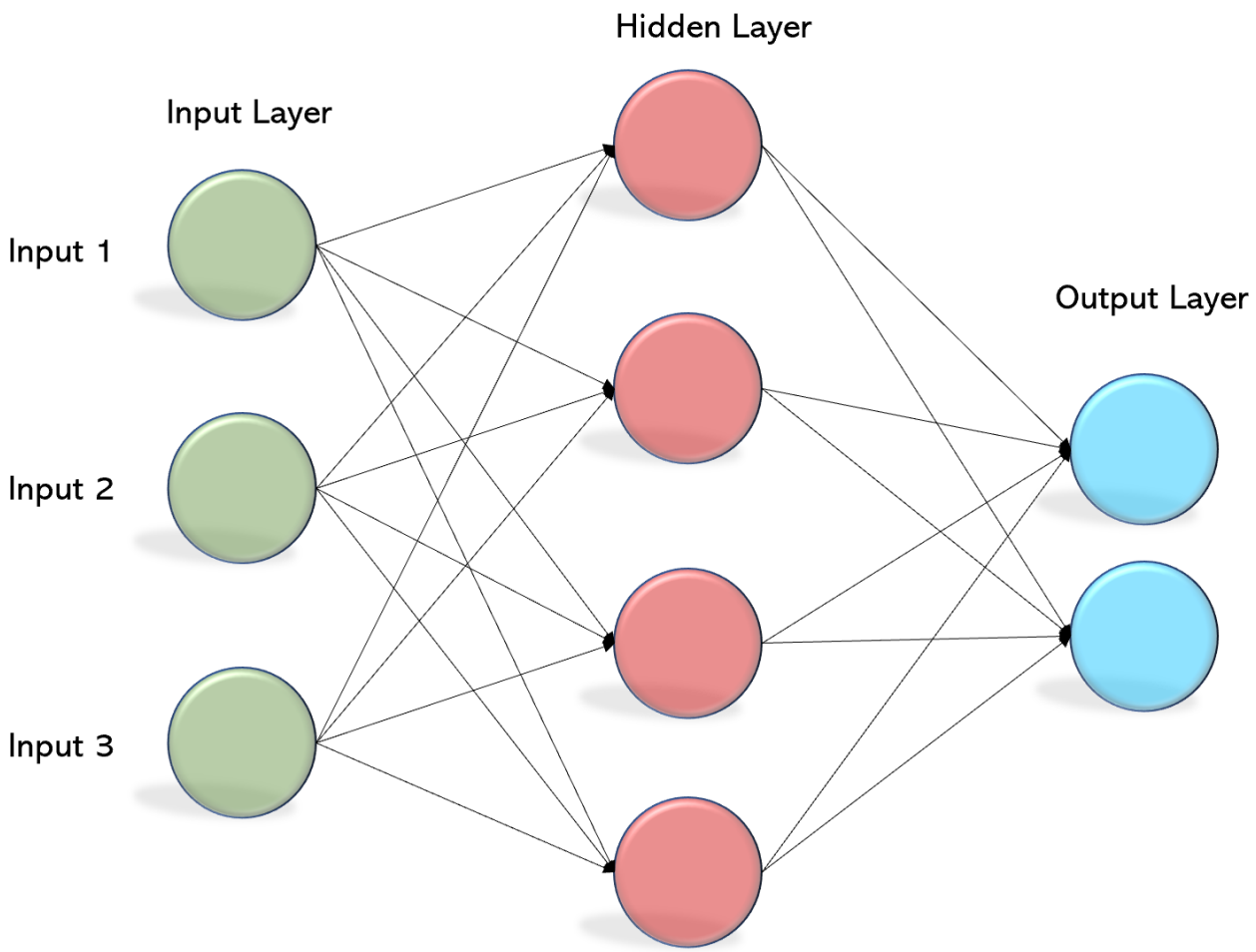

Self-Organizing Maps

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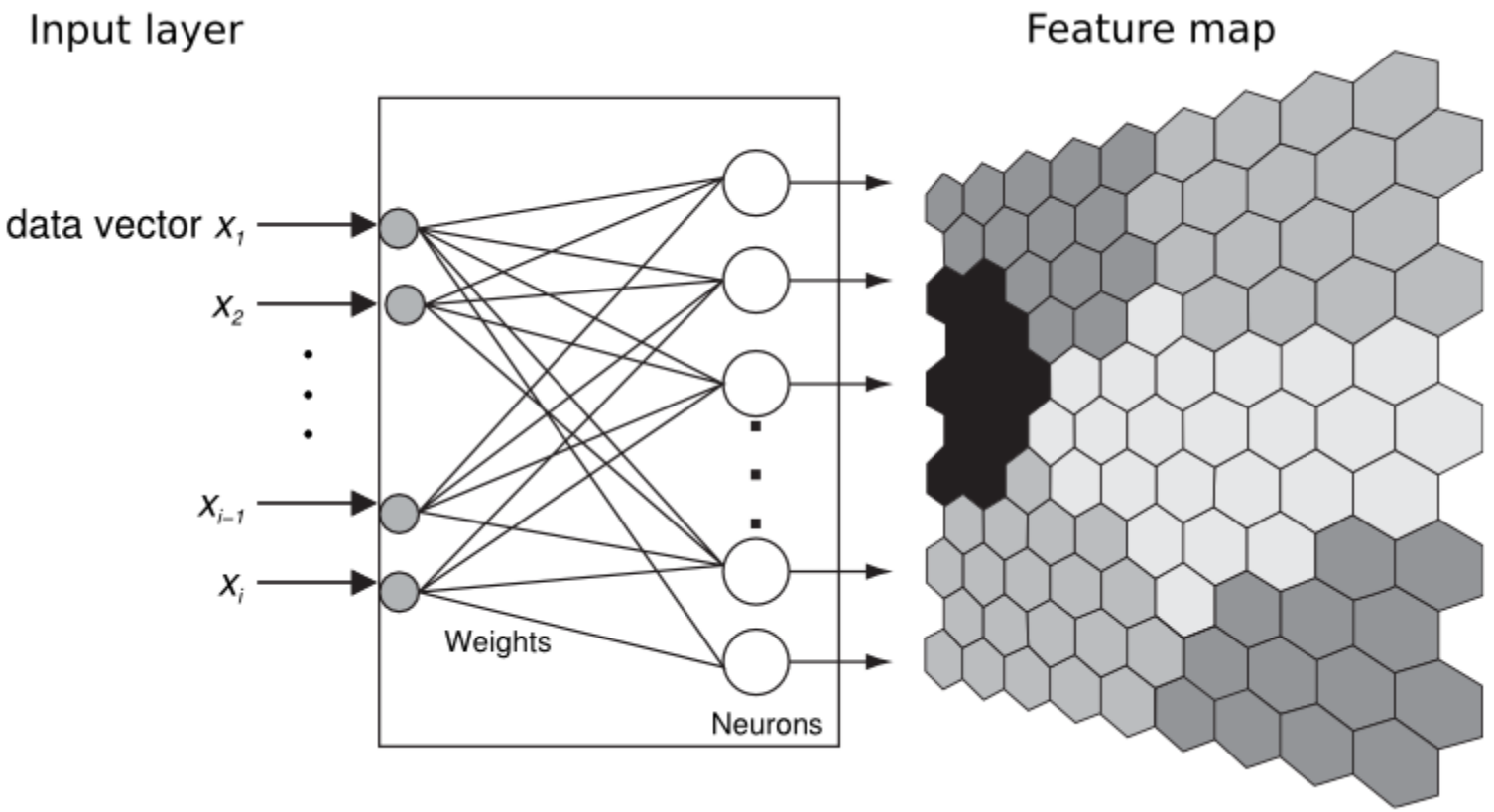

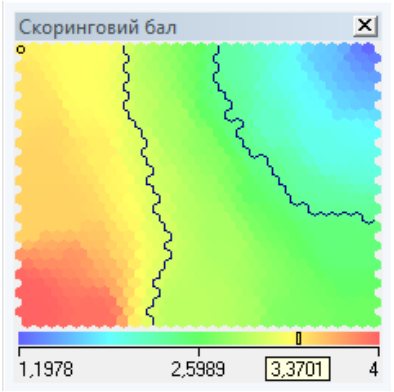

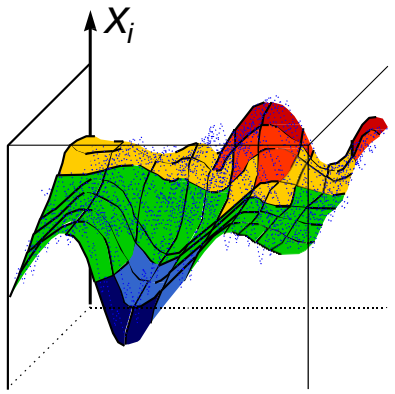

Regression Model Accuracy

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$$MAE = \frac{1}{N}\sum_{i=1}^{N}|y_i - \hat{y}|$$

$$MSE = \frac{1}{N}\sum_{i=1}^{N}(y_i - \hat{y})^2$$

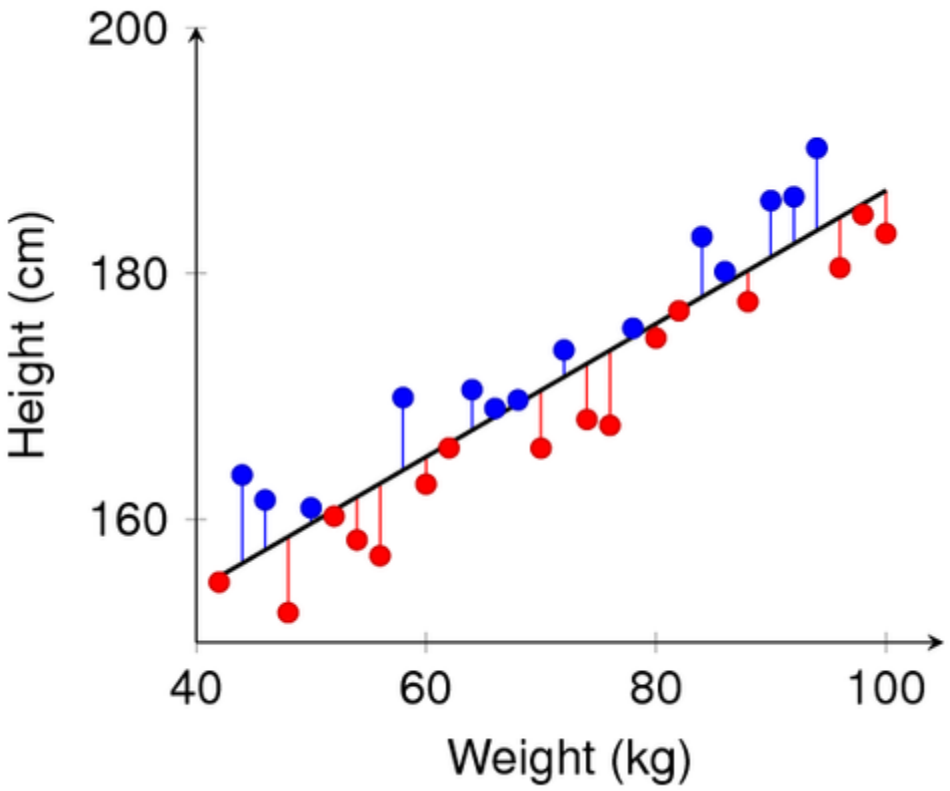
$$RMSE = \sqrt{MSE} = \sqrt{\frac{1}{N}\sum_{i=1}^{N}(y_i - \hat{y})^2}$$

$$R^2 = 1 - \frac{\sum(y_i - \hat{y})^2}{\sum(y_i - \bar{y})^2}$$

Where,

$\hat{y}$ – *predicted value of* y

$\bar{y}$ – *mean value of* y



Classification Model Accuracy

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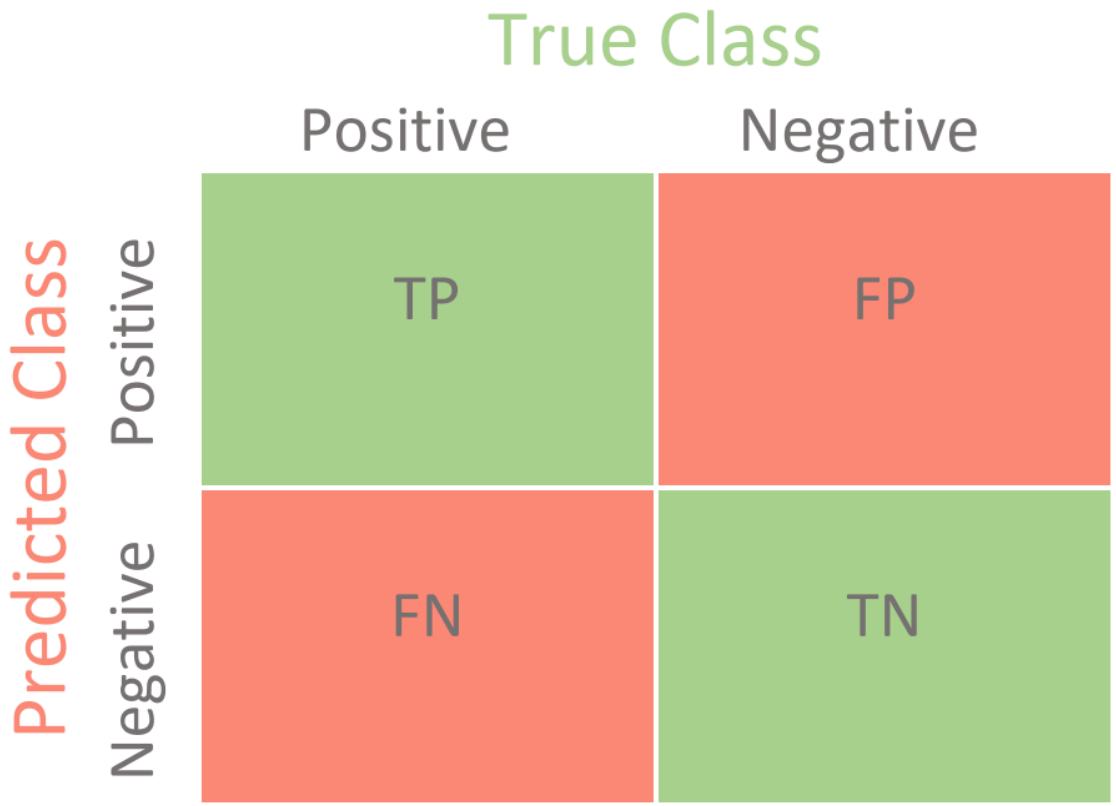
Confusion Matrix for Binary Classification



TP - correctly predicts the positive class as positive

TN - correctly predicts the negative class as negative

FP - incorrectly predicts the negative class as positive

FN - incorrectly predicts the positive class as negative

ROC curve

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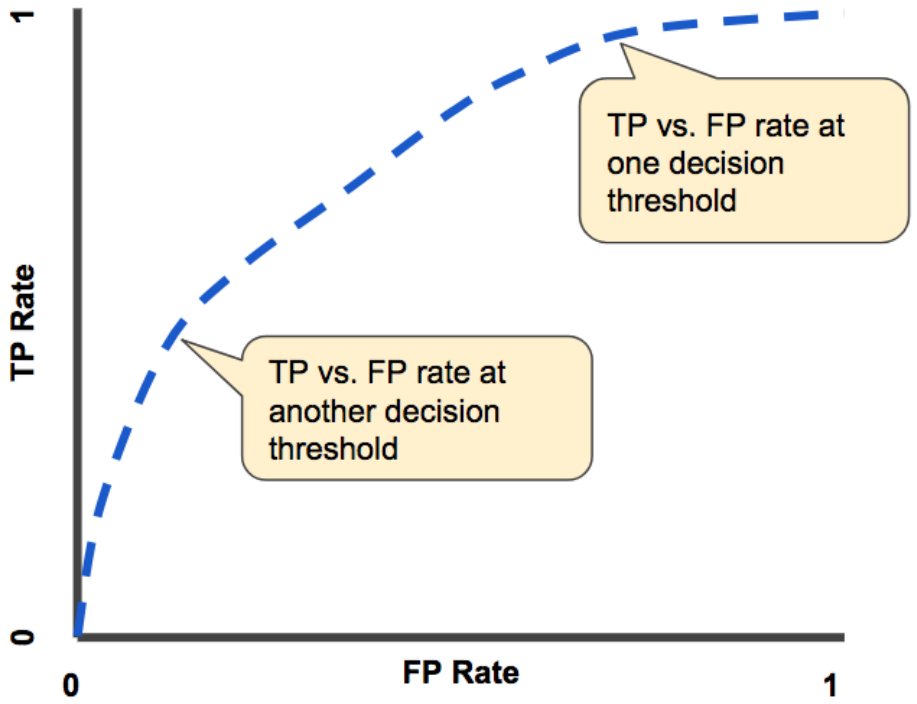

Percentile distribution

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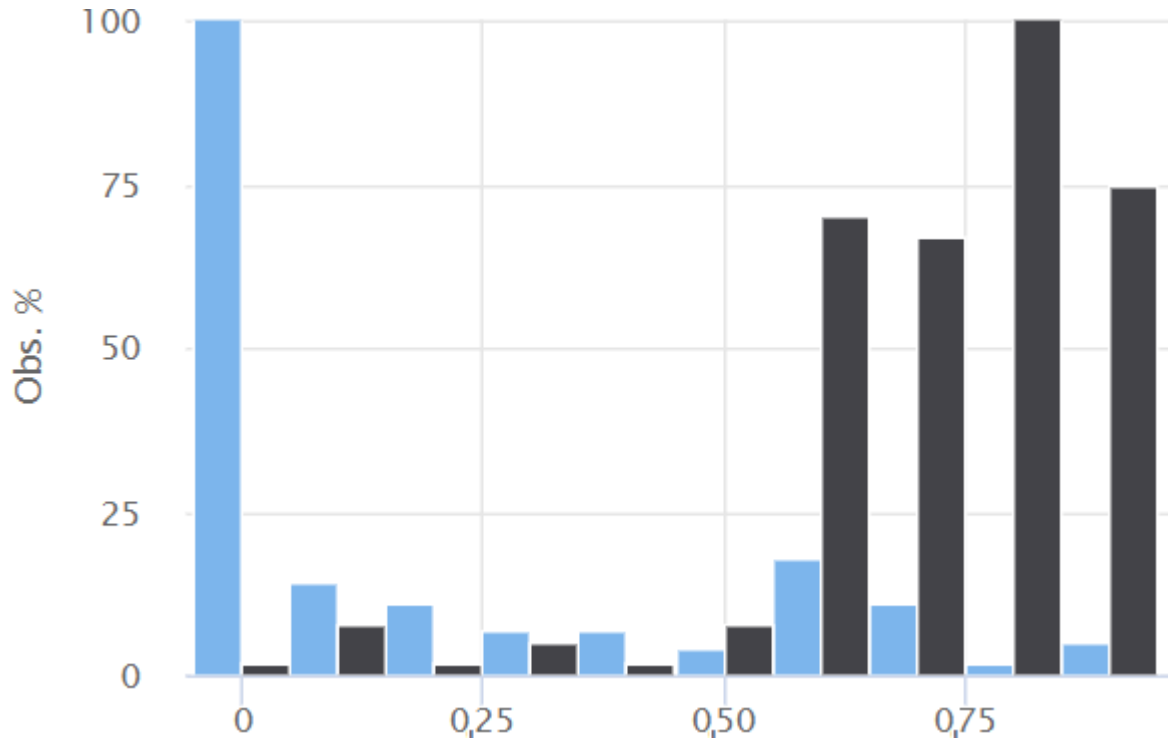

Classification efficiency

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OVERDRAFT

№	Probability range	Bad clients	Good clients
1	0-10%	7%	63%
2	10-20%	4%	4%
3	20-30%	2%	4%
4	30-40%	7%	7%
5	40-50%	0%	2%
6	50-60%	0%	0%
7	60-70%	7%	2%
8	70-80%	7%	0%
9	80-90%	11%	7%
10	90-100%	57%	9%

COMPLIANCE

№	Probability range	Denied	Approved
1	0-10%	3%	33%
2	10-20%	11%	17%
3	20-30%	3%	0%
4	30-40%	6%	11%
5	40-50%	6%	8%
6	50-60%	11%	14%
7	60-70%	17%	3%
8	70-80%	11%	8%
9	80-90%	14%	6%
10	90-100%	19%	0%