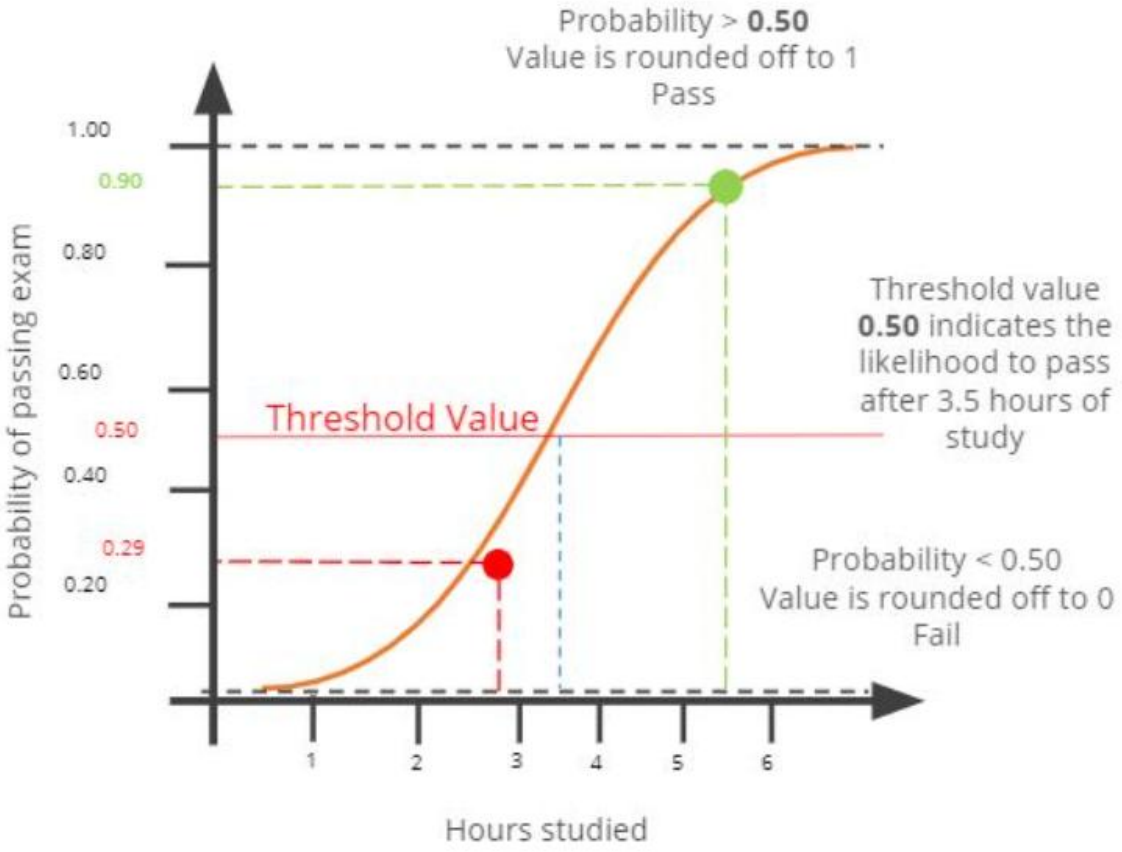
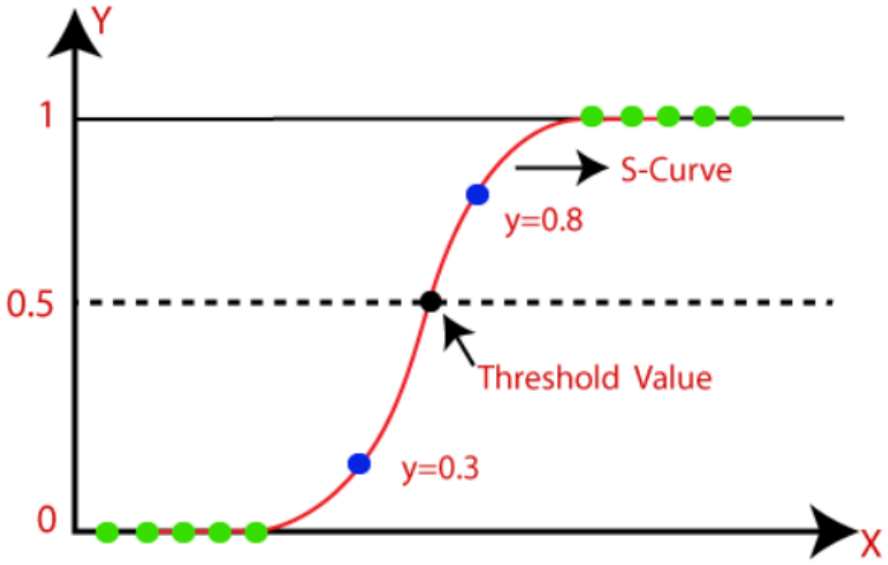
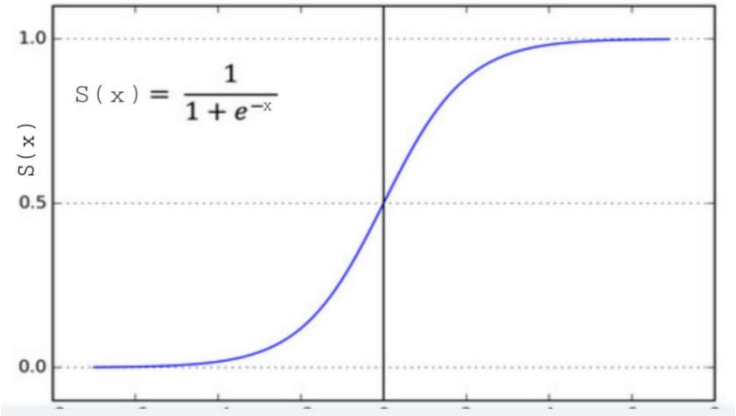
Logistic Regression

- Its one of the most popular ML algorithms, which comes in the category of Supervised Learning technique.
- It is used for predicting the categorical dependent variable
- It predicts the output of a categorical dependent variable. So the outcome must be a categorical or discrete value.
- It can be either Yes or No, 0 or 1, true or False, etc. but instead of giving the exact value as 0 and 1, **it gives the probabilistic values which lie between 0 and 1**.
- In Logistic regression, instead of fitting a regression line, we fit an "S" shaped logistic function, which predicts two maximum values (0 or 1).



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





For Good performance

1. The dependant variable in binary logistic regression **must be binary**.
2. Only the variables that are **relevant** should be included.

Performance Metrics

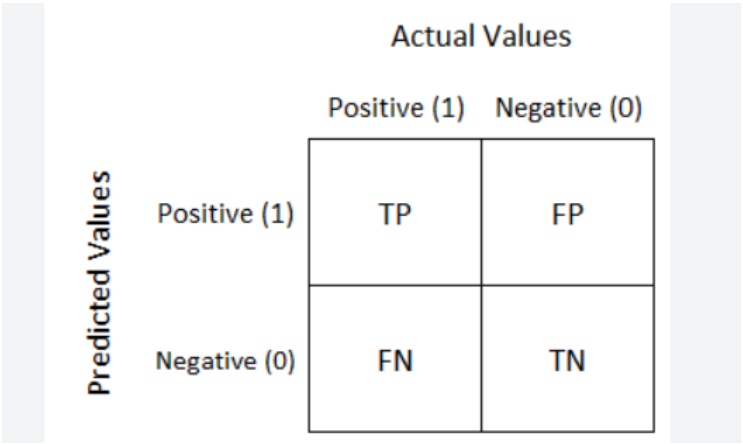
1. Accuracy :

Actuals : 0 0 1 1 0 1 0 0 1 1
Preds : 0 0 0 1 1 1 1 0 0 1

Total correct predictions/Total Predictions = 6/10 = 60%

Confusion Metrics:

Actual -> cancerous ; Pred -> cancerous (TP)
Actual -> Non cancerous ; Pred -> cancerous (FP)
Actual -> cancerous ; Pred -> Non cancerous (FN)
Actual -> Non cancerous ; Pred -> Non cancerous(TN)



by CM we can calculate precision recall and accuracy

$$
\begin{aligned}
precision &= \frac{TP}{TP + FP} \\
recall &= \frac{TP}{TP + FN} \\
F1 &= \frac{2 \times precision \times recall}{precision + recall} \\
accuracy &= \frac{TP + TN}{TP + FN + TN + FP}
\end{aligned}
$$

Precision

We use this metric when we want out FP to be as low as possible

Out of total predicted positives, how many are actually positives

Recall

We use this metric when we want FN to be low

Out of total actual positives, how many are predicted positives

we have confusion by taking precision and recall better to take F1 score.