Logistic Regression

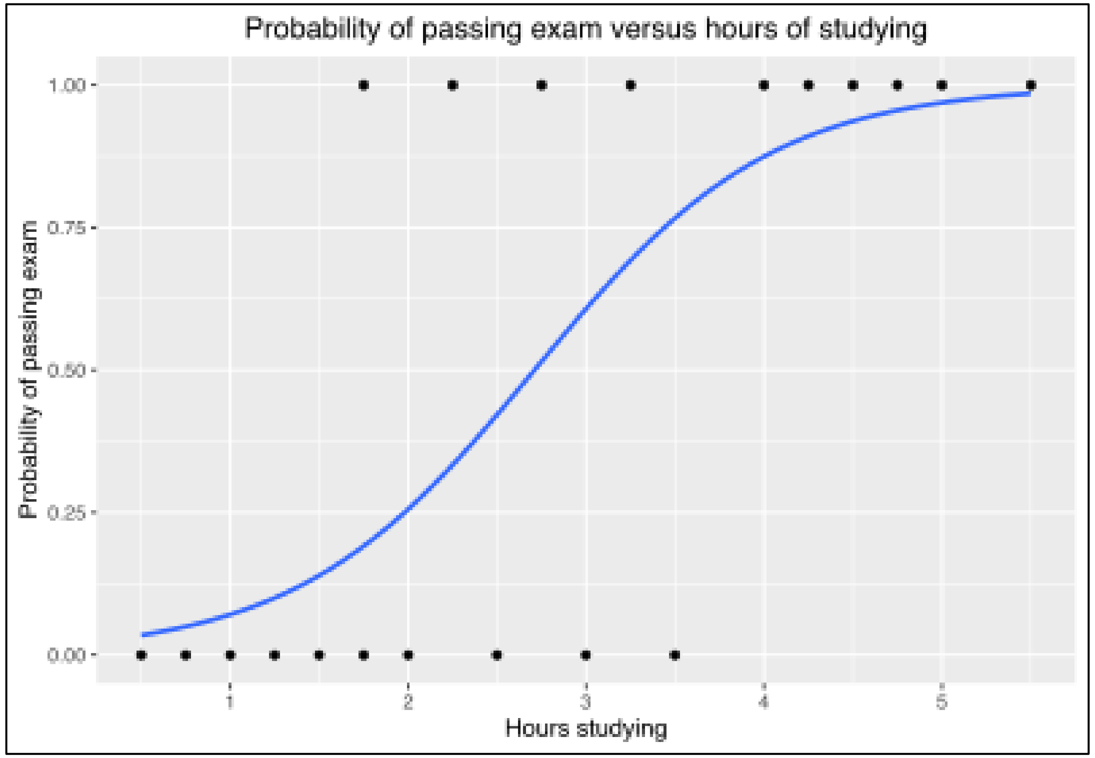
UTKARSH GAIKWAD

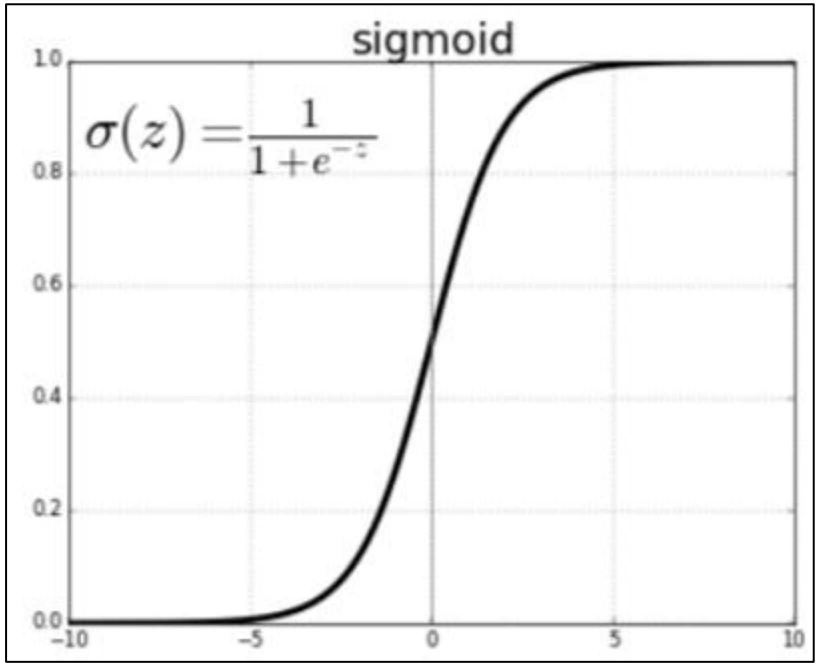
CLASS STARTING SHARP AT 06:04 PM

Logistic Regression explained

- Logistic regression is a statistical method used to predict the probability of an event happening. It is commonly used when the outcome we want to predict is binary,multiclass, binary means it can have only two possible outcomes, like "yes" or "no," "admitted" or "not admitted," or "success" or "failure.“
- In everyday life, we use probability to make predictions and assess risks. For example, weather forecasts often provide the probability of rain. If the forecast says there is a 30% chance of rain, it means there is a 30% probability that it will rain. So, out of ten similar days, we would expect it to rain on around three of them.

Logistic regression example



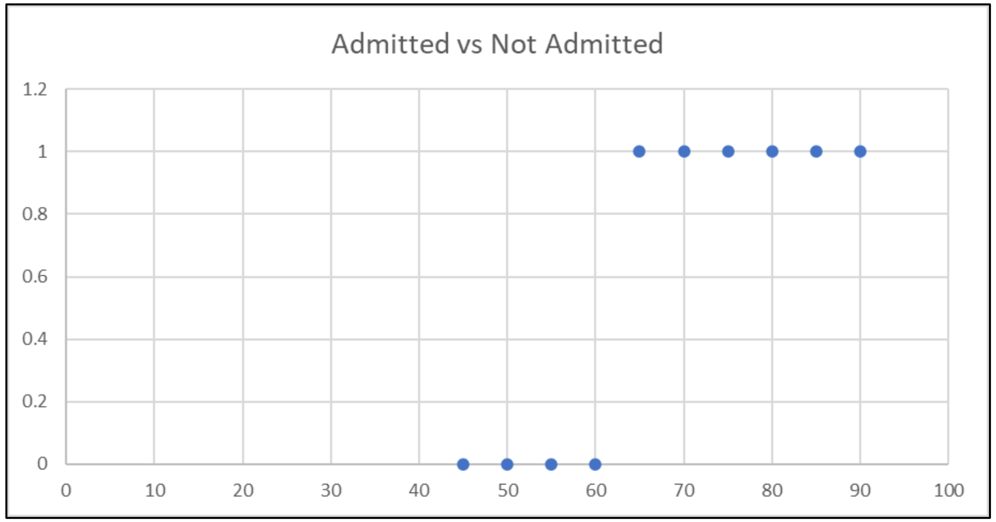


Predictions are in Probabilities (0-1)

Example dataset for Logistic regressoin

Exam Score (X)	Admitted (Y)
65	1
80	1
55	0
75	1
60	0
90	1
85	1
50	0
70	1
45	0

$$Prob = \frac{1}{1 + e^{-(B0+B1*x)}}$$



Log Loss or Binary Cross Entropy

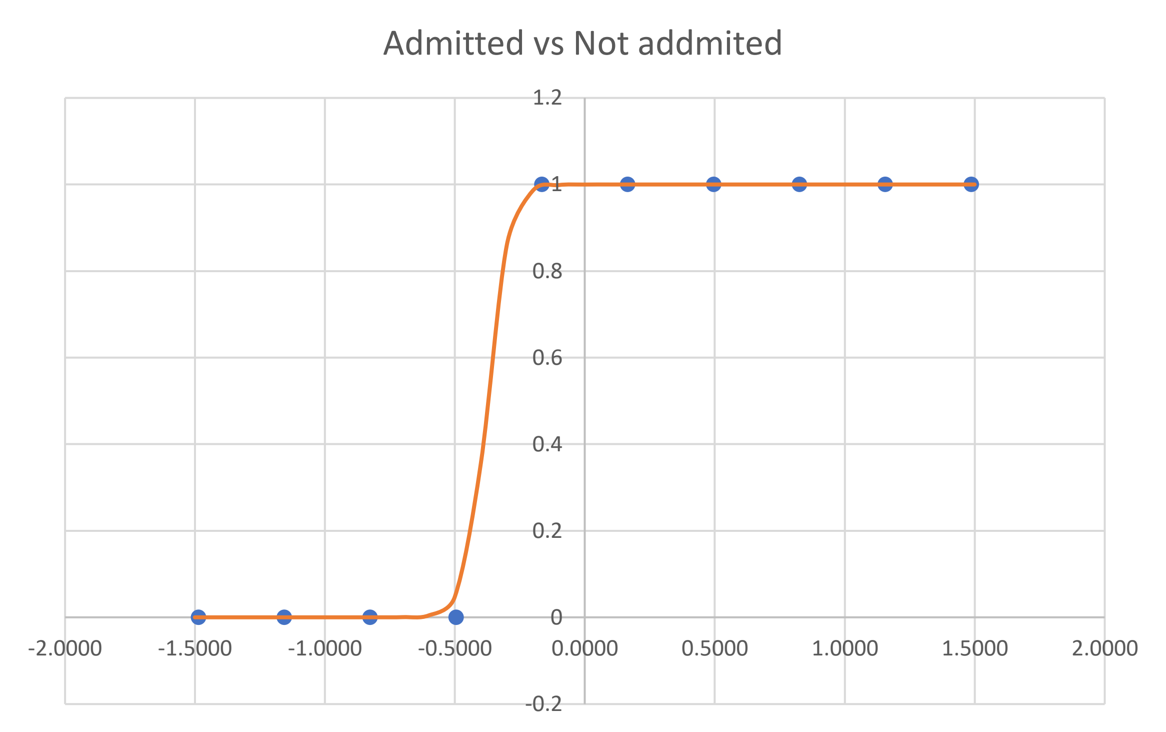
B0	9.0396
B1	24.0996

$$logloss_{(N=1)} = y\log(p) + (1-y)\log(1-p)$$

Exam Score (X)	Admitted (Y)	X Scaled	Yprob	Log Loss	
65	1	-0.1651	0.99	0.002748105	
80	1	0.8257	1	1.17359E-13	
55	0	-0.8257	0	8.34328E-06	
75	1	0.4954	1	3.36193E-10	
60	0	-0.4954	0.05	0.023257867	
90	1	1.4863	1	0	
85	1	1.1560	1	0	
50	0	-1.1560	0	2.91361E-09	
70	1	0.1651	1	9.62715E-07	
45	0	-1.4863	0	1.01746E-12	

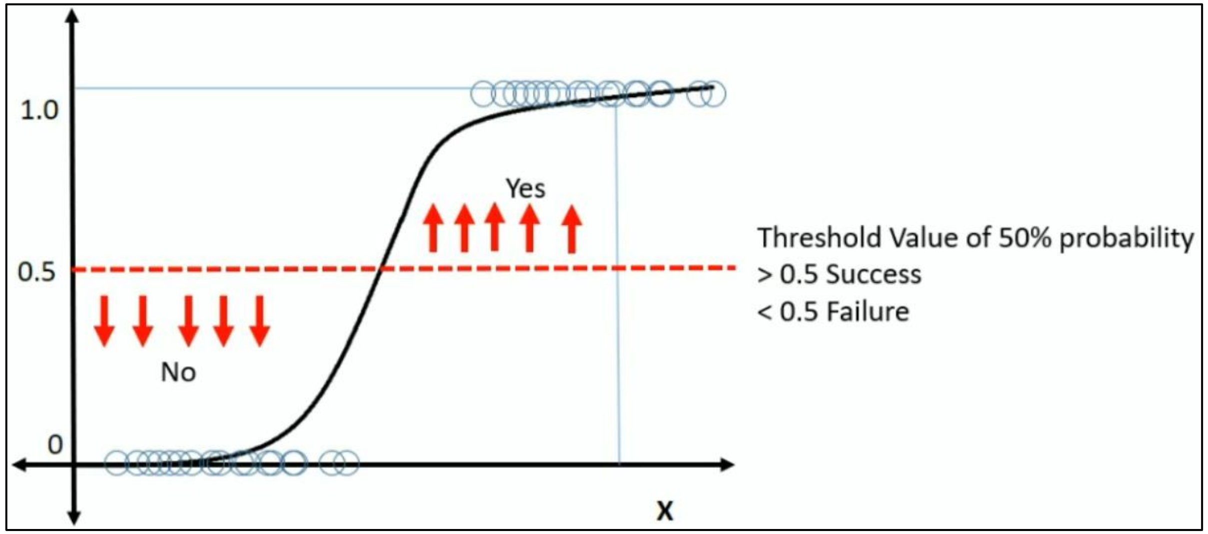
67.5	Mean
15.1383	Stdev

Loss 0.0026015



Predicting new students probability of admission

B0	9.0396
B1	24.0996



Eg. student scored 62 marks

X = 62

X_scaled = (62-mean)/std

X_scaled = (62-67.5)/15.1383

X_scaled = -0.3633

Yprob = 1/(1+exp(-(B0+B1*x_scaled))

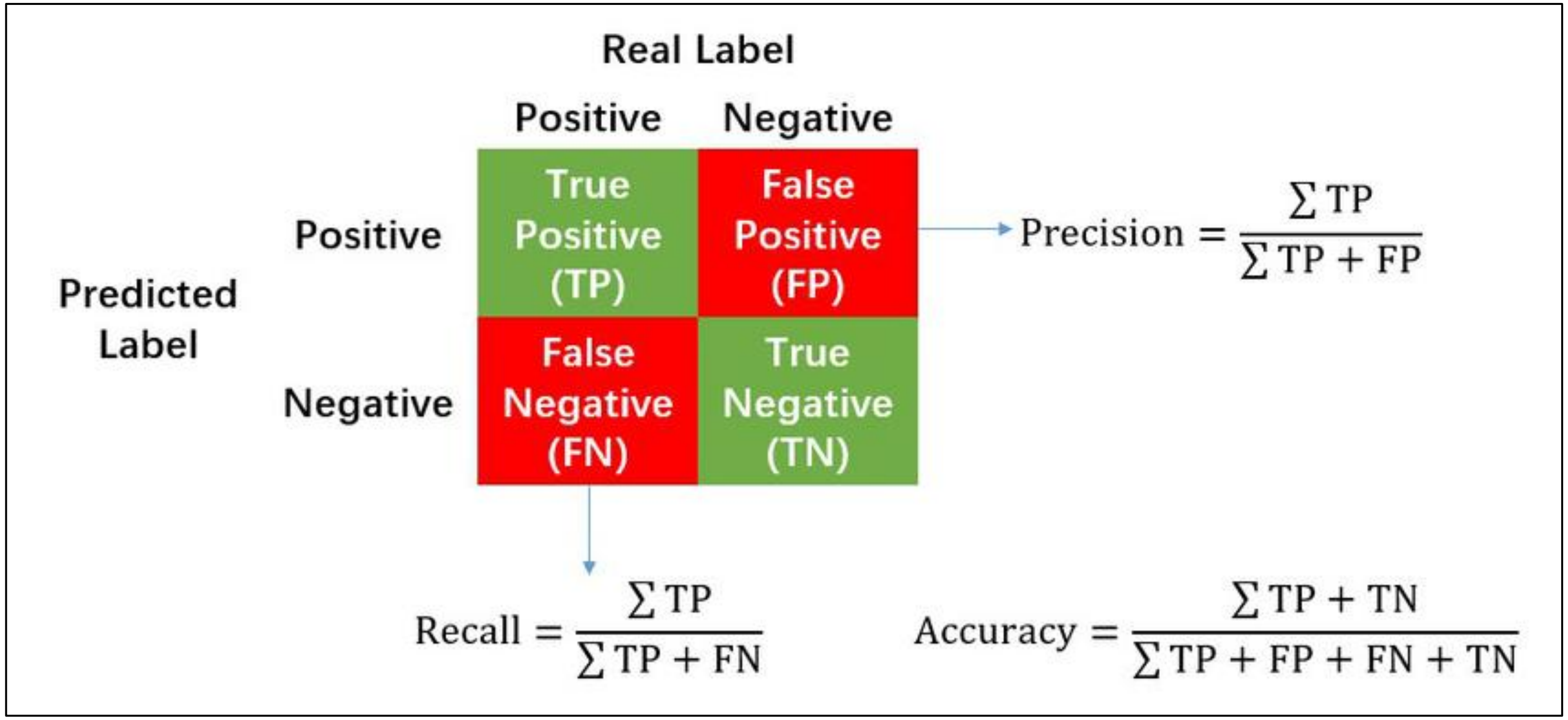
Yprob = 1/(1+exp(-9.0936-24.0996*-0.3633)

Yprob = 0.5705

Yprob >= 0.5

Prediction = 1 : Student is admitted

Confusion Matrix Model Evaluation



$$F_1 = \frac{2 \cdot precision \cdot recall}{precision + recall}$$

Thank you

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