Logistic Regression

An Introduction to LR classifier

Logistic Regression – Binary Classification

- The sentiment analysis task is mainly a binary classification problem to predict whether a given sentence is positive of negative. In our demonstrations we denote ‘0’ as negative and ‘1’ as positive.

Logistic Regression – The points concept

- Each sentence is mapped to a point.
- If the point is greater than 0.5 then positive else negative.

Logistic Regression – The points concept

Words/ Documents	going	to	today	i	am	it	is	rain	Points
Document 1	0	0.07	0.07	0	0	0.17	0.17	0.17	0.62
Document 2	0	0	0.07	0.07	0.07	0	0	0	0.41
Document 3	0	0.05	0	0.05	0.05	0	0	0	0.72

Logistic Regression – Learning algorithm

- A learning algorithm is a specific type of algorithm whose performance increases with time. Logistic regression is a type of learning algorithm. It learns from a training dataset, the pattern of the data and applies the learned logics on new data for prediction.

Logistic Regression – Linear Equation

Consider the equation:

$$y = a + bx_1 + cx_2 + \cdots + dx_{2000}$$

a, b, c, d = coefficients

X_1, X_2, …, X_{2000} = independent variables

y = dependent variable

Logistic Regression – The points concept

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Logistic Regression – Optimal Coefficients

The algorithm finds the optimal values for the coefficients

Logistic Regression – Predicting Sentiment

If $y >= 0.5 \rightarrow$ Positive sentiment

If $y < 0.5 \rightarrow$ Negative sentiment

Logistic Regression – Value range

For some values of the dependent variables, the value of y can be > 1 or < 0.

For that, we need some way to restrict the value of y within the range 0 and 1.

Logistic Regression – Value range

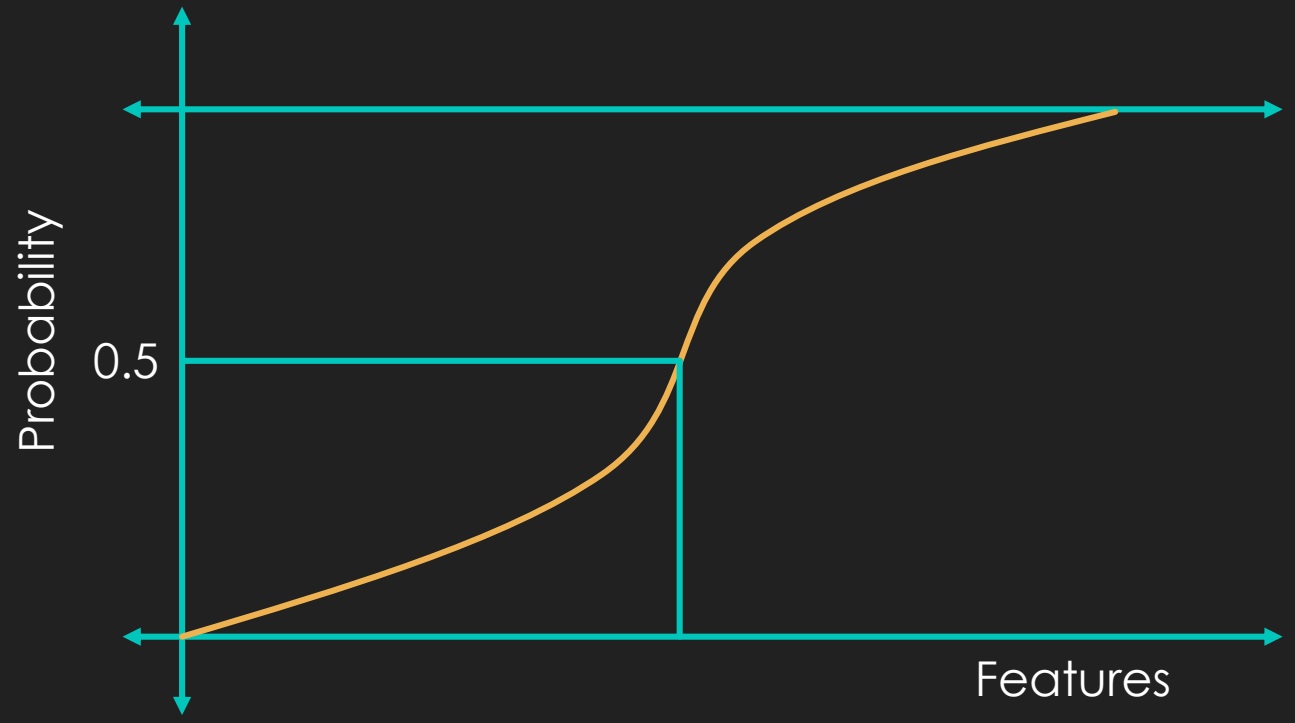
For y > 0, $y = e^{(a+bx_1+cx_2+\cdots+dx_{2000})}$

For y < 1, $y = \frac{e^{(a+bx_1+cx_2+\cdots+dx_{2000})}}{e^{(a+bx_1+cx_2+\cdots+dx_{2000})}+1}$

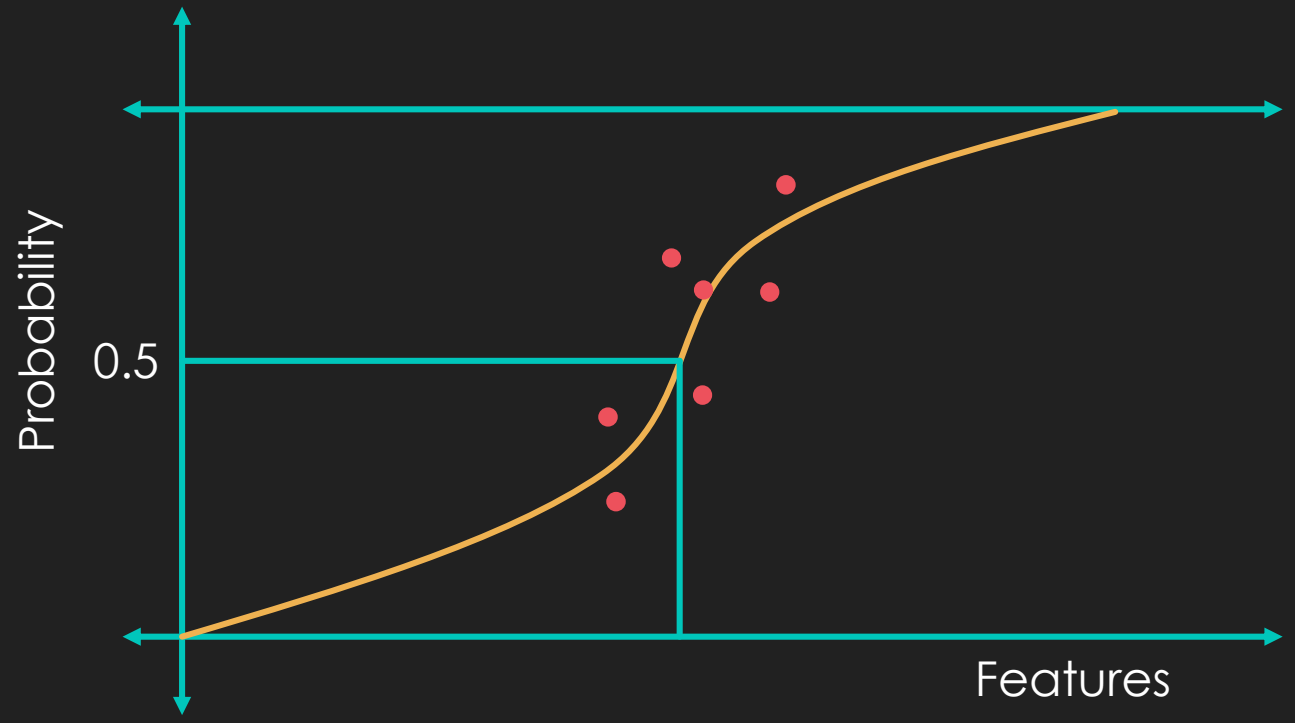
Logistic Regression – Value range

$$\ln\left(\frac{y}{y-1}\right) = a + bx_1 + cx_2 + \cdots + dx_{2000}$$

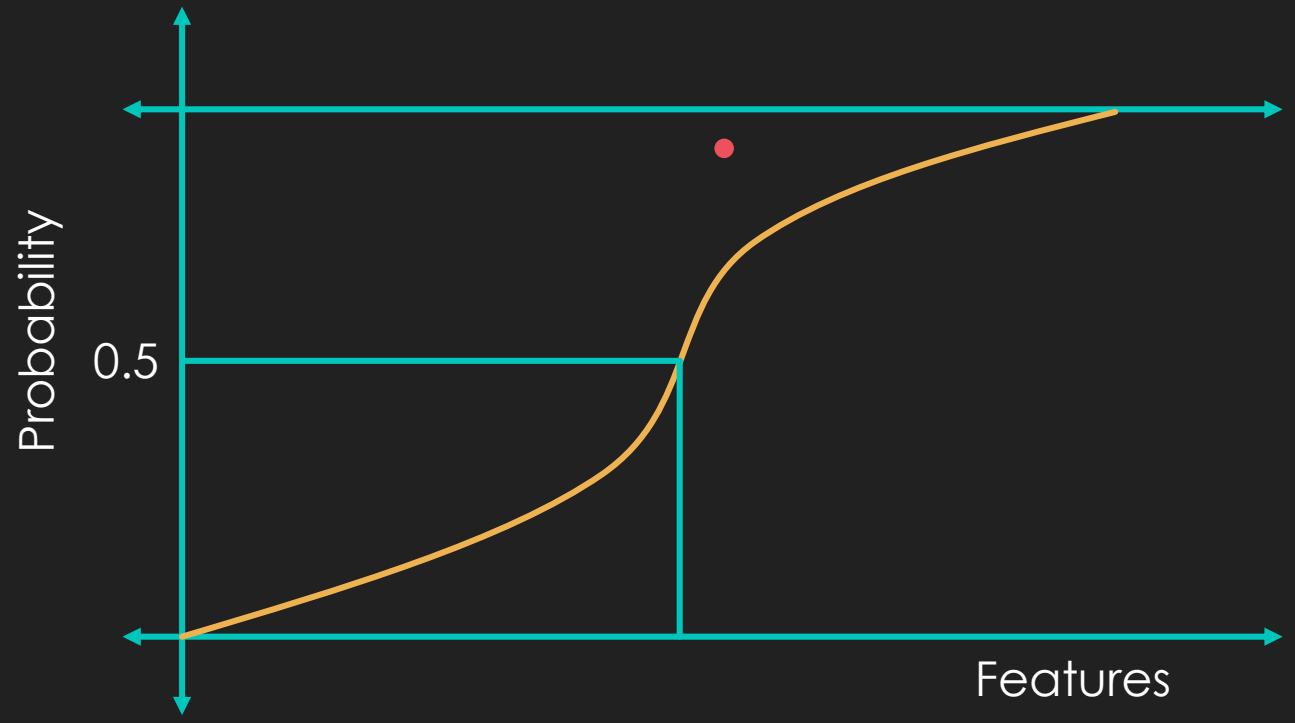
Logistic Regression – Graph



Logistic Regression – Graph



Logistic Regression – Graph



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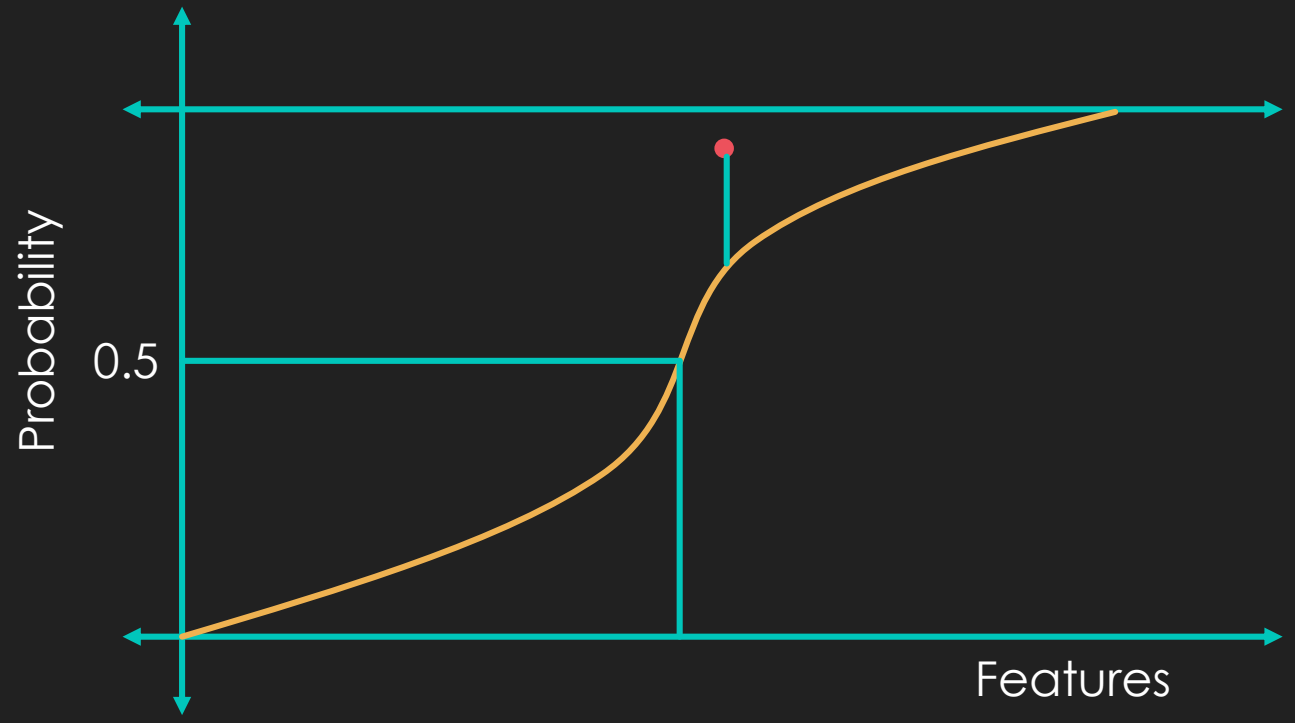

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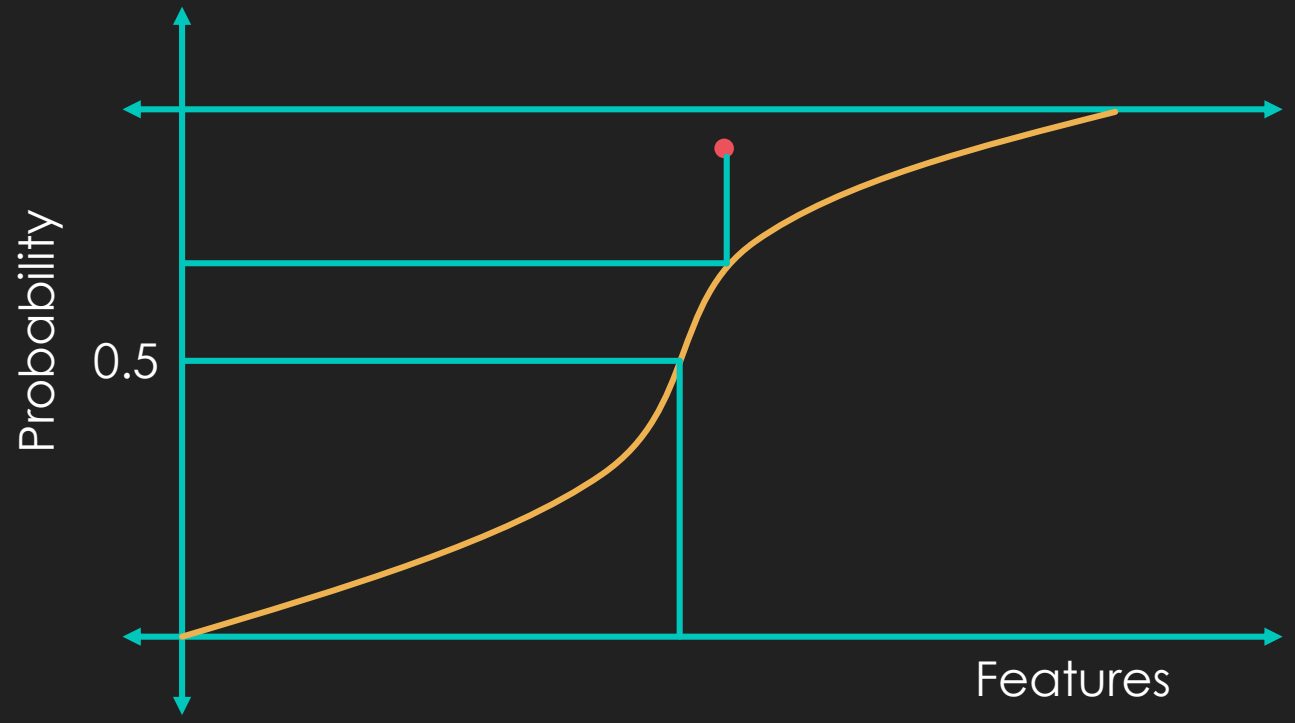

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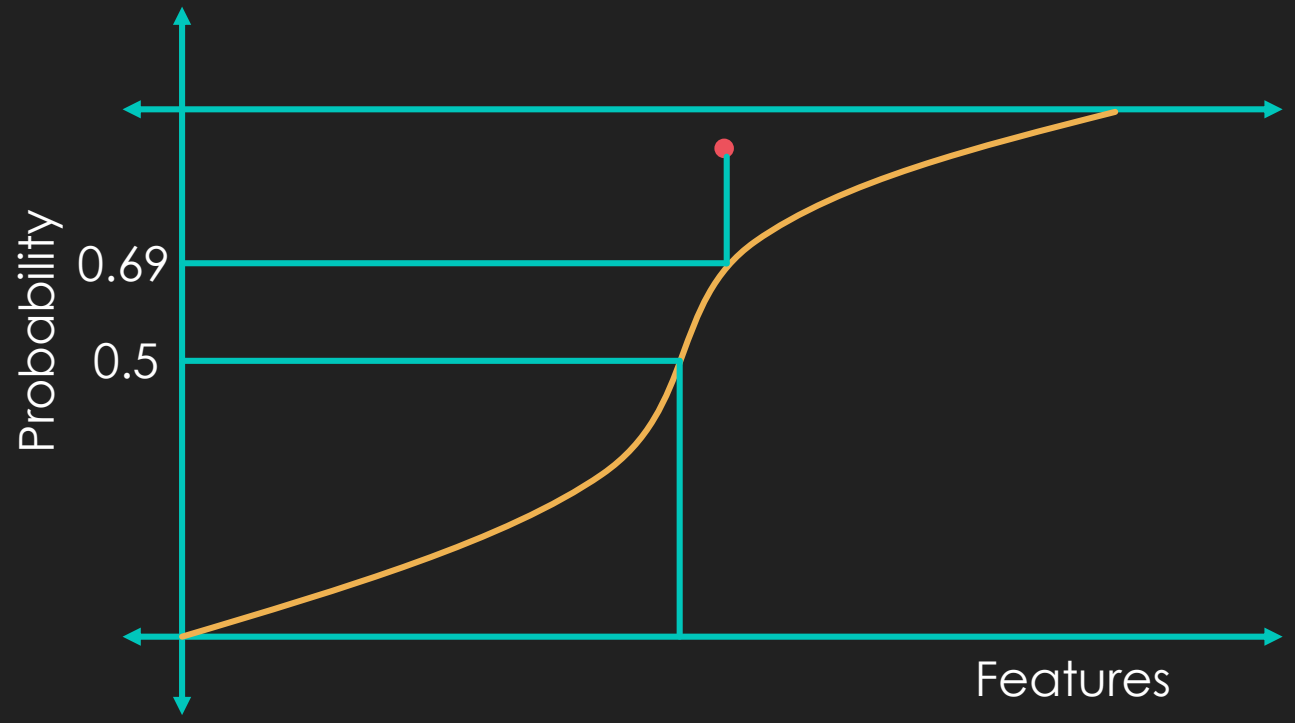

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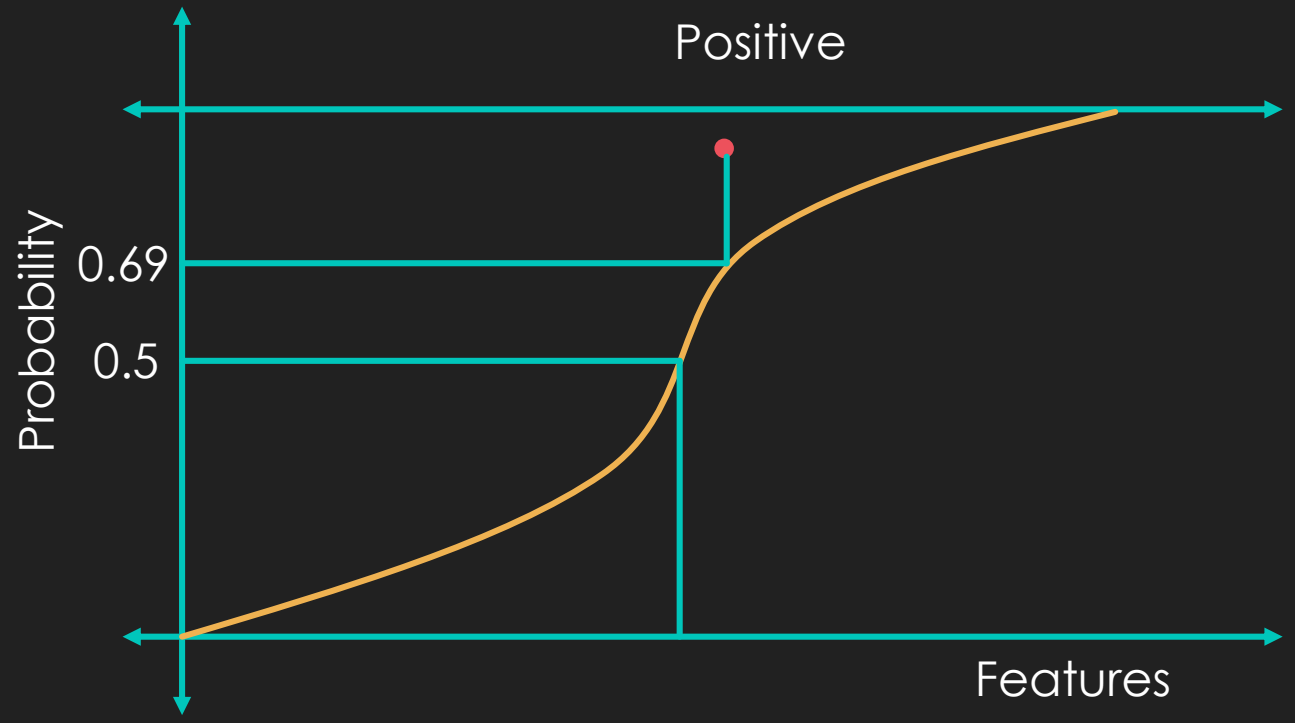

Logistic Regression – Summary

- Logistic Regression calculates the values of the coefficients.
- Based on the calculated coefficients, new sentences are given points.
- If the point > 0.5, the sentence is predicted to be positive and vice versa