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Logistic Regression

Neemias Bucéli da Silva

neemiasbsilva@gmail.com
https://neemiasbuceli.com

Federal University of Mato Grosso do Sul

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What is Regression?

- Regression Analysis is a **predictive modelling** technique;
- It estimates the relationship between a **dependent** and an **independent** variable.

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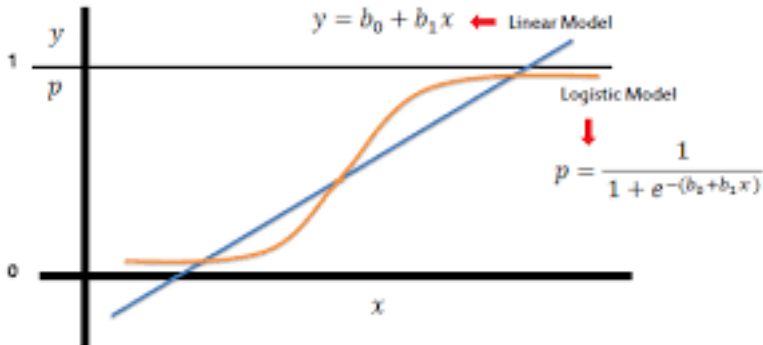Implementation Logistic Regression
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Logistic Regression: What and Why?

Logistic Regression produces results in a **binary format** which is used to predict the out come of a categorical dependent variable. So the out come should be **discrete** / **categorical** such as:

- 0 or 1;
- Yes or No;
- True or False;
- High and Low.

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Why Not Linear Regression?

$$y = b_0 + b_1 x \quad \longleftarrow \text{Linear Model}$$

Logistic Model

$$p = \frac{1}{1 + e^{-(b_0 + b_1 x)}}$$

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Logistic Regression Equation

The logistic regression equation is derived from **Straight** line equation

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Logistic Regression Equation

Equation of a straight line

$$y = c \; + \; b_0 \times x_0 \; + \; b_1 \times x_1 \; + \; ... \tag{1}$$

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Logistic Regression Equation

Now, to get the range of y between 0 and infinity let's transform y

$$\frac{y}{1-y} \tag{2}$$

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Logistic Regression Equation

Let us transform it further, to get range between - (infinity) and (infinity)

$$\log\left[\frac{y}{1-y}\right] \tag{3}$$

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Linear vs Logistic

Linear	Logistic
Continues variables	Categorical variables
Solves regression problems	Solves classification problems
Straight line	Sigmoid Curve

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Logistic Regression: uses-cases

Figure: [NIST, 2018]

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Steps of Implementation

The implementation of logistic regression can be divided into **five steps**. Below follows the names of the respective steps: x

1. Colleting Data;
2. Analyzing Data;
3. Data Wrabling;
4. Train Test;
5. and Accuracy.

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Implementing Logistic Regression

Let's go implementing Logistic Regression for the Titanic Data using the **jupyter notebook**.

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📄 Dr. Saed Sayad

Logistic Regression Available from World Wide Web:
https://www.saedsayad.com/logistic_regression.htm.

📄 Edureka

Edureka Available from World Wide Web:
https://www.edureka.co/data-science-python-certification-course.

📄 National Institute of Standards and Technology

NIST Available from World Wide Web: https://www.nist.gov/.