SNS COLLEGE OF TECHNOLOGY

Coimbatore-35

An Autonomous Institution

Accredited by NBA – AICTE and Accredited by NAAC – UGC with 'A++' Grade

Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai

DEPARTMENT OF COMPUTER APPLICATIONS

23CAT702 – MACHINE LEARNING

II YEAR III SEM

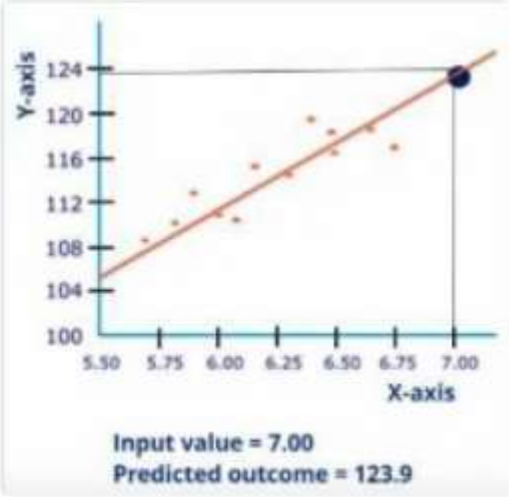
UNIT II – LINEAR MODELS

TOPIC 13 – Logistic regression

- What is Regression?
- Logistic regression: What and Why?
- Linear Vs Logistic Regression
- Use- Cases
- Demo

What is Regression?

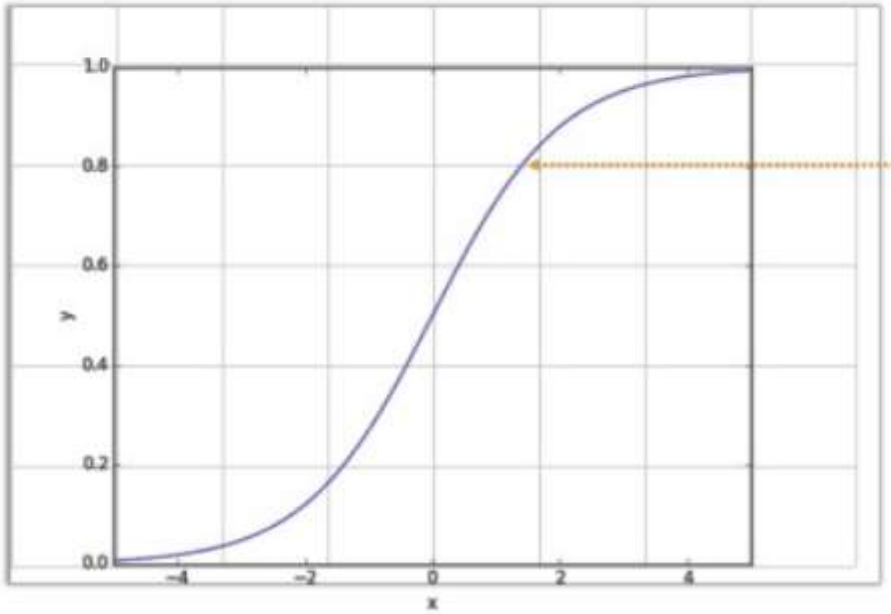
- Regression Analysis is a predictive modelling technique
- It estimates the relationship between a dependent (target) and an independent variable(predictor)



Logistic Regression: What And Why?

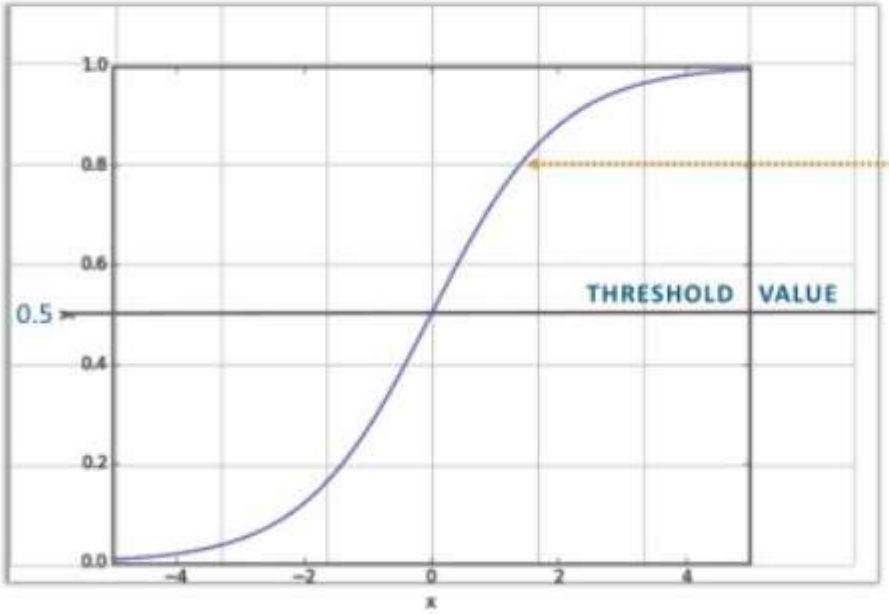
Logistic Regression produces results in a binary format which is used to predict the outcome of a categorical dependent variable. So the outcome should be discrete/ categorical such as:

Logistic Regression Curve



The Sigmoid "S" Curve

Logistic Regression Curve



The Sigmoid "S" Curve

With this, the threshold value indicates the probability of winning or losing

Logistic Regression Equation

The Logistic Regression Equation is derived from the Straight Line Equation

Equation of a straight line

$Y = C + BIX1 + B2X2 + \ldots.$ ——→ Range is from –(infinity) to (infinity)

Let's try to reduce the Logistic Regression Equation from Straight Line Equation

$Y = C + BIX1 + B2X2 + \ldots.$ ——→ In Logistic equation Y can be only from 0 to 1

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

$\frac{Y}{1-Y}$ Y= 0 then 0, Y= 1 then infinity ——→ Now, the range is between 0 to infinity

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

$\log \frac{Y}{1-Y} \Rightarrow Y = C + BIX1 + B2X2 + \ldots.$ ——→ **Final Logistic Regression Equation**

Linear Vs Logistic Regression

Linear Regression

1. Continuous variables
2. Solves Regression Problems
3. Straight line

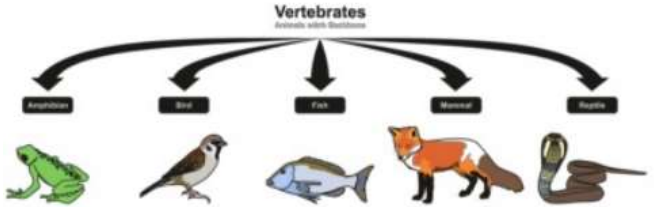
Logistic Regression

1. Categorical variables
2. Solves Classification Problems
3. S-Curve

Logistic Regression: Use - Cases

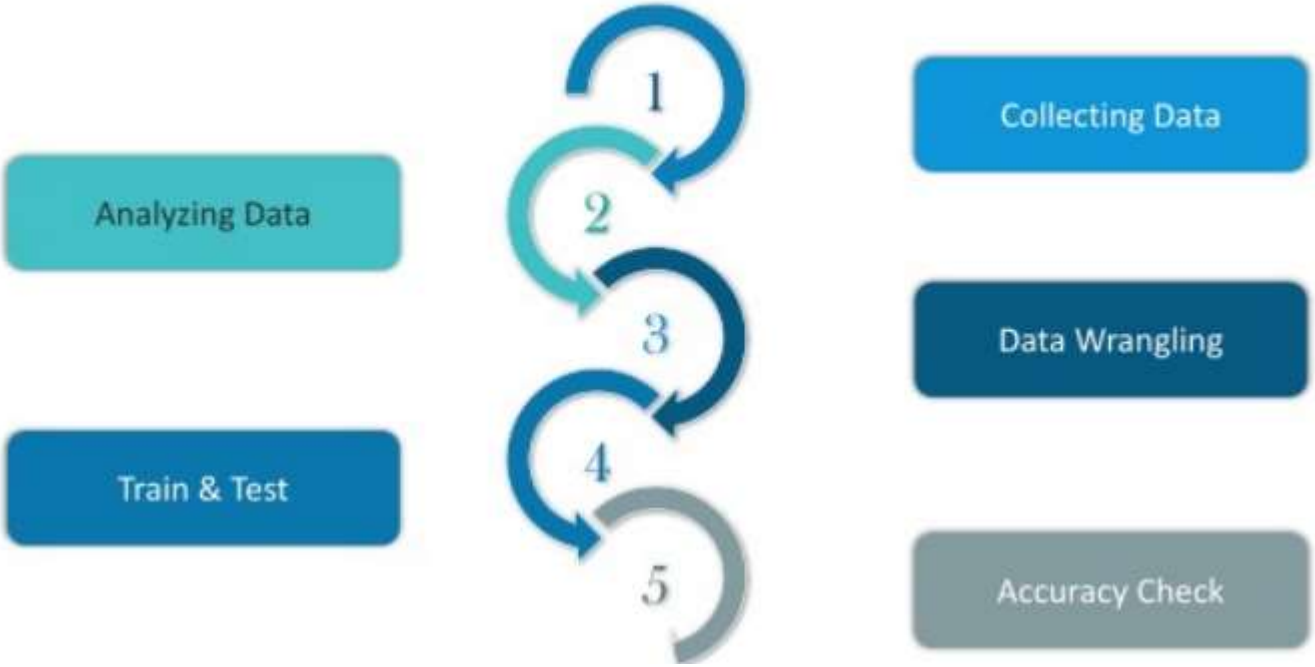
Weather Predictions

Classification Problems

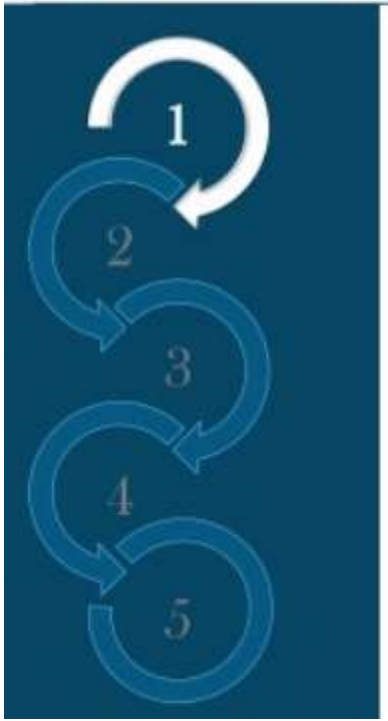


Determines Illness

Implement Logistic Regression



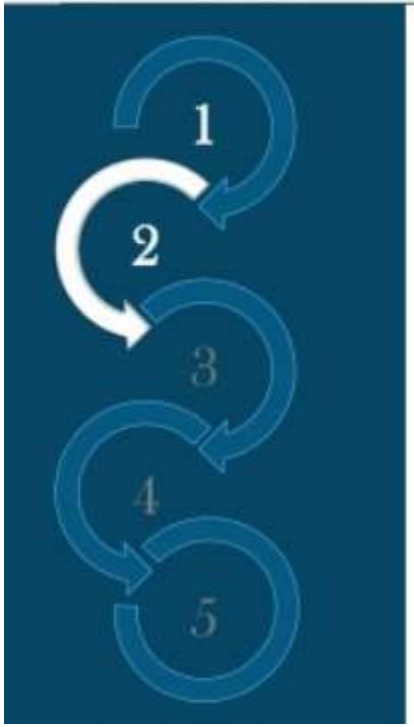
Implement Logistic Regression



Collect Data: Import Libraries

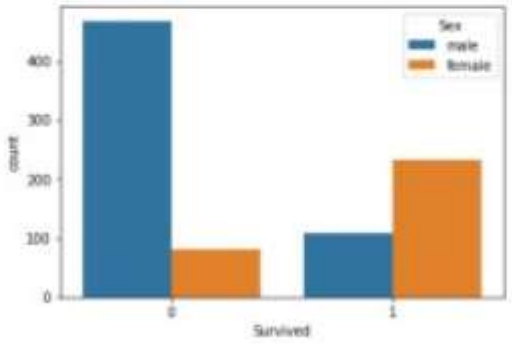
```
In [33]: import pandas as pd
         import numpy as np
         import seaborn as sns
         import matplotlib.pyplot as plt
         import math
         %matplotlib inline

         titanic_data= pd.read_csv('Titanic.csv')
```

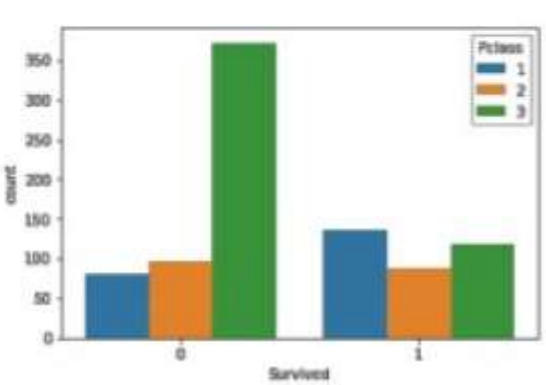
Implement Logistic Regression



Analyzing Data

Creating different plot to check relationship between variables

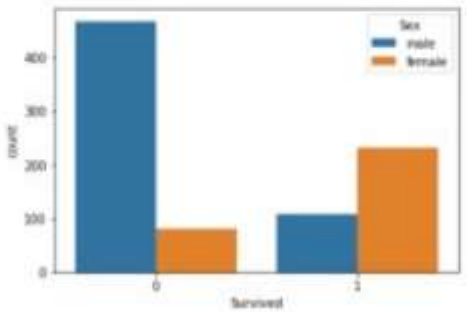


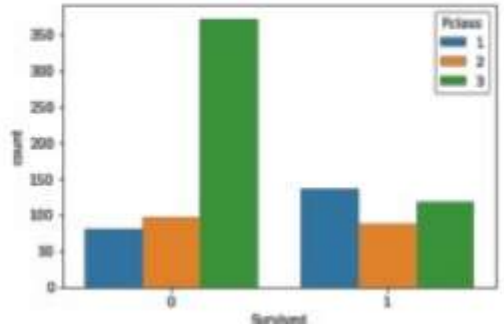


Implement Logistic Regression

Analyzing Data

Creating different plot to check relationship between variables





Implement Logistic Regression

Data Wrangling

Clean the data by removing the Nan values and unnecessary columns in the dataset

	Survived	Age	SibSp	Parch	Fare	male	Q	S	2	3
0	0	22.0	1	0	7.2500	1	0	1	0	1
1	1	38.0	1	0	71.2833	0	0	0	0	0
2	1	26.0	0	0	7.9250	0	0	1	0	1
3	1	35.0	1	0	53.1000	0	0	1	0	0
4	0	35.0	0	0	8.0500	1	0	1	0	1

Implement Logistic Regression

Train & Test Data

Build the model on the train data and predict the output on the test data

```
logistic = LogisticRegression()
logistic.fit(train_X,train_Y)
```

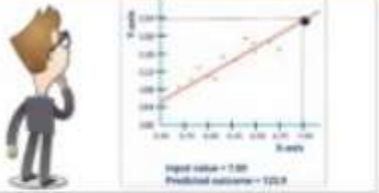
Implement Logistic Regression

Accuracy Check

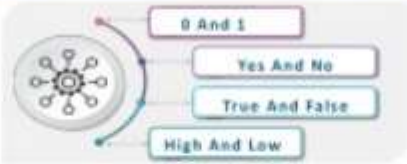
Calculate accuracy to check how accurate your results are.

```
from sklearn.metrics import accuracy_score
accuracy_score(y_test,predictions)*100
```

What is regression?



Logistic: What & Why?



Linear VS Logistic

Use - Cases

Demo1: Titanic Analysis

REFERENCE

- Y. S. Abu-Mostafa, M. Magdon-Ismail, and H.-T. Lin, ―Learning from Data, AML Book Publishers, 2012.
- P. Flach, ―Machine Learning: The art and science of algorithms that make sense of data‖, Cambridge University Press, 2012.
- W3school.com

Thank
you