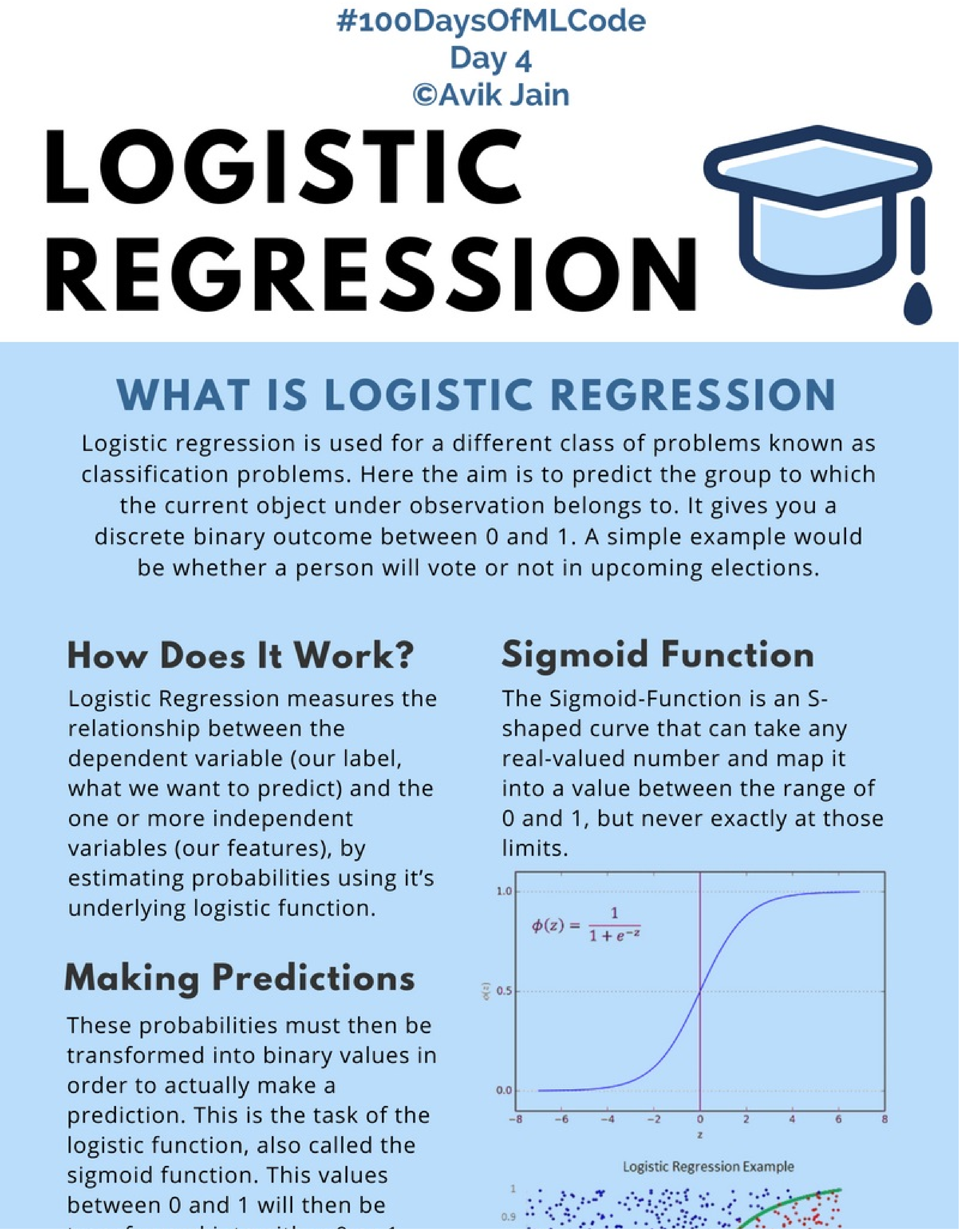
Logistic Regression



#100DaysOfMLCode
Day 4
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LOGISTIC REGRESSION

WHAT IS LOGISTIC REGRESSION

Logistic regression is used for a different class of problems known as classification problems. Here the aim is to predict the group to which the current object under observation belongs to. It gives you a discrete binary outcome between 0 and 1. A simple example would be whether a person will vote or not in upcoming elections.

How Does It Work?

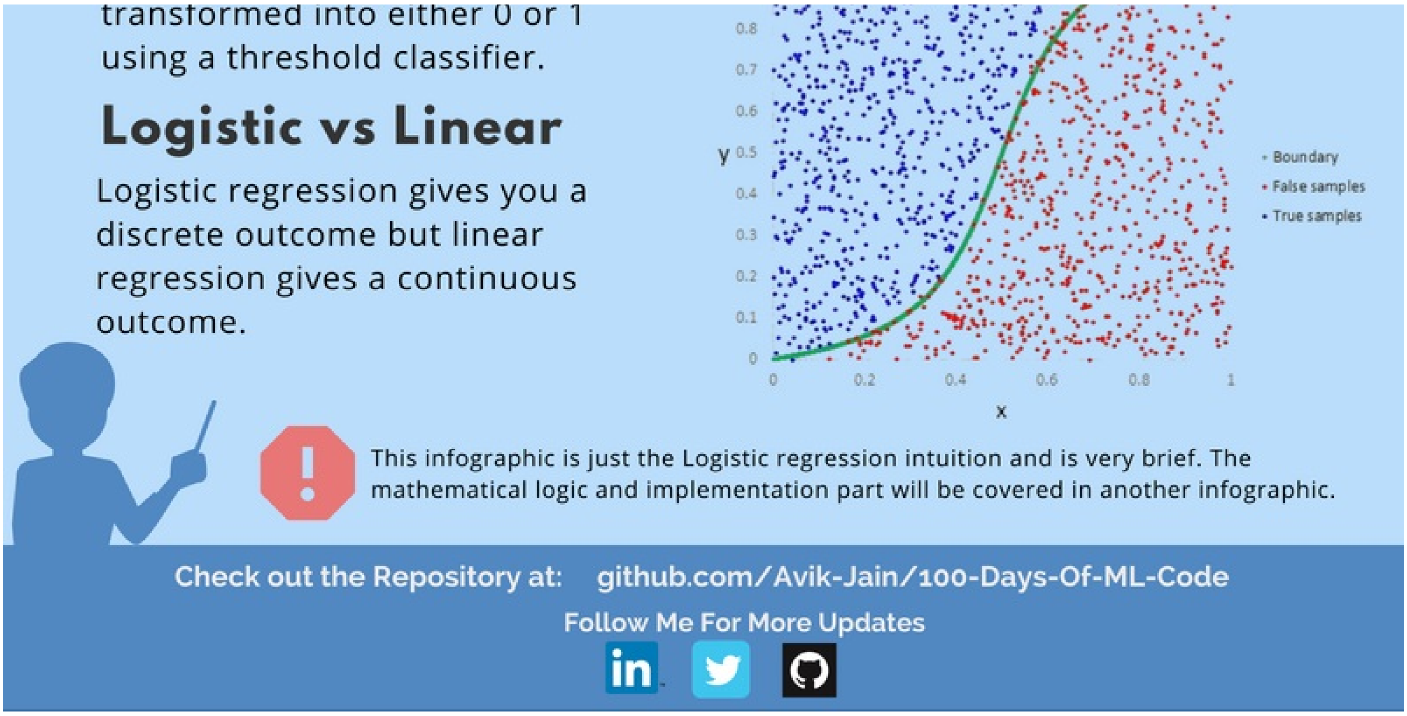
Logistic Regression measures the relationship between the dependent variable (our label, what we want to predict) and the one or more independent variables (our features), by estimating probabilities using it’s underlying logistic function.

Making Predictions

These probabilities must then be transformed into binary values in order to actually make a prediction. This is the task of the logistic function, also called the sigmoid function. This values between 0 and 1 will then be

Sigmoid Function

The Sigmoid-Function is an S-shaped curve that can take any real-valued number and map it into a value between the range of 0 and 1, but never exactly at those limits.



transformed into either 0 or 1 using a threshold classifier.

Logistic vs Linear

Logistic regression gives you a discrete outcome but linear regression gives a continuous outcome.

This infographic is just the Logistic regression intuition and is very brief. The mathematical logic and implementation part will be covered in another infographic.

Check out the Repository at: github.com/Avik-Jain/100-Days-Of-ML-Code

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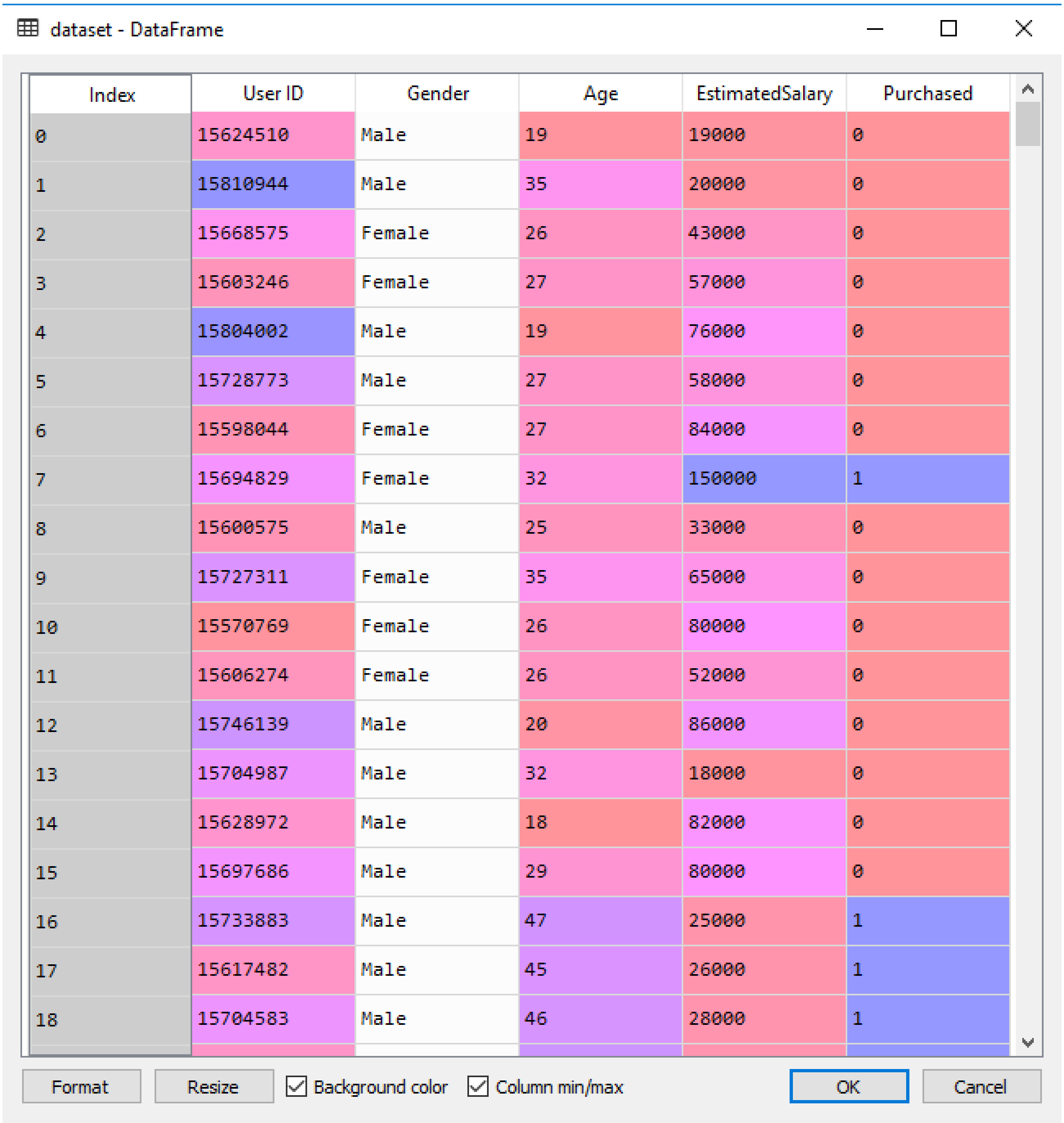
The DataSet | Social Network



Index	User ID	Gender	Age	EstimatedSalary	Purchased
0	15624510	Male	19	19000	0
1	15810944	Male	35	20000	0
2	15668575	Female	26	43000	0
3	15603246	Female	27	57000	0
4	15804002	Male	19	76000	0
5	15728773	Male	27	58000	0
6	15598044	Female	27	84000	0
7	15694829	Female	32	150000	1
8	15600575	Male	25	33000	0
9	15727311	Female	35	65000	0
10	15570769	Female	26	80000	0
11	15606274	Female	26	52000	0
12	15746139	Male	20	86000	0
13	15704987	Male	32	18000	0
14	15628972	Male	18	82000	0
15	15697686	Male	29	80000	0
16	15733883	Male	47	25000	1
17	15617482	Male	45	26000	1
18	15704583	Male	46	28000	1

☑ Background color ☑ Column min/max

This dataset contains information of users in a social network. Those informations are the user id the gender the age and the estimated salary. A car company has just launched their brand new luxury SUV. And we're trying to see which of these users of the social network are going to buy this brand new SUV And the last column here tells If yes or no the user bought this SUV we are going to build a model that is going to predict if a user is going to buy or not the SUV based on two variables which are going to be the age and the estimated salary. So our matrix of feature is only going to be these two columns. We want to find some correlations between the age and the estimated salary of a user and his decision to purchase yes or no the SUV.

Step 1 | Data Pre-Processing

Importing the Libraries

```
import numpy as np
import matplotlib.pyplot as plt
import pandas as pd
```

Importing the dataset

Get the dataset from here

```
dataset = pd.read_csv('Social_Network_Ads.csv')
X = dataset.iloc[:, [2, 3]].values
y = dataset.iloc[:, 4].values
```

Splitting the dataset into the Training set and Test set

```
from sklearn.cross_validation import train_test_split
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size = 0.25,
random_state = 0)
```

Feature Scaling

```
from sklearn.preprocessing import StandardScaler
sc = StandardScaler()
X_train = sc.fit_transform(X_train)
X_test = sc.transform(X_test)
```

Step 2 | Logistic Regression Model

The library for this job which is going to be the linear model library and it is called linear because the logistic regression is a linear classifier which means that here since we're in two dimensions, our two categories of users are going to be separated by a straight line. Then import the logistic regression class. Next we will create a new object from this class which is going to be our classifier that we are going to fit on our training set.

Fitting Logistic Regression to the Training set

```
from sklearn.linear_model import LogisticRegression
classifier = LogisticRegression()
classifier.fit(X_train, y_train)
```

Step 3 | Predection

Predicting the Test set results

```
y_pred = classifier.predict(X_test)
```

Step 4 | Evaluating The Predection

We predicted the test results and now we will evaluate if our logistic regression model learned and understood correctly. So this confusion matrix is going to contain the correct predictions that our model made on the set as well as the incorrect predictions.

Making the Confusion Matrix

```
from sklearn.metrics import confusion_matrix
cm = confusion_matrix(y_test, y_pred)
```