Experiment 3

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Aim: To implement logistic regression

Theory:

Logistic Regression is one of the most popular machine learning algorithms, which comes under the supervised learning technique. It is used for predicting the categorical dependent variable using a given set of independent variable. It predicts the output of a categorical dependent variable. Therefore the outcome must be a categorical or discrete value. It can be either Yes or No. 0 or 1, true or false, etc. but instead of giving the exact value as 0 or 1, it gives the probabilistic values which lies between 0 and 1.

Logistic Regression is like the linear regression except that how they are used. Linear regression is used for solving regression problems. whereas logistic regression is used for solving the classification problems. In logistic regression, instead of fitting a regression line, we fit an 'S' shaped logistic function, which predicts two maximum values (0 or 1). The curve from the logistic function indicates the likelyhood of something such as whether the cells are cancerous or not, a mouse is obese or not based on its weight.

It is a significant machine learning algorithm because it can provide probabilities and classify new data using continuous and discrete datasets. It can be used to classify the observations using different types of data and can easily determine the most effective variables used for the classification.

Conclusion: Hence, we implemented Logistic Regression.

ML EXPERIMENT 3

LOGISTIC REGRESSION

Importing the libraries

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

Importing the dataset

```
[ ] dataset = pd.read_csv('Social_Network_Ads.csv')
    X = dataset.iloc[:,:-1].values
    y = dataset.iloc[:,-1].values
```

Splitting the dataset into the Training set and Test set

```
[ ] from sklearn.model_selection 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

Feature Scaling

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

Training the Logistic Regression model on the Training set

```
[ ] from sklearn.linear_model import LogisticRegression
    classifier = LogisticRegression(random_state=0)
    classifier.fit(X_train, y_train)
```

```
LogisticRegression
LogisticRegression(random_state=0)
```

Predicting a new result

```
[ ] classifier.predict(sc.transform([[30, 87000]]))
```

```
array([0])
```

Making the Confusion Matrix

```
[ ] from sklearn.metrics import confusion_matrix, accuracy_score
    cm = confusion_matrix(y_test,y_pred)
    print(cm) # Gives us the confusion matrix
    accuracy_score(y_test, y_pred) # Rate of correct prediction
```

```
[[65  3]
 [ 8 24]]
0.89
```

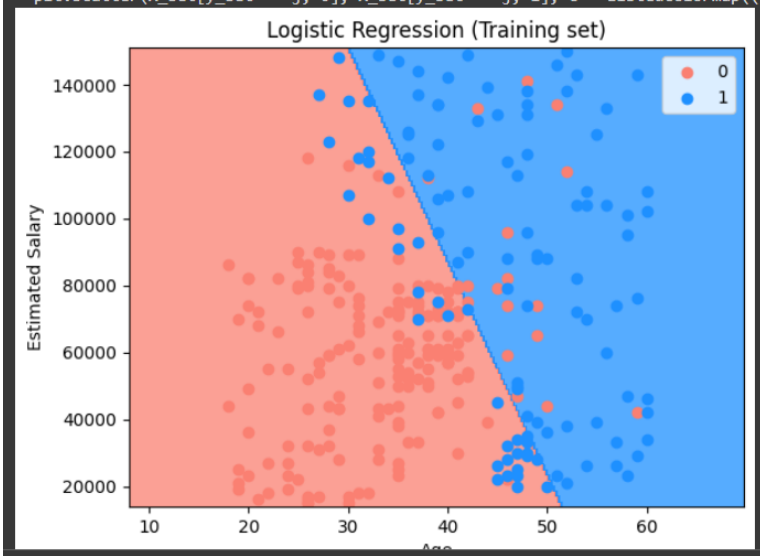
+ Code + Text

Visualising the Training set results

```
[ ] # By this entire code we can see that the curve here is a straight line since logistic regression is a linear classifier
    # We can also see that the demarkation has been made by the color scope showing the results
    from matplotlib.colors import ListedColormap
    X_set, y_set = sc.inverse_transform(X_train), y_train
    X1, X2 = np.meshgrid(np.arange(start = X_set[:, 0].min() - 10, stop = X_set[:, 0].max() + 10, step = 0.25),
                         np.arange(start = X_set[:, 1].min() - 1000, stop = X_set[:, 1].max() + 1000, step = 0.25))
    plt.contourf(X1, X2, classifier.predict(sc.transform(np.array([X1.ravel(), X2.ravel()]).T)).reshape(X1.shape),
                 alpha = 0.75, cmap = ListedColormap(('salmon', 'dodgerblue')))
    plt.xlim(X1.min(), X1.max())
    plt.ylim(X2.min(), X2.max())
```

```
for i, j in enumerate(np.unique(y_set)):
    plt.scatter(X_set[y_set == j, 0], X_set[y_set == j, 1], c = ListedColormap(('salmon', 'dodgerblue'))(i), label = j)
plt.title('Logistic Regression (Training set)')
plt.xlabel('Age')
plt.ylabel('Estimated Salary')
plt.legend()
plt.show()
```

```
<ipython-input-9-498cf0fd9ad8>:10: UserWarning: *c* argument looks like a single numeric RGB or RGBA sequence, which should b
  plt.scatter(X_set[y_set == j, 0], X_set[y_set == j, 1], c = ListedColormap(('salmon', 'dodgerblue'))(i), label = j)
```



Connected to Python 3 Google Compute Engine backend (GPU)

```
from matplotlib.colors import ListedColormap
X_set, y_set = sc.inverse_transform(X_test), y_test
X1, X2 = np.meshgrid(np.arange(start = X_set[:, 0].min() - 10, stop = X_set[:, 0].max() + 10, step = 0.25),
                     np.arange(start = X_set[:, 1].min() - 1000, stop = X_set[:, 1].max() + 1000, step = 0.25))
plt.contourf(X1, X2, classifier.predict(sc.transform(np.array([X1.ravel(), X2.ravel()]).T)).reshape(X1.shape),
             alpha = 0.75, cmap = ListedColormap(('salmon', 'dodgerblue')))
plt.xlim(X1.min(), X1.max())
plt.ylim(X2.min(), X2.max())
for i, j in enumerate(np.unique(y_set)):
    plt.scatter(X_set[y_set == j, 0], X_set[y_set == j, 1], c = ListedColormap(('salmon', 'dodgerblue'))(i), label = j)
plt.title('Logistic Regression (Test set)')
plt.xlabel('Age')
plt.ylabel('Estimated Salary')
plt.legend()
plt.show()
```

```
<ipython-input-10-96b67a383660>:10: UserWarning: *c* argument looks like a single numeric RGB or RGBA sequence, which should be avoided as value-map
  plt.scatter(X_set[y_set == j, 0], X_set[y_set == j, 1], c = ListedColormap(('salmon', 'dodgerblue'))(i), label = j)
```