Loading Datasets

```
from Logistic_Regression.models.utils import loadData

x, y = loadData()

x.head()
```

```
   3.8915  4.2105
0  3.6898  6.6051
1  2.7763  7.5057
2  3.1137  5.7724
3  2.9251  5.4315
4  3.6699  6.4406
```

```
y.head()
```

```
   0
0  0
1  0
2  0
3  0
4  0
```

Normalisation

```
from Logistic_Regression.models.utils import MinMaxScaler

scaler = MinMaxScaler()
xNorm = scaler.fitTransform(x)
yNorm = scaler.fitTransform(y)

xNorm.head()
```

```
     3.8915    4.2105
0  0.322538  0.849108
1  0.191576  1.000000
2  0.239947  0.709592
3  0.212908  0.652475
4  0.319685  0.821546
```

```
yNorm.head()
```

```
     0
0  0.0
1  0.0
2  0.0
```

```
3  0.0
4  0.0
```

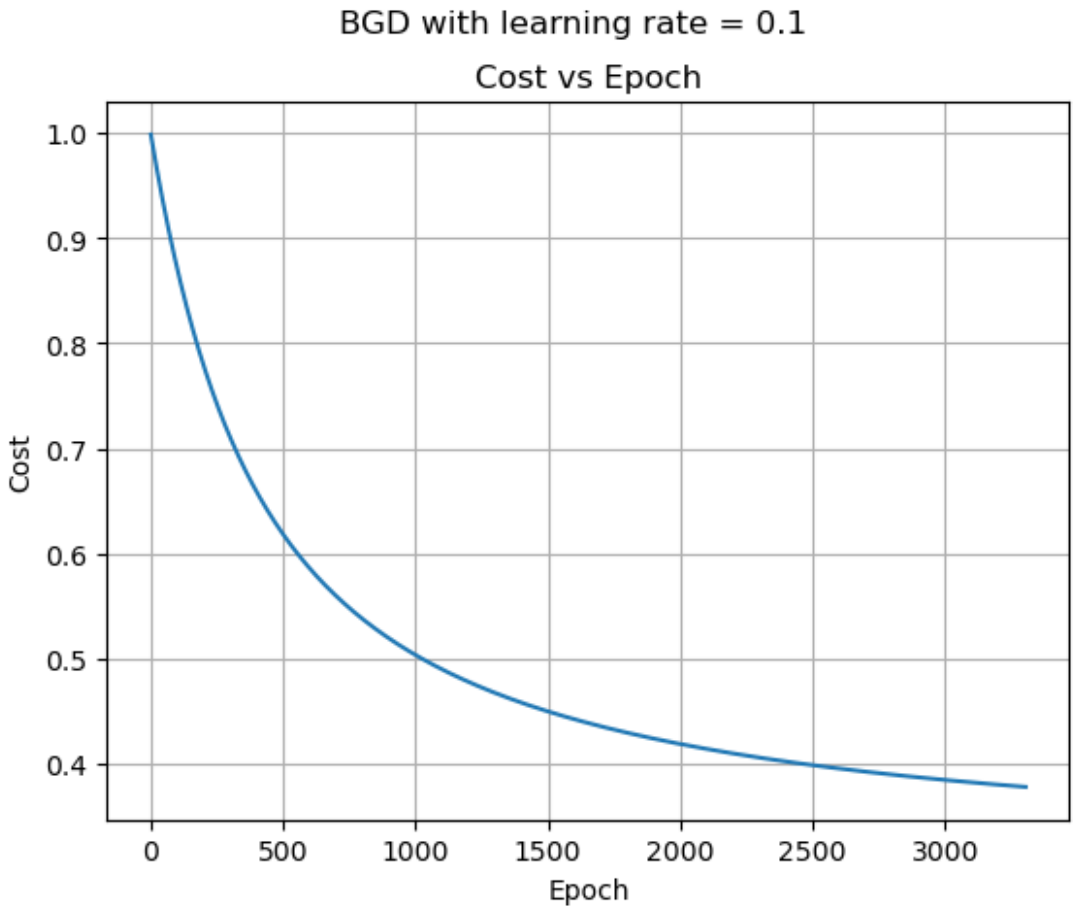
BGD until convergence with learning rate = 0.1

```
from Logistic_Regression.models.utils import LogisticRegression
import numpy as np

model = LogisticRegression()
lr = 0.1
finCost = model.fit(xNorm, yNorm, epochs=5000, learning_rate=lr)
eg = np.array([[xNorm.mean().iloc[0], yNorm.mean().iloc[0]]])
yHat = model.predict(eg)
print(f"Prediction for input ({eg}) =", yHat[0][0])
print(f"Final cost = {finCost}")
print(f"Parameters:\tw = {model.w}, b = {model.b}")
```

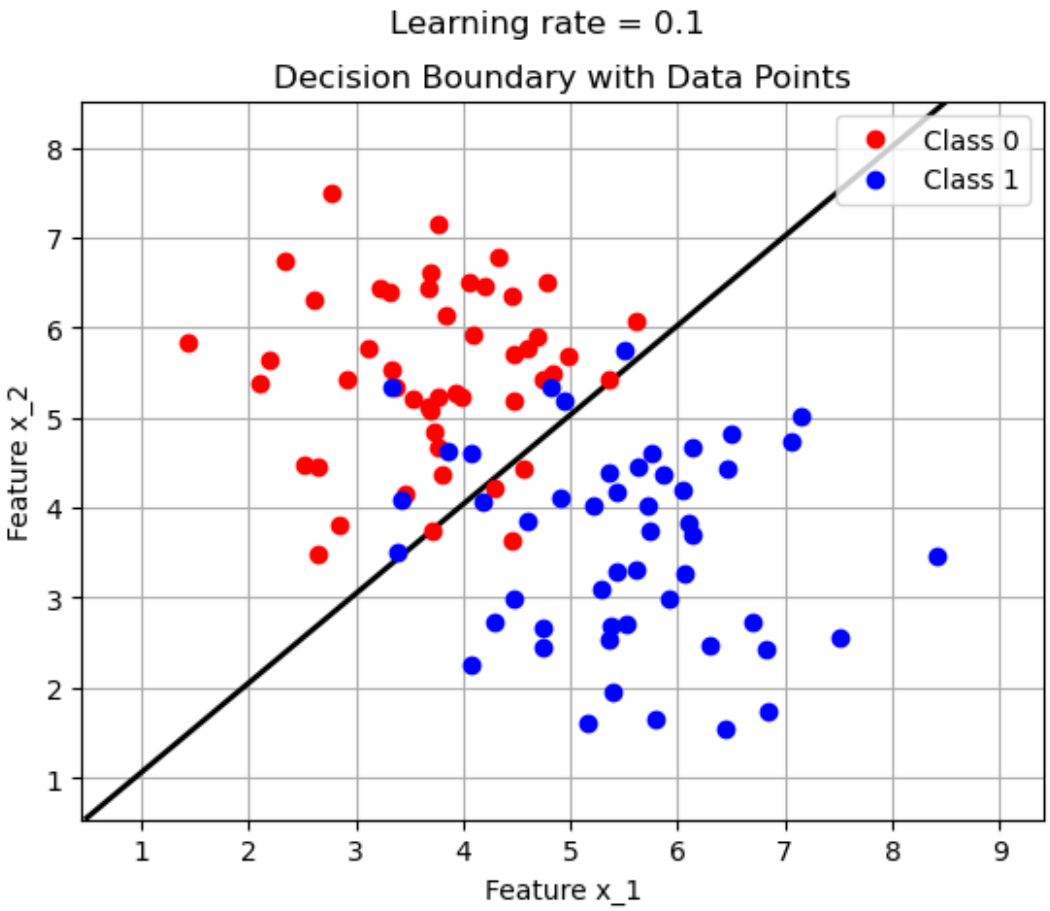
```
Prediction for input ([[0.45676353 0.50505051]]) = 1
Final cost = 0.37787475909925594
Parameters:     w = [[ 6.91479057]
 [-6.96696498]], b = 0.4863303181144615
```

```
model.plotCost(f"BGD with learning rate = {lr}")
```



Decision Boundary

```
model.decisionBoundary(x, y, subtitle=f"Learning rate = {0.1}")
```



Confusion Matrix

```
yHat = model.predict(x)
cm = model.confusionMatrix(y, yHat)
print("Confusion Matrix:")
print(cm)
```

```
Confusion Matrix:
[[42  4]
 [ 8 45]]
```

Classification Report

```
accuracy, precision, recall, f1Score = model.classificationReport(y,
yHat)
print("Classification Report:")
print(f"Accuracy = {accuracy}")
print(f"Precision = {precision}")
```

```
print(f"Recall = {recall}")
print(f"F1-Score = {f1Score}")
```

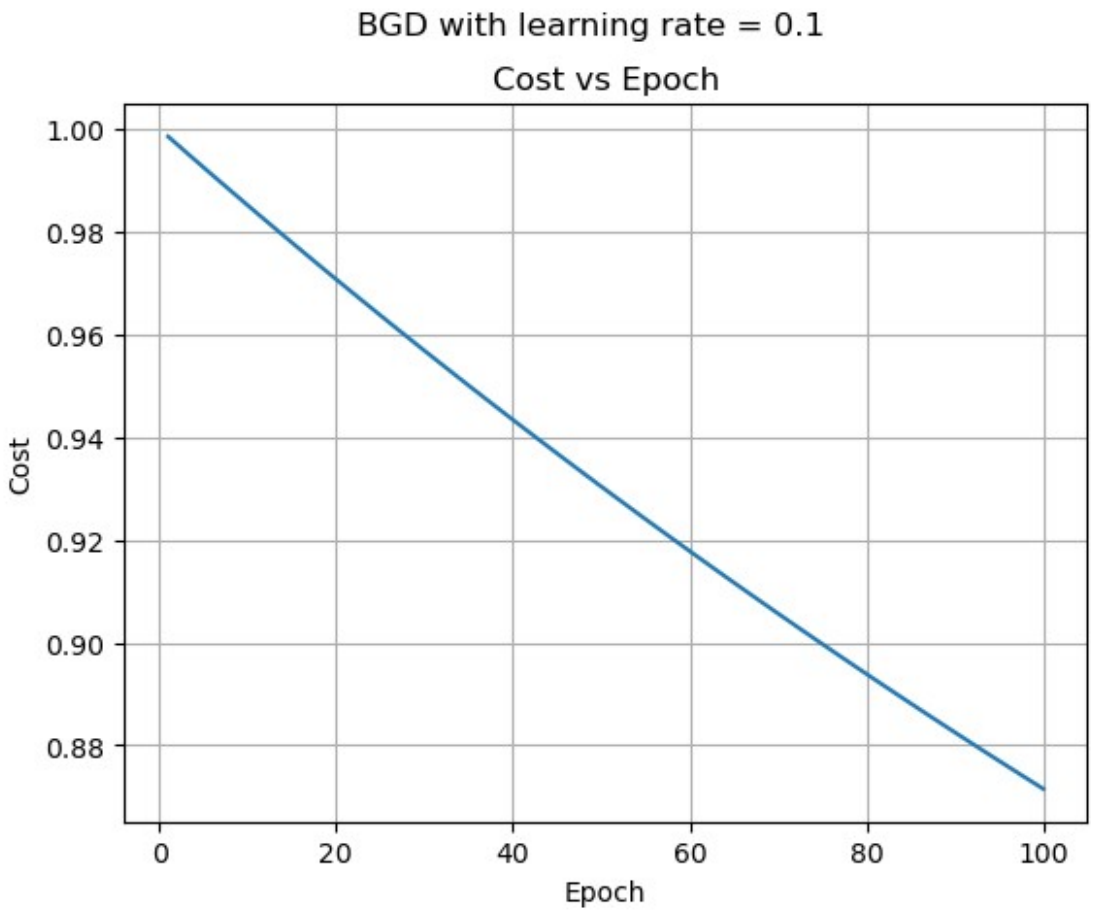
```
Classification Report:
Accuracy = 0.46464646464646464
Precision = 0.84
Recall = 0.4827586206896552
F1-Score = 0.6131386861313869
```

BGD up to 100 epochs with learning rate = 0.1

```
from Logistic_Regression.models.utils import LogisticRegression

lr = 0.1
model = LogisticRegression()
model.fit(xNorm, yNorm, epochs=100, learning_rate=lr)
yHat = model.predict(eg)
costs1 = model.costs
print(f"Prediction for input ({eg}) =", yHat[0][0])
model.plotCost(f"BGD with learning rate = {lr}")
```

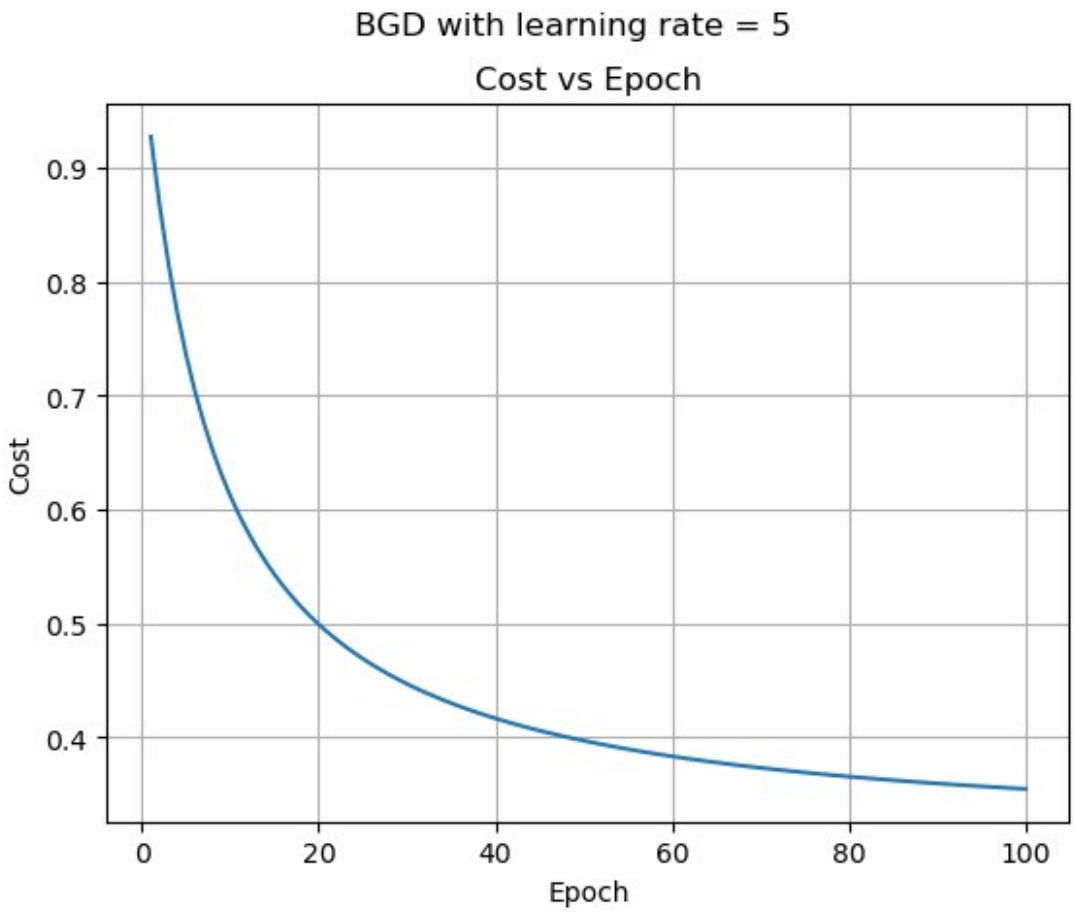
```
Prediction for input ([[0.45676353 0.50505051]]) = 0
```




```
from Logistic_Regression.models.utils import LogisticRegression

lr = 5
model = LogisticRegression()
model.fit(xNorm, yNorm, epochs=100, learning_rate=lr)
yHat = model.predict(eg)
costs2 = model.costs
print(f"Prediction for input ({eg}) =", yHat[0][0])
model.plotCost(f"BGD with learning rate = {lr}")
```

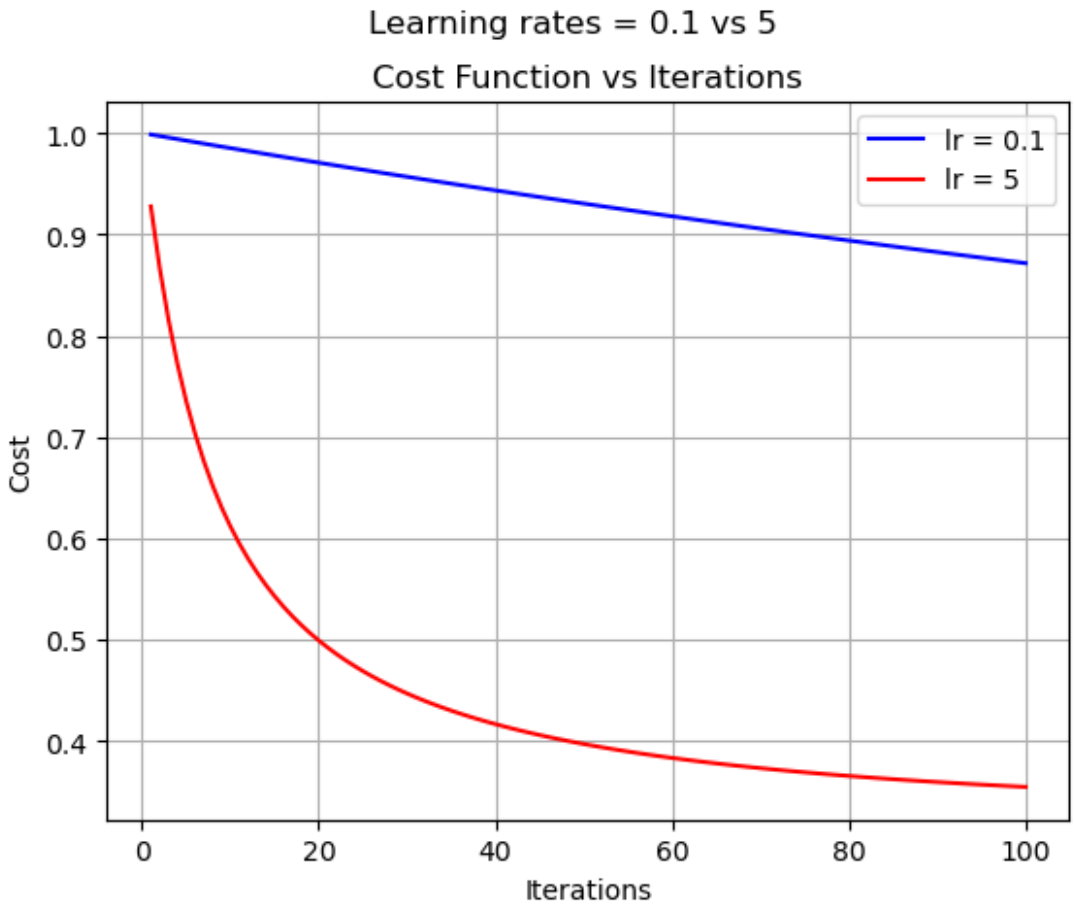
```
Prediction for input ([[0.45676353 0.50505051]]) = 1
```



Comparison

```
from Logistic_Regression.models.utils import compareCosts

compareCosts(costs1, costs2, epochs=100, subtitle=f"Learning rates =
0.1 vs 5")
```


Learning rates = 0.1 vs 5
Cost Function vs Iterations
lr = 0.1
lr = 5
Cost
Iterations
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0
20
40
60
80
100