

```
In [1]: import numpy as np
import pandas as pd
import os
import matplotlib.pyplot as plt
import torch
import torch.optim as optim
import time
import csv
from torch import nn as nn
from torch.nn.functional import normalize
from PIL import Image
from torchvision import datasets
from torchvision import transforms
from torch.utils.data import Dataset
import torch.utils.data.dataloader as dataloader
import torch.nn.functional as F
from sklearn.preprocessing import MinMaxScaler, StandardScaler
from sklearn.model_selection import train_test_split
from skimage import io
from sklearn.naive_bayes import GaussianNB
from sklearn import metrics
```

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In [2]: data_path = pd.DataFrame(pd.read_csv('dataset_csv_file.csv'))
data_path.head()
```

```
Out[2]:
```

	Btop	Bjungle	Bmid	Bbot	Bsupport	Rtop	Rjungle	Rmid	Rbot	Rsupport	Bwin
0	95	79	31	46	85	16	82	17	27	3	1
1	118	79	65	15	100	40	37	17	47	66	0
2	68	82	115	27	3	112	63	65	100	85	0
3	78	103	83	48	77	95	37	17	98	74	0
4	29	81	40	46	50	93	25	58	47	74	0

```
In [3]: data = data_path[["Btop", 'Bjungle', 'Bmid', 'Bbot', 'Bsupport', 'Rtop', 'Rjungle',
'Rmid', 'Rbot', 'Rsupport']]
target = data_path['Bwin']
#data.shape, target.shape, print(data), print(target)
```

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In [4]: data_path_n = MinMaxScaler().fit_transform(data_path)
X = data_path_n[:,0:10]
y = data_path_n[:,10]
#data.shape, target.shape, print(X), print(y)
```

```
In [5]: x_train, x_test, y_train, y_test = train_test_split(X,y, train_size = 0.8, test_size = 0.2, random_state=42)

sc = StandardScaler()

x_train_sc = sc.fit_transform(x_train)
x_test_sc = sc.transform(x_test)

Y_train = np.array(y_train)
Y_test = np.array(y_test)

x_train_sc.shape, x_test_sc.shape, y_train.shape, y_test.shape
```

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Out[5]: ((3222, 10), (806, 10), (3222,), (806,))
```

```
In [6]: from collections import Counter
Counter(y_train), Counter(y_test)
```

```
Out[6]: (Counter({0.0: 2481, 1.0: 741}), Counter({0.0: 622, 1.0: 184}))
```

```
In [7]: X_train = torch.from_numpy(x_train_sc.astype(np.float32))
X_test = torch.from_numpy(x_test_sc.astype(np.float32))
Y_train = torch.from_numpy(Y_train.astype(np.float32))
Y_test = torch.from_numpy(Y_test.astype(np.float32))
```

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In [8]: Y_train = Y_train.view(Y_train.shape[0],1)
        Y_test = Y_train.view(Y_train.shape[0],1)
```

```
In [9]: n_samples, n_features = X.shape

class LogisticRegression(nn.Module):

    def __init__(self, n_input_features):
        super(LogisticRegression, self).__init__()
        self.linear = nn.Linear(n_input_features,1)

    def forward(self, x):
        y_predicted = torch.sigmoid(self.linear(x))
        return y_predicted

model = LogisticRegression(n_features)

learning_rate = 1e-3

loss_fn = nn.BCELoss()

optimizer = torch.optim.SGD(model.parameters(), lr= learning_rate)
```

```
In [10]: n_epochs = 3000

t1 = time.process_time()
for epoch in range(1, n_epochs + 1):

    y_predicted = model(X_train)
    loss = loss_fn(y_predicted, Y_train)

    loss.backward()
    optimizer.step()
    optimizer.zero_grad()

    print(f"Epoch: %d, Loss: %f" % (epoch,float(loss)))

with torch.no_grad():
    y_predicted = model(X_test)
    y_predicted_cls = y_predicted.round()
    acc = y_predicted_cls.eq(Y_test).sum() / float(Y_test.shape[0])
    print(f'accuracy = {acc:.4f}')
t2 = time.process_time()
print(f'Time: {t2-t1} seconds')
```

Epoch: 1, Loss: 0.784202  
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Epoch: 2991, Loss: 0.599067  
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Epoch: 2993, Loss: 0.599012  
Epoch: 2994, Loss: 0.598985  
Epoch: 2995, Loss: 0.598957  
Epoch: 2996, Loss: 0.598930  
Epoch: 2997, Loss: 0.598902  
Epoch: 2998, Loss: 0.598875  
Epoch: 2999, Loss: 0.598848  
Epoch: 3000, Loss: 0.598820

```
accuracy = 0.7638
Time: 0.859375 seconds
```

```
In [11]: from sklearn.linear_model import LogisticRegression

#C = [.1, 1e-2, 1e-3, 1e-4]

#for c in C:

model_log = LogisticRegression(penalty='l2',C=1e-3,solver='liblinear',class_weight='balanced')
model_log.fit(x_train_sc, y_train)
expected = y_test
predicted = model_log.predict(x_test_sc)
probability = model_log.predict_proba(x_test_sc)[:,:1]

trainAcc = model_log.score(x_train_sc, y_train)
valAcc = model_log.score(x_test_sc, y_test)

print('Training Accuracy:',trainAcc)
print('Validation Accuracy:',valAcc)
```

```
Training Accuracy: 0.5189323401613904
Validation Accuracy: 0.5310173697270472
```

```
In [12]: print(metrics.classification_report(expected, predicted, digits=4))
print(metrics.confusion_matrix(expected, predicted))
```

	precision	recall	f1-score	support
0.0	0.7877	0.5370	0.6386	622
1.0	0.2461	0.5109	0.3322	184
accuracy			0.5310	806
macro avg	0.5169	0.5239	0.4854	806
weighted avg	0.6641	0.5310	0.5687	806

```
[[334 288]
 [ 90 94]]
```

```
In [13]: model_nb = GaussianNB()
model_nb.fit(x_train_sc, y_train)
expected_nb = y_test
predicted_nb = model_nb.predict(x_test_sc)
probability_nb = model_nb.predict_proba(x_test_sc)
```

```
In [14]: print(metrics.classification_report(expected_nb, predicted_nb, digits=3))
print(metrics.confusion_matrix(expected_nb, predicted_nb))
```

	precision	recall	f1-score	support
0.0	0.772	1.000	0.871	622
1.0	0.000	0.000	0.000	184
accuracy			0.772	806
macro avg	0.386	0.500	0.436	806
weighted avg	0.596	0.772	0.672	806

```
[[622  0]
 [184  0]]
```

```
C:\Users\Cato\anaconda3\lib\site-packages\sklearn\metrics\_classification.py:1318: UndefinedMetricWarning: Precision and F-score are ill-defined and being set to 0.0 in labels with no predicted samples. Use `zero_division` parameter to control this behavior.
  _warn_prf(average, modifier, msg_start, len(result))
C:\Users\Cato\anaconda3\lib\site-packages\sklearn\metrics\_classification.py:1318: UndefinedMetricWarning: Precision and F-score are ill-defined and being set to 0.0 in labels with no predicted samples. Use `zero_division` parameter to control this behavior.
  _warn_prf(average, modifier, msg_start, len(result))
C:\Users\Cato\anaconda3\lib\site-packages\sklearn\metrics\_classification.py:1318: UndefinedMetricWarning: Precision and F-score are ill-defined and being set to 0.0 in labels with no predicted samples. Use `zero_division` parameter to control this behavior.
  _warn_prf(average, modifier, msg_start, len(result))
```

```
In [ ]:
```