COMP-SCI-5567-0001

Deep Learning

Project - 1

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Configuration-1

```
scaler = StandardScaler()
X = scaler.fit_transform(X)

# Split the dataset into training and testing sets
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, random_state=42)
y_train = y_train.to_numpy().reshape(-1,1)
y_test = y_test.to_numpy().reshape(-1,1)

epocs = 500
learn_rate = .003
batch_size = 40
val_split = .5
verbose = 0

layer_structure = [X_train.shape[1],30,2,6,1]
nn = Neural(layer_structure, epocs, learn_rate, batch_size, val_split, verbose)

nn.fit(X_train, y_train)

y_pred = nn.predict(X_test)
nn.plot_learning()

print("Test error: ",mean_squared_error(y_test, y_pred))
```

Results of Configuration - 1

Test Error for Test - 1 0.030313052
Test Error for Test - 2 0.029107338
Test Error for Test - 3 0.028802645
Test Error for Test - 4 0.03425655
Test Error for Test - 5 0.027622081

Configuration-2

```
scaler = StandardScaler()
X = scaler.fit_transform(X)

# Split the dataset into training and testing sets
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, random_state=42)
y_train = y_train.to_numpy().reshape(-1,1)
y_test = y_test.to_numpy().reshape(-1,1)

epocs = 1000
```

```
learn_rate = .001
batch_size = 30
val_split = .4
verbose = 0

layer_structure = [X_train.shape[1],9,3,1]
nn = Neural(layer_structure, epocs, learn_rate, batch_size, val_split, verbose)

nn.fit(X_train, y_train)

y_pred = nn.predict(X_test)
nn.plot_learning()

print("Test error: ",mean_squared_error(y_test, y_pred))
```

Results of Configuration - 2

Test Error for Test - 1 0.026284702
Test Error for Test - 2 0.026840834
Test Error for Test - 3 0.028352876
Test Error for Test - 4 0.025028803
Test Error for Test - 5 0.0313276

Configuration-3

```
scaler = StandardScaler()
X = scaler.fit_transform(X)

# Split the dataset into training and testing sets
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, random_state=42)
y_train = y_train.to_numpy().reshape(-1,1)
y_test = y_test.to_numpy().reshape(-1,1)

epocs = 1000
learn_rate = .003
batch_size = 20
val_split = .4
verbose = 0

layer_structure = [X_train.shape[1],6,4,1]
nn = Neural(layer_structure, epocs, learn_rate, batch_size, val_split, verbose)

nn.fit(X_train, y_train)

y_pred = nn.predict(X_test)
```

```
nn.plot_learning()

print("Test error: ",mean_squared_error(y_test, y_pred))
```

Results of Configuration - 3

Test Error for Test - 1	0.028867211
Test Error for Test - 2	0.029875016
Test Error for Test - 3	0.028241076
Test Error for Test - 4	0.030096415
Test Error for Test - 5	0.028458904

Configuration-4

```
scaler = StandardScaler()
X = scaler.fit_transform(X)

# Split the dataset into training and testing sets
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, random_state=42)
y_train = y_train.to_numpy().reshape(-1,1)
y_test = y_test.to_numpy().reshape(-1,1)

epocs = 1000
learn_rate = .003
batch_size = 50
val_split = .2
verbose = 0

layer_structure = [X_train.shape[1],6,2,1]
nn = Neural(layer_structure, epocs, learn_rate, batch_size, val_split, verbose)

nn.fit(X_train, y_train)

y_pred = nn.predict(X_test)
nn.plot_learning()

print("Test error: ",mean_squared_error(y_test, y_pred))
```

Results of Configuration - 4

Test Error for Test - 1	0.045263516
Test Error for Test - 2	0.043423595
Test Error for Test - 3	0.056743944
Test Error for Test - 4	0.043987975
Test Error for Test - 5	0.043976544

Configuration-5

```
scaler = StandardScaler()
X = scaler.fit_transform(X)

# Split the dataset into training and testing sets
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, random_state=42)
y_train = y_train.to_numpy().reshape(-1,1)
y_test = y_test.to_numpy().reshape(-1,1)

epocs = 1500
learn_rate = .0003
batch_size = 50
val_split = .1
verbose = 0

layer_structure = [X_train.shape[1],6,2,1]
nn = Neural(layer_structure, epocs, learn_rate, batch_size, val_split, verbose)

nn.fit(X_train, y_train)

y_pred = nn.predict(X_test)
nn.plot_learning()

print("Test error: ",mean_squared_error(y_test, y_pred))
```

Results of Configuration - 5

Test Error for Test - 1 0.042394308
Test Error for Test - 2 0.046431478
Test Error for Test - 3 0.046328309
Test Error for Test - 4 0.045266905
Test Error for Test - 5 0.04107111

Configuration-6

```
scaler = StandardScaler()
X = scaler.fit_transform(X)

# Split the dataset into training and testing sets
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, random_state=42)
y_train = y_train.to_numpy().reshape(-1,1)
y_test = y_test.to_numpy().reshape(-1,1)

epocs = 2000
```

```
learn_rate = .0003
batch_size = 40
val_split = .5
verbose = 0

layer_structure = [X_train.shape[1],10,3,1]
nn = Neural(layer_structure, epocs, learn_rate, batch_size, val_split, verbose)

nn.fit(X_train, y_train)

y_pred = nn.predict(X_test)
nn.plot_learning()

print("Test error: ",mean_squared_error(y_test, y_pred))
```

Results of Configuration - 6

Test Error for Test - 1	0.049921908
Test Error for Test - 2	0.039095608
Test Error for Test - 3	0.047024966
Test Error for Test - 4	0.046573867
Test Error for Test - 5	0.042633103

Configuration-7

```
scaler = StandardScaler()
X = scaler.fit_transform(X)

# Split the dataset into training and testing sets
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, random_state=42)
y_train = y_train.to_numpy().reshape(-1,1)
y_test = y_test.to_numpy().reshape(-1,1)

epocs = 5000
learn_rate = .001
batch_size = 20
val_split = .1
verbose = 0

layer_structure = [X_train.shape[1],2,2,1]
nn = Neural(layer_structure, epocs, learn_rate, batch_size, val_split, verbose)

nn.fit(X_train, y_train)

y_pred = nn.predict(X_test)
```

```
nn.plot_learning()

print("Test error: ",mean_squared_error(y_test, y_pred))
```

Results of Configuration - 7

Test Error for Test - 1 0.048515116
Test Error for Test - 2 0.044015993
Test Error for Test - 3 0.033406487
Test Error for Test - 4 0.047065779
Test Error for Test - 5 0.046430936

Configuration-8

```
scaler = StandardScaler()
X = scaler.fit_transform(X)

# Split the dataset into training and testing sets
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, random_state=42)
y_train = y_train.to_numpy().reshape(-1,1)
y_test = y_test.to_numpy().reshape(-1,1)

epocs = 8000
learn_rate = .0001
batch_size = 25
val_split = .3
verbose = 0

layer_structure = [X_train.shape[1],2,4,1]
nn = Neural(layer_structure, epocs, learn_rate, batch_size, val_split, verbose)

nn.fit(X_train, y_train)

y_pred = nn.predict(X_test)
nn.plot_learning()

print("Test error: ",mean_squared_error(y_test, y_pred))
```

Results of Configuration - 8

Test Error for Test - 1 0.044451121
Test Error for Test - 2 0.03539089
Test Error for Test - 3 0.028140763
Test Error for Test - 4 0.031009822
Test Error for Test - 5 0.030359856

Configuration-9

```
scaler = StandardScaler()
X = scaler.fit_transform(X)

# Split the dataset into training and testing sets
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, random_state=42)
y_train = y_train.to_numpy().reshape(-1,1)
y_test = y_test.to_numpy().reshape(-1,1)
epocs = 9000
learn_rate = .0003
batch_size = 30
val_split = .4
verbose = 0

layer_structure = [X_train.shape[1],2,2,1]
nn = Neural(layer_structure, epocs, learn_rate, batch_size, val_split, verbose)

nn.fit(X_train, y_train)

y_pred = nn.predict(X_test)
nn.plot_learning()

print("Test error: ",mean_squared_error(y_test, y_pred))
```

Results of Configuration - 9

Test Error for Test - 1 0.02400255
Test Error for Test - 2 0.024542174
Test Error for Test - 3 0.049062882
Test Error for Test - 4 0.04058731
Test Error for Test - 5 0.022649393

Configuration-10

```
scaler = StandardScaler()
X = scaler.fit_transform(X)

# Split the dataset into training and testing sets
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, random_state=42)
y_train = y_train.to_numpy().reshape(-1,1)
y_test = y_test.to_numpy().reshape(-1,1)

epocs = 10000
learn_rate = .0003
batch_size = 30
```

```
val_split = .3
verbose = 0

layer_structure = [X_train.shape[1],3,2,1]
nn = Neural(layer_structure, epocs, learn_rate, batch_size, val_split, verbose)

nn.fit(X_train, y_train)

y_pred = nn.predict(X_test)
nn.plot_learning()

print("Test error: ",mean_squared_error(y_test, y_pred))
```

Results of Configuration - 10

Test Error for Test - 1	0.036170436
Test Error for Test - 2	0.038100054
Test Error for Test - 3	0.035827104
Test Error for Test - 4	0.034998694
Test Error for Test - 5	0.035599409

Video Link

https://d2y36twrtb17ty.cloudfront.net/sessions/ec1b2822-2976-4c2e-9d92-b13200388292/eaf2f39c-6e2c-49c3-a66f-b1320038829b-4be0de27-befa-4bac-bab6-b132015a534d.mp4?invocationId=a6837ee4-80e1-ee11-8291-12c206d2fd2b