general_architecture_put

March 20, 2025

[133]:
```python
import matplotlib.pyplot as plt
import numpy as np
import pandas as pd
import tensorflow as tf
from sklearn.model_selection import train_test_split
from sklearn.preprocessing import StandardScaler
from keras.models import Sequential
from keras.layers import Dense, LeakyReLU
from keras.optimizers import Adam
```

[134]:
```python
df = pd.read_csv('nvda_options_data.csv')
df = df.dropna()
```

[135]:
```python
X = df[['strike', 'IV','Stock_Price', 'Time_to_Expire','Risk_Free_Rate']]
y = df[['PutPrice']]
X.head()
```

[135]:
```
   strike        IV  Stock_Price  Time_to_Expire  Risk_Free_Rate
0     5.0  0.566315   117.889999        1.820671          0.0422
1    10.0  0.566315   117.889999        1.820671          0.0422
2    15.0  0.566315   117.889999        1.820671          0.0422
3    20.0  0.566315   117.889999        1.820671          0.0422
4    25.0  0.566315   117.889999        1.820671          0.0422
```

[136]:
```python
X.head()
```

[136]:
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```

[137]:
```python
print(f"X shape: {X.shape}, Y shape: {y.shape}")
```

```
X shape: (50, 5), Y shape: (50, 1)
```

[138]:
```python
X = StandardScaler().fit_transform(X)
```

[139]:
```
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2,␣
 ↪random_state=500)
```

[140]:
```
X_train, y_train = tf.convert_to_tensor(X_train, dtype=tf.float32), tf.
 ↪convert_to_tensor(y_train, dtype=tf.float32)
X_test, y_test = tf.convert_to_tensor(X_test, dtype=tf.float32), tf.
 ↪convert_to_tensor(y_test, dtype=tf.float32)
```

[141]:
```
# Hyperparams
n_units = X_train.shape[1]
n1_units = 400
layers = 4
```

[142]:
```
model = Sequential()
model.add(Dense(n_units, input_dim=X_train.shape[1]))
model.add(LeakyReLU())
for _ in range(layers - 1):
    model.add(Dense(n1_units))
    model.add(LeakyReLU())

model.add(Dense(1, activation='relu'))
```

```
/Users/aadityatrivedee/tf_lib/env/lib/python3.10/site-
packages/keras/src/layers/core/dense.py:87: UserWarning: Do not pass an
`input_shape`/`input_dim` argument to a layer. When using Sequential models,
prefer using an `Input(shape)` object as the first layer in the model instead.
  super().__init__(activity_regularizer=activity_regularizer, **kwargs)
```

[143]:
```
model.summary()
```

```
Model: "sequential_6"


 Layer (type)                       Output Shape                 Param #

 dense_30 (Dense)                   (None, 5)                         30

 leaky_re_lu_24 (LeakyReLU)         (None, 5)                          0

 dense_31 (Dense)                   (None, 400)                    2,400

 leaky_re_lu_25 (LeakyReLU)         (None, 400)                        0

 dense_32 (Dense)                   (None, 400)                  160,400

 leaky_re_lu_26 (LeakyReLU)         (None, 400)                        0

 dense_33 (Dense)                   (None, 400)                  160,400
 leaky_re_lu_27 (LeakyReLU)        (None, 400)                        0

 dense_34 (Dense)                  (None, 1)                        401


Total params: 323,631 (1.23 MB)

Trainable params: 323,631 (1.23 MB)

Non-trainable params: 0 (0.00 B)
```

[144]:

```
model.compile(loss='mae', optimizer=Adam(learning_rate=0.001))
```

[145]:

```
batch_size = 32
losses = model.fit(X_train, y_train, validation_data=(X_test,␣
 ↪y_test),batch_size=batch_size, epochs=30, verbose=1)
```

```
Epoch 1/30
2/2               1s 137ms/step - loss:
46.0341 - val_loss: 61.2771
Epoch 2/30
2/2               0s 34ms/step - loss:
47.5572 - val_loss: 60.7713
Epoch 3/30
2/2               0s 32ms/step - loss:
47.1658 - val_loss: 60.0471
Epoch 4/30
2/2               0s 32ms/step - loss:
43.9392 - val_loss: 58.9328
Epoch 5/30
2/2               0s 32ms/step - loss:
44.2940 - val_loss: 57.2146
Epoch 6/30
2/2               0s 33ms/step - loss:
43.0434 - val_loss: 54.6109
Epoch 7/30
2/2               0s 32ms/step - loss:
41.8758 - val_loss: 50.8762
Epoch 8/30
2/2               0s 33ms/step - loss:
37.7716 - val_loss: 45.7587
Epoch 9/30
2/2               0s 32ms/step - loss:
35.5667 - val_loss: 38.8922
Epoch 10/30
```

```
2/2             0s 32ms/step - loss:
27.9982 - val_loss: 29.9896
Epoch 11/30
2/2             0s 33ms/step - loss:
24.7762 - val_loss: 18.8069
Epoch 12/30
2/2             0s 32ms/step - loss:
15.7983 - val_loss: 6.3493
Epoch 13/30
2/2             0s 32ms/step - loss:
5.2885 - val_loss: 13.1119
Epoch 14/30
2/2             0s 32ms/step - loss:
7.3536 - val_loss: 18.2413
Epoch 15/30
2/2             0s 32ms/step - loss:
11.1955 - val_loss: 15.3761
Epoch 16/30
2/2             0s 32ms/step - loss:
7.9059 - val_loss: 8.8517
Epoch 17/30
2/2             0s 32ms/step - loss:
4.1013 - val_loss: 4.1007
Epoch 18/30
2/2             0s 32ms/step - loss:
3.7215 - val_loss: 6.4939
Epoch 19/30
2/2             0s 32ms/step - loss:
5.2956 - val_loss: 5.1956
Epoch 20/30
2/2             0s 32ms/step - loss:
3.7316 - val_loss: 4.7095
Epoch 21/30
2/2             0s 33ms/step - loss:
2.8011 - val_loss: 7.0343
Epoch 22/30
2/2             0s 32ms/step - loss:
3.6049 - val_loss: 5.7920
Epoch 23/30
2/2             0s 33ms/step - loss:
2.7741 - val_loss: 4.2422
Epoch 24/30
2/2             0s 32ms/step - loss:
2.1391 - val_loss: 3.5260
Epoch 25/30
2/2             0s 32ms/step - loss:
2.4255 - val_loss: 3.7460
Epoch 26/30
```

```
2/2              0s 33ms/step - loss:
2.0360 - val_loss: 4.4839
Epoch 27/30
2/2              0s 32ms/step - loss:
2.0376 - val_loss: 4.6473
Epoch 28/30
2/2              0s 33ms/step - loss:
2.1979 - val_loss: 4.2922
Epoch 29/30
2/2              0s 33ms/step - loss:
1.9899 - val_loss: 4.2590
Epoch 30/30
2/2              0s 33ms/step - loss:
1.9149 - val_loss: 4.2730
```

[146]:

```
model.evaluate(X_test[:3], y_test[:3],batch_size=batch_size)
```

```
1/1              0s 43ms/step - loss:
8.7053
```

[146]:

```
8.70527172088623
```

[147]:

```
model.predict(pd.DataFrame(X_test).iloc[0:3])
```

```
1/1              0s 43ms/step
```

[147]:

```
array([[ 77.50868 ],
       [ 26.495623],
       [126.072754]], dtype=float32)
```

[148]:

```
pd.DataFrame(y_test).iloc[0:3]
```

[148]:

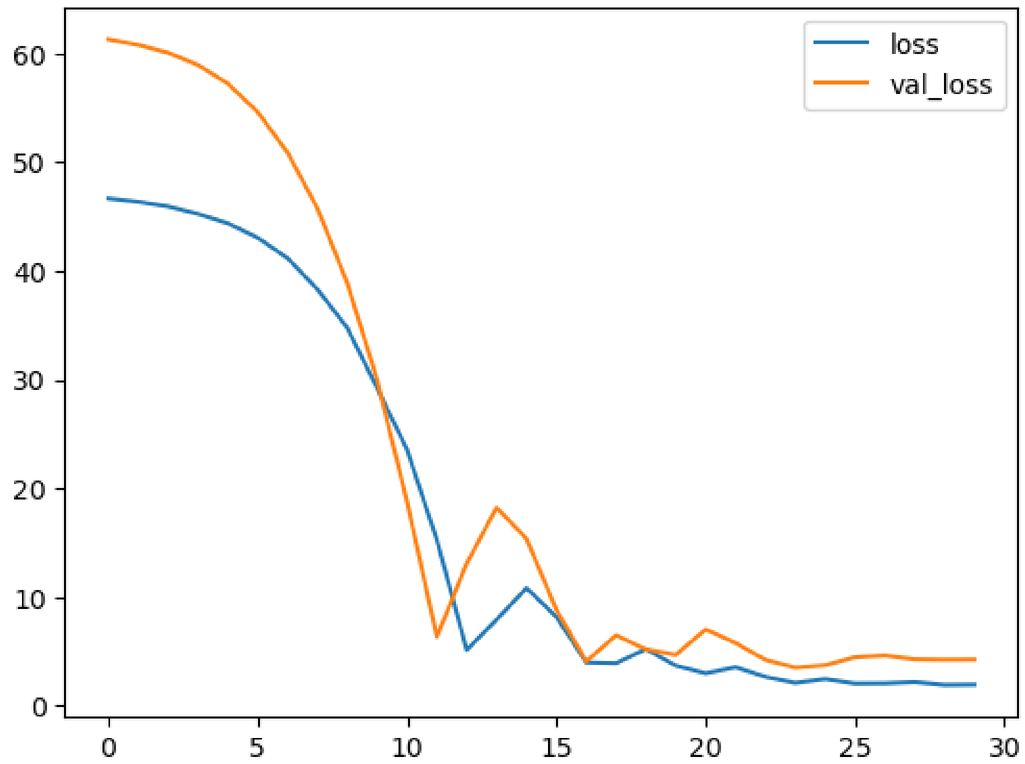
```
            0
0   61.310001
1   30.900000
2  120.559998
```

[149]:

```
loss_df = pd.DataFrame(losses.history)
loss_df.loc[:,['loss','val_loss']].plot()
```

[149]:

```
<Axes: >
```



[150]:
```
def error(x,y):
    error = np.sum(np.abs(model.predict(pd.DataFrame(x)) - pd.
↪DataFrame(y)))*100/(np.sum(np.array(y)))
    return error
```

[151]:
```
print('Mean Square Percentage Error in train:', error(X_train, y_train))
print('Mean Square Percentage Error in test:', error(X_test, y_test))
```

```
2/2            0s 23ms/step
Mean Square Percentage Error in train: 0    4.203948
dtype: float32
1/1            0s 24ms/step
Mean Square Percentage Error in test: 0    6.925685
dtype: float32
```

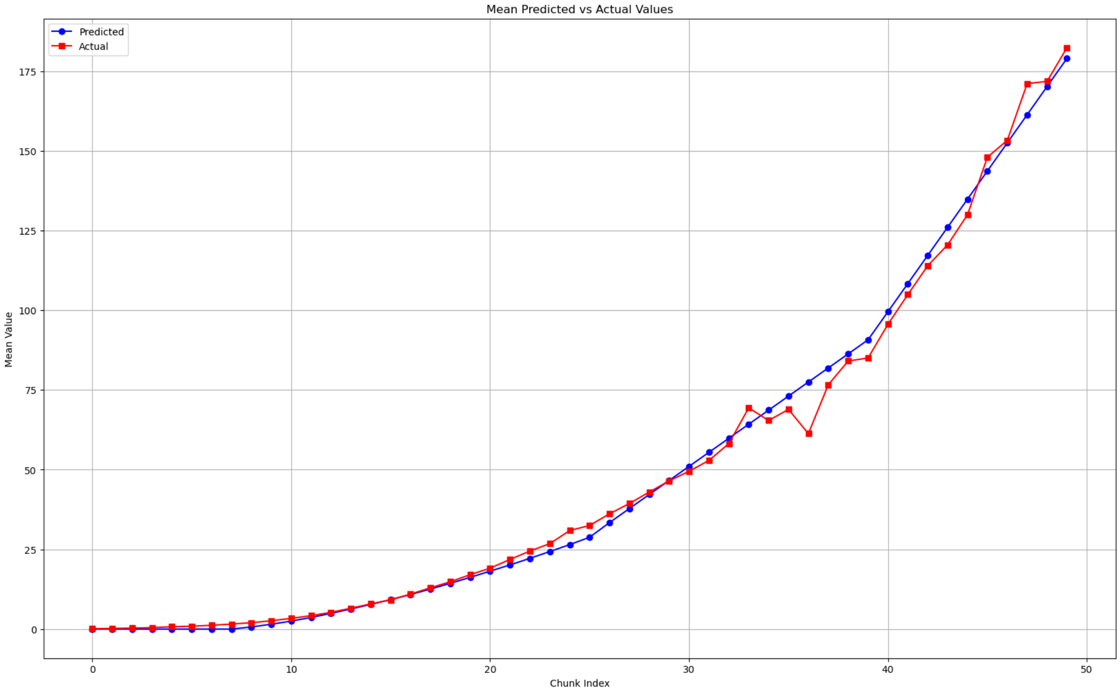
```
/Users/aadityatrivedee/tf_lib/env/lib/python3.10/site-
packages/numpy/core/fromnumeric.py:86: FutureWarning: The behavior of
DataFrame.sum with axis=None is deprecated, in a future version this will reduce
over both axes and return a scalar. To retain the old behavior, pass axis=0 (or
do not pass axis)
  return reduction(axis=axis, out=out, **passkwargs)
/Users/aadityatrivedee/tf_lib/env/lib/python3.10/site-
packages/numpy/core/fromnumeric.py:86: FutureWarning: The behavior of
```

```
DataFrame.sum with axis=None is deprecated, in a future version this will reduce
over both axes and return a scalar. To retain the old behavior, pass axis=0 (or
do not pass axis)
  return reduction(axis=axis, out=out, **passkwargs)
```

```
[152]: def aggregate(data, size=1):
           return np.array([np.mean(data[i:i + size]) for i in range(0, len(data),␣
        ↪size)])
```

```
[153]: plt.figure(figsize=(20, 12))
       X_plt=model.predict(pd.DataFrame(X))
       plt.plot(aggregate(X_plt), label='Predicted', marker='o', linestyle='-',␣
        ↪color='blue')
       plt.plot(aggregate(pd.DataFrame(y)), label='Actual', marker='s', linestyle='-',␣
        ↪color='red')
       plt.title('Mean Predicted vs Actual Values')
       plt.xlabel('Chunk Index')
       plt.ylabel('Mean Value')
       plt.grid()
       plt.legend()
       plt.show()
```

```
2/2              0s 19ms/step
```



```
[154]: model.save('generalarch_put.h5')
```

```
WARNING:absl:You are saving your model as an HDF5 file via `model.save()` or
`keras.saving.save_model(model)`. This file format is considered legacy. We
recommend using instead the native Keras format, e.g.
`model.save('my_model.keras')` or `keras.saving.save_model(model,
'my_model.keras')`.
```