COS30018 Assignment B – Task 1

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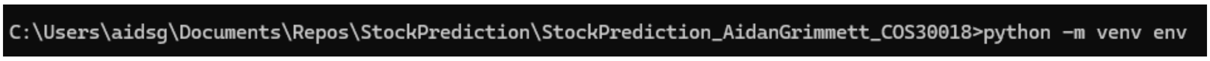
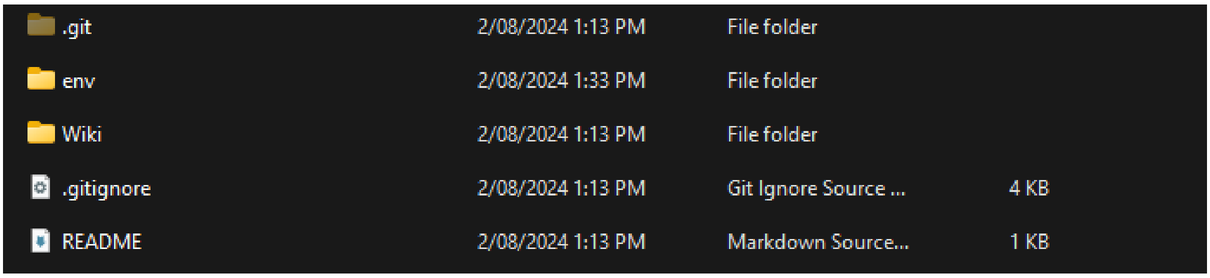
The first thing I did is create a new github repository, here is a link to the wiki page: https://github.com/AidanGrimmettSwin/StockPrediction_AidanGrimmett_COS30018/wiki

From there, I tried to create a virtual environment using venv as I had used it before.

Creating the venv:

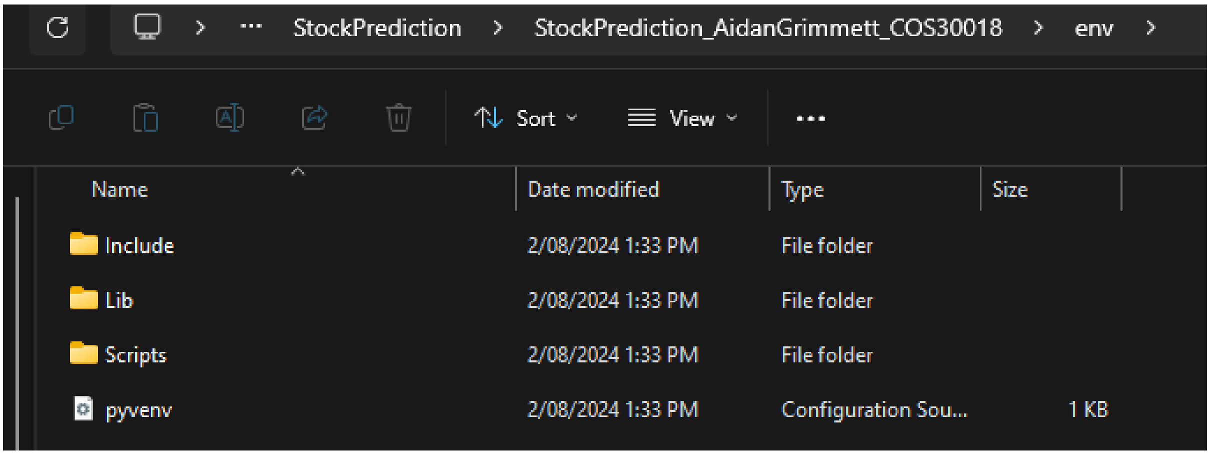


```
C:\Users\aidsg\Documents\Repos\StockPrediction\StockPrediction_AidanGrimmett_COS30018>python -m venv env
```



.git	2/08/2024 1:13 PM	File folder	
env	2/08/2024 1:33 PM	File folder	
Wiki	2/08/2024 1:13 PM	File folder	
.gitignore	2/08/2024 1:13 PM	Git Ignore Source ...	4 KB
README	2/08/2024 1:13 PM	Markdown Source...	1 KB

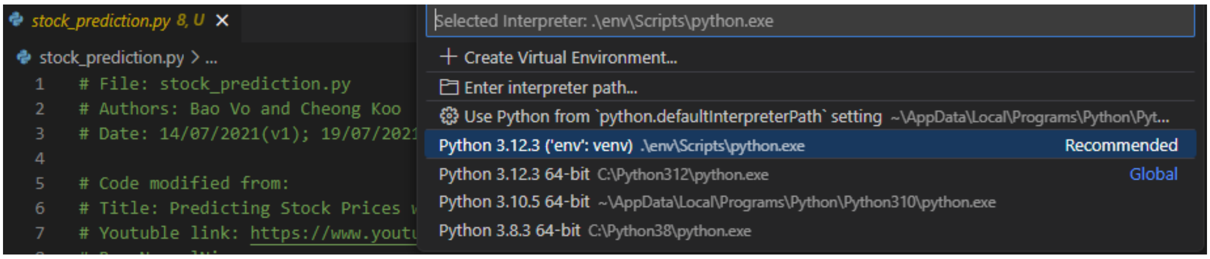
Inside the 'env' environment structure:



StockPrediction > StockPrediction_AidanGrimmett_COS30018 > env >
Sort
View

Name	Date modified	Type	Size
Include	2/08/2024 1:33 PM	File folder	
Lib	2/08/2024 1:33 PM	File folder	
Scripts	2/08/2024 1:33 PM	File folder	
pyvenv	2/08/2024 1:33 PM	Configuration Sou...	1 KB

Then, I had to select the venv interpreter in VSC where I am running the code from (ctrl + shift + P to bring up this menu):

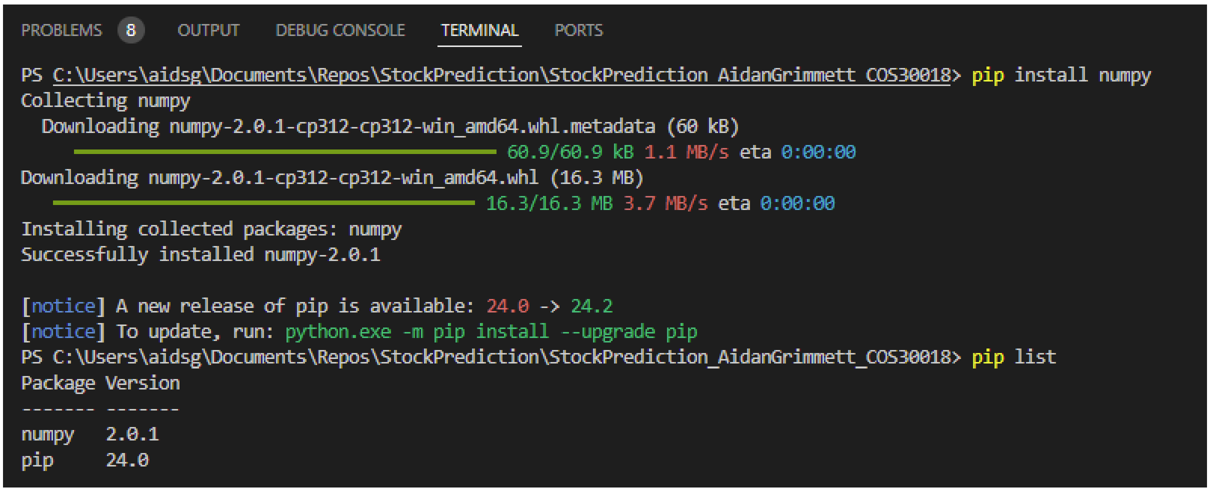


```
# File: stock_prediction.py
# Authors: Bao Vo and Cheong Koo
# Date: 14/07/2021(v1); 19/07/2021

# Code modified from:
# Title: Predicting Stock Prices w
# Youtuble link: https://www.youtu
```

Selected Interpreter: .\env\Scripts\python.exe

- + Create Virtual Environment...
- Enter interpreter path...
- Use Python from `python.defaultInterpreterPath` setting ~\AppData\Local\Programs\Python\Pyt...
- Python 3.12.3 ('env': venv) .\env\Scripts\python.exe — Recommended
- Python 3.12.3 64-bit C:\Python312\python.exe — Global
- Python 3.10.5 64-bit ~\AppData\Local\Programs\Python\Python310\python.exe
- Python 3.8.3 64-bit C:\Python38\python.exe

Installing numpy and showing that that is the only other package installed: (my global pip has lots of packages)



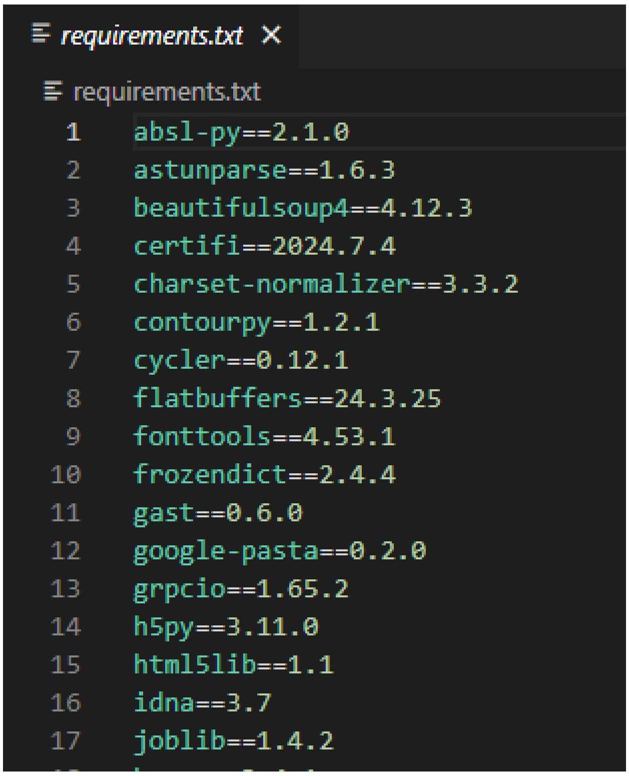
```
PS C:\Users\aidsg\Documents\Repos\StockPrediction\StockPrediction_AidanGrimmett_COS30018> pip install numpy
Collecting numpy
  Downloading numpy-2.0.1-cp312-cp312-win_amd64.whl.metadata (60 kB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 60.9/60.9 kB 1.1 MB/s eta 0:00:00
Downloading numpy-2.0.1-cp312-cp312-win_amd64.whl (16.3 MB)
   ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 16.3/16.3 MB 3.7 MB/s eta 0:00:00
Installing collected packages: numpy
Successfully installed numpy-2.0.1

[notice] A new release of pip is available: 24.0 -> 24.2
[notice] To update, run: python.exe -m pip install --upgrade pip
PS C:\Users\aidsg\Documents\Repos\StockPrediction\StockPrediction_AidanGrimmett_COS30018> pip list
Package Version
------- -------
numpy   2.0.1
pip     24.0
```

To install packages/modules in the virtual environment, I ran this command:

`pip install numpy matplotlib pandas tensorflow scikit-learn pandas-datareader yfinance`

Then to create the requirements file for future installs:

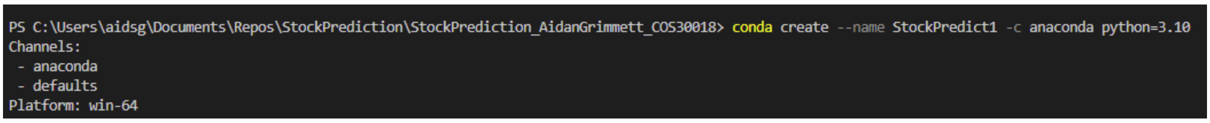
Run `python -m pip freeze > requirements.txt`



```
absl-py==2.1.0
astunparse==1.6.3
beautifulsoup4==4.12.3
certifi==2024.7.4
charset-normalizer==3.3.2
contourpy==1.2.1
cycler==0.12.1
flatbuffers==24.3.25
fonttools==4.53.1
frozendict==2.4.4
gast==0.6.0
google-pasta==0.2.0
grpcio==1.65.2
h5py==3.11.0
html5lib==1.1
idna==3.7
joblib==1.4.2
```

.... Continues

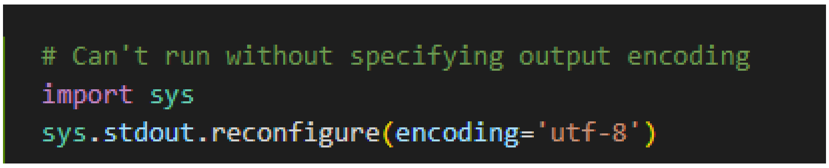
However, I was running into issues with running the code still. Certain packages were still not being found (tensorflow, distutils). So instead I installed anaconda and used that to set up a new environment like so:



```
PS C:\Users\aidsg\Documents\Repos\StockPrediction\StockPrediction_AidanGrimmett_COS30018> conda create --name StockPredict1 -c anaconda python=3.10
Channels:
 - anaconda
 - defaults
Platform: win-64
```

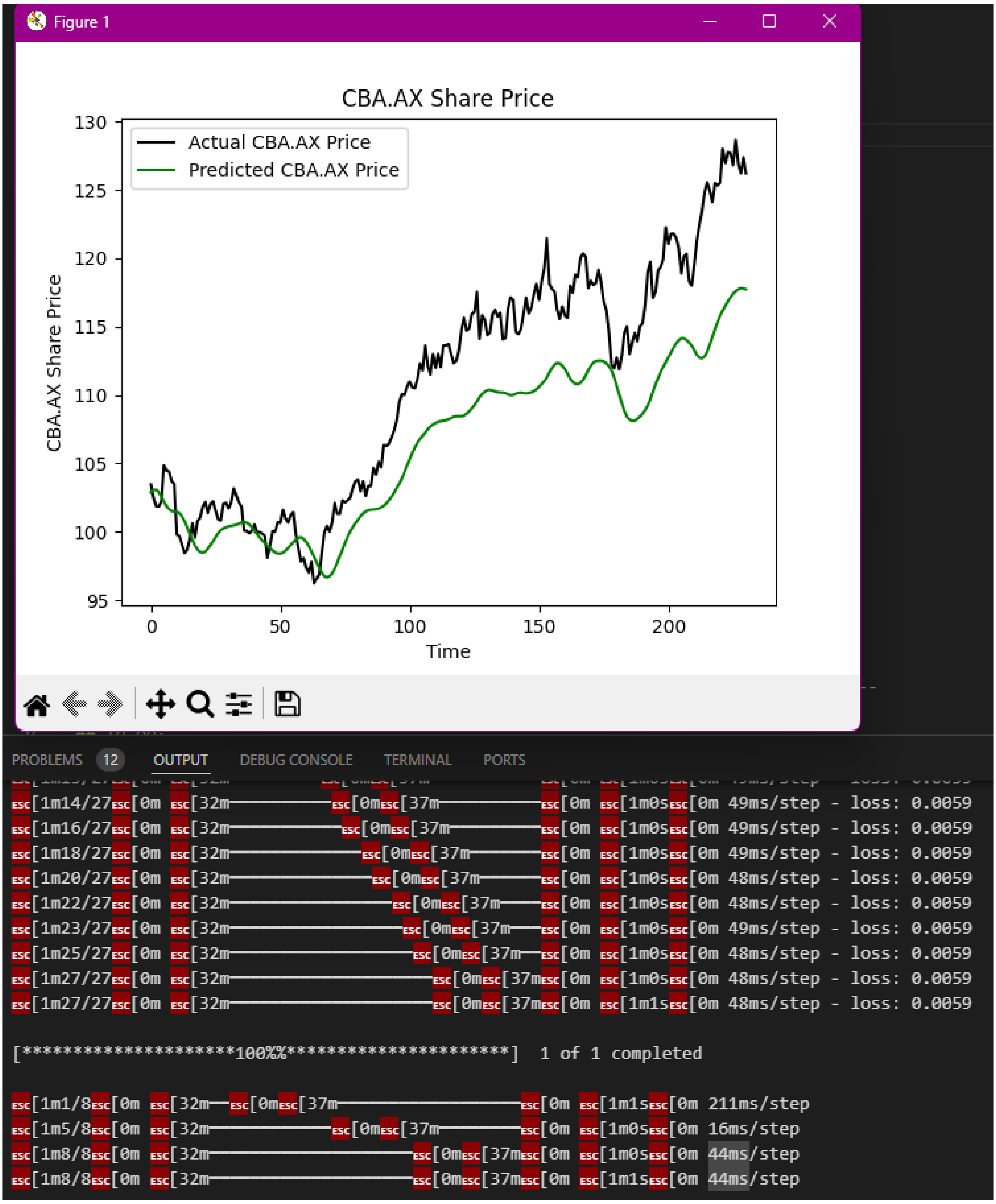
Then I installed the required packages using the requirements.txt file, `pip install -r requirements.txt`. I had to be careful to do this inside the anaconda command prompt, trying to use conda commands through the terminal inside visual studio code was not working.

Now all of the packages were being imported correctly, but I ran into a missing charset issue, so I added these two lines to the top of the code to enforce a utf-8 encoding which fixed that issue.



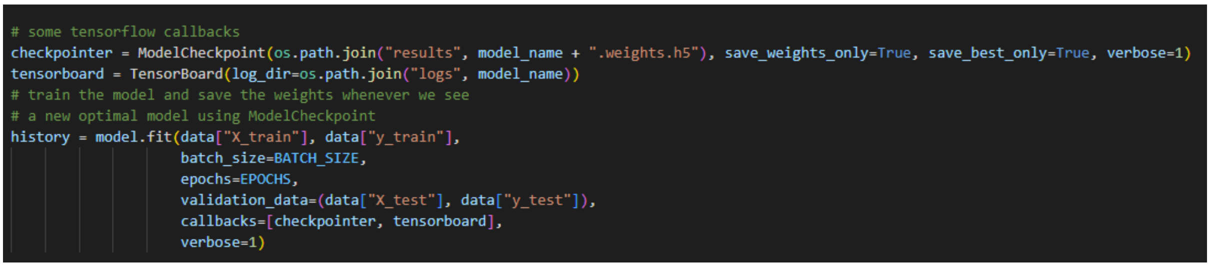
```
# Can't run without specifying output encoding
import sys
sys.stdout.reconfigure(encoding='utf-8')
```

From there, the v0.1 code ran properly and I was able to very roughly predict the stock price as shown:



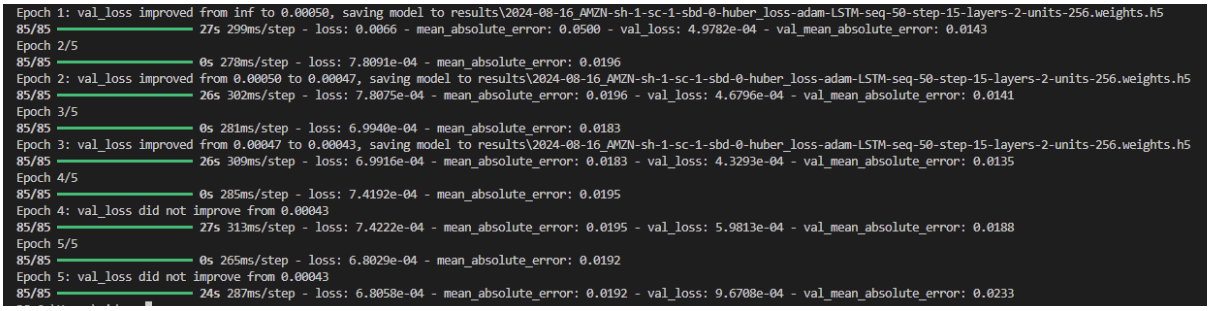
```
ESC[1m14/27ESC[0m ESC[32m━━━━━━━━━━ESC[0mESC[37m━━━━━━━━━━ESC[0m ESC[1m0sESC[0m 49ms/step - loss: 0.0059
ESC[1m16/27ESC[0m ESC[32m━━━━━━━━━━━ESC[0mESC[37m━━━━━━━━━ESC[0m ESC[1m0sESC[0m 49ms/step - loss: 0.0059
ESC[1m18/27ESC[0m ESC[32m━━━━━━━━━━━━━ESC[0mESC[37m━━━━━━━ESC[0m ESC[1m0sESC[0m 49ms/step - loss: 0.0059
ESC[1m20/27ESC[0m ESC[32m━━━━━━━━━━━━━━ESC[0mESC[37m━━━━━━ESC[0m ESC[1m0sESC[0m 48ms/step - loss: 0.0059
ESC[1m22/27ESC[0m ESC[32m━━━━━━━━━━━━━━━━ESC[0mESC[37m━━━━ESC[0m ESC[1m0sESC[0m 48ms/step - loss: 0.0059
ESC[1m23/27ESC[0m ESC[32m━━━━━━━━━━━━━━━━━ESC[0mESC[37m━━━ESC[0m ESC[1m0sESC[0m 49ms/step - loss: 0.0059
ESC[1m25/27ESC[0m ESC[32m━━━━━━━━━━━━━━━━━━ESC[0mESC[37m━━ESC[0m ESC[1m0sESC[0m 48ms/step - loss: 0.0059
ESC[1m27/27ESC[0m ESC[32m━━━━━━━━━━━━━━━━━━━━ESC[0mESC[37mESC[0m ESC[1m0sESC[0m 48ms/step - loss: 0.0059
ESC[1m27/27ESC[0m ESC[32m━━━━━━━━━━━━━━━━━━━━ESC[0mESC[37mESC[0m ESC[1m1sESC[0m 48ms/step - loss: 0.0059

[*********************100%%**********************]  1 of 1 completed

ESC[1m1/8ESC[0m ESC[32m━━ESC[0mESC[37m━━━━━━━━━━━━━━━━━━ESC[0m ESC[1m1sESC[0m 211ms/step
ESC[1m5/8ESC[0m ESC[32m━━━━━━━━━━━━ESC[0mESC[37m━━━━━━━━ESC[0m ESC[1m0sESC[0m 16ms/step
ESC[1m8/8ESC[0m ESC[32m━━━━━━━━━━━━━━━━━━━━ESC[0mESC[37mESC[0m ESC[1m0sESC[0m 44ms/step
ESC[1m8/8ESC[0m ESC[32m━━━━━━━━━━━━━━━━━━━━ESC[0mESC[37mESC[0m ESC[1m1sESC[0m 44ms/step
```

For the P1 code, I did set up a fresh conda environment as there was one different package (yahoo-finance vs yfinance in v0.1), and I thought I was getting some incompatibilities but it may have been another issue. There was one issue with the code which I fixed, I had to change what was appended to the model name from `model_name + ".h5"` to `model_name + ".weights.h5"`, as it wasn't recognising the file names.



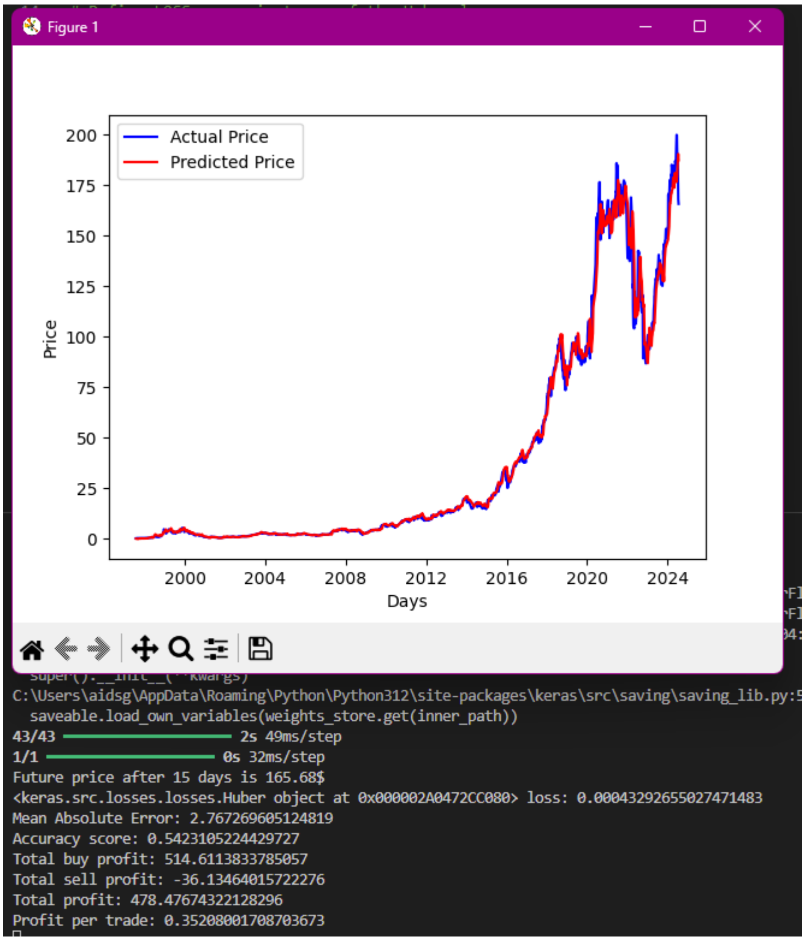
```
# some tensorflow callbacks
checkpointer = ModelCheckpoint(os.path.join("results", model_name + ".weights.h5"), save_weights_only=True, save_best_only=True, verbose=1)
tensorboard = TensorBoard(log_dir=os.path.join("logs", model_name))
# train the model and save the weights whenever we see
# a new optimal model using ModelCheckpoint
history = model.fit(data["X_train"], data["y_train"],
                    batch_size=BATCH_SIZE,
                    epochs=EPOCHS,
                    validation_data=(data["X_test"], data["y_test"]),
                    callbacks=[checkpointer, tensorboard],
                    verbose=1)
```

Once that was changed, I was able to train the model as shown here:



```
Epoch 1: val_loss improved from inf to 0.00050, saving model to results\2024-08-16_AMZN-sh-1-sc-1-sbd-0-huber_loss-adam-LSTM-seq-50-step-15-layers-2-units-256.weights.h5
85/85 ━━━━━━━━━━━━━━━━━━━━ 27s 299ms/step - loss: 0.0066 - mean_absolute_error: 0.0500 - val_loss: 4.9782e-04 - val_mean_absolute_error: 0.0143
Epoch 2/5
85/85 ━━━━━━━━━━━━━━━━━━━━ 0s 278ms/step - loss: 7.8091e-04 - mean_absolute_error: 0.0196
Epoch 2: val_loss improved from 0.00050 to 0.00047, saving model to results\2024-08-16_AMZN-sh-1-sc-1-sbd-0-huber_loss-adam-LSTM-seq-50-step-15-layers-2-units-256.weights.h5
85/85 ━━━━━━━━━━━━━━━━━━━━ 26s 302ms/step - loss: 7.8075e-04 - mean_absolute_error: 0.0196 - val_loss: 4.6796e-04 - val_mean_absolute_error: 0.0141
Epoch 3/5
85/85 ━━━━━━━━━━━━━━━━━━━━ 0s 281ms/step - loss: 6.9940e-04 - mean_absolute_error: 0.0183
Epoch 3: val_loss improved from 0.00047 to 0.00043, saving model to results\2024-08-16_AMZN-sh-1-sc-1-sbd-0-huber_loss-adam-LSTM-seq-50-step-15-layers-2-units-256.weights.h5
85/85 ━━━━━━━━━━━━━━━━━━━━ 26s 309ms/step - loss: 6.9916e-04 - mean_absolute_error: 0.0183 - val_loss: 4.3293e-04 - val_mean_absolute_error: 0.0135
Epoch 4/5
85/85 ━━━━━━━━━━━━━━━━━━━━ 0s 285ms/step - loss: 7.4192e-04 - mean_absolute_error: 0.0195
Epoch 4: val_loss did not improve from 0.00043
85/85 ━━━━━━━━━━━━━━━━━━━━ 27s 313ms/step - loss: 7.4222e-04 - mean_absolute_error: 0.0195 - val_loss: 5.9813e-04 - val_mean_absolute_error: 0.0188
Epoch 5/5
85/85 ━━━━━━━━━━━━━━━━━━━━ 0s 265ms/step - loss: 6.8029e-04 - mean_absolute_error: 0.0192
Epoch 5: val_loss did not improve from 0.00043
85/85 ━━━━━━━━━━━━━━━━━━━━ 24s 287ms/step - loss: 6.8058e-04 - mean_absolute_error: 0.0192 - val_loss: 9.6708e-04 - val_mean_absolute_error: 0.0233
```

Then, I was able to run the test script to produce this stock prediction. It is significantly more accurate than the prediction created by the v0.1 code, and I only trained for 5 epochs, where it is common for training algorithms to run for dozens if not hundreds of epochs.



```
  super().__init__(**kwargs)
C:\Users\aidsg\AppData\Roaming\Python\Python312\site-packages\keras\src\saving\saving_lib.py:5
  saveable.load_own_variables(weights_store.get(inner_path))
43/43 ━━━━━━━━━━━━━━━━━━━━ 2s 49ms/step
1/1 ━━━━━━━━━━━━━━━━━━━━ 0s 32ms/step
Future price after 15 days is 165.68$
<keras.src.losses.losses.Huber object at 0x000002A0472CC080> loss: 0.00043292655027471483
Mean Absolute Error: 2.767269605124819
Accuracy score: 0.5423105224429727
Total buy profit: 514.6113833785057
Total sell profit: -36.13464015722276
Total profit: 478.47674322128296
Profit per trade: 0.35208001708703673
```