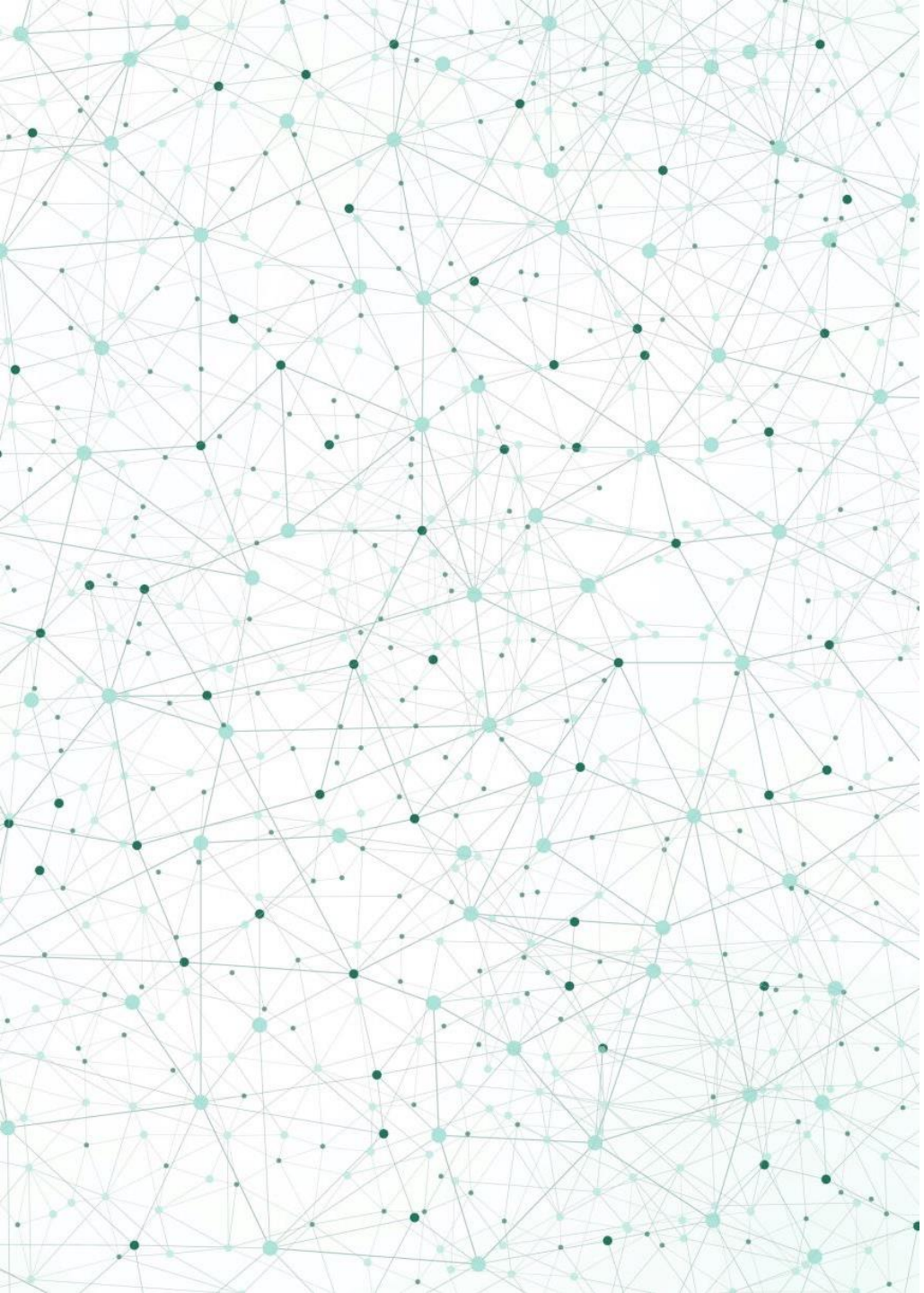


ECE 57000: AI TRACK 2 PROTOTYPE

“EQUITY EDUCATION”

JOEY SQUILLACI

PROJECT BACKGROUND AND MOTIVATION

Background

- Financial data is complex and difficult for beginner traders to interpret.
- Existing platforms show in-depth technical indicators (volume/volatility measures, ratios, financials, etc), but often provide little explanation/context
- Beginners may struggle to connect raw metrics from current tools to actual market behavior
- Question: How can we understand past market behavior to make smart trading decisions for the future?

Motivation

- There is a need for a more accessible and educational forecasting tool for novice traders
- Goal to combine machine learning predictions with visual and contextual explanations
- Not meant to be a stock market predictor, but an educational market analysis tool

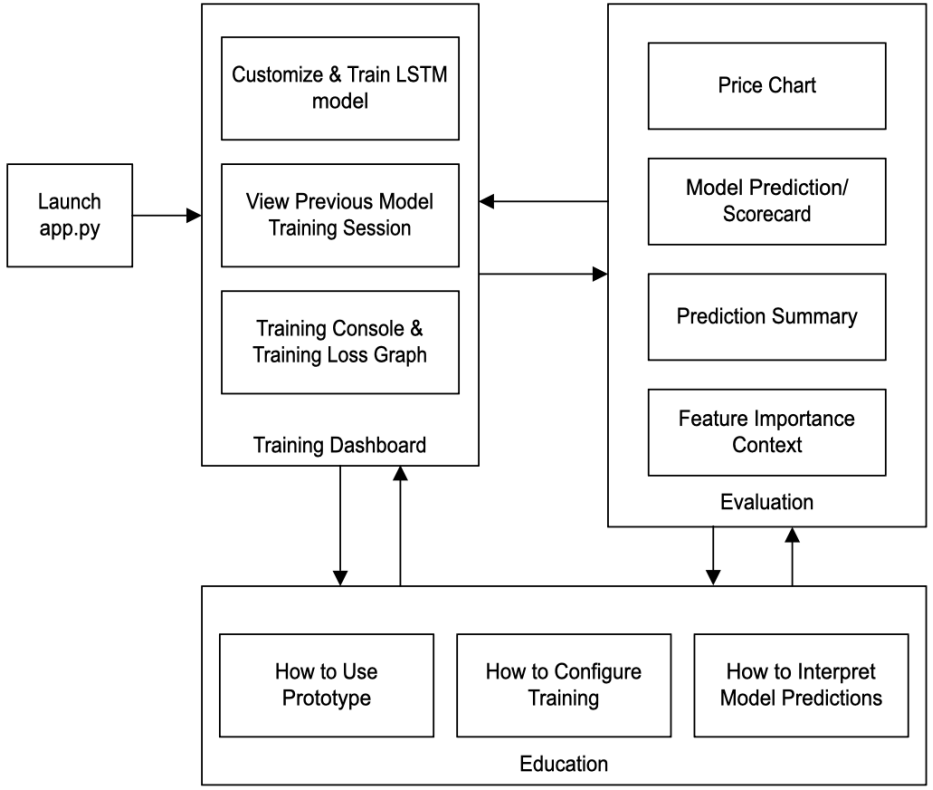
SYSTEM BACKGROUND/ARCHITECTURE

High Level

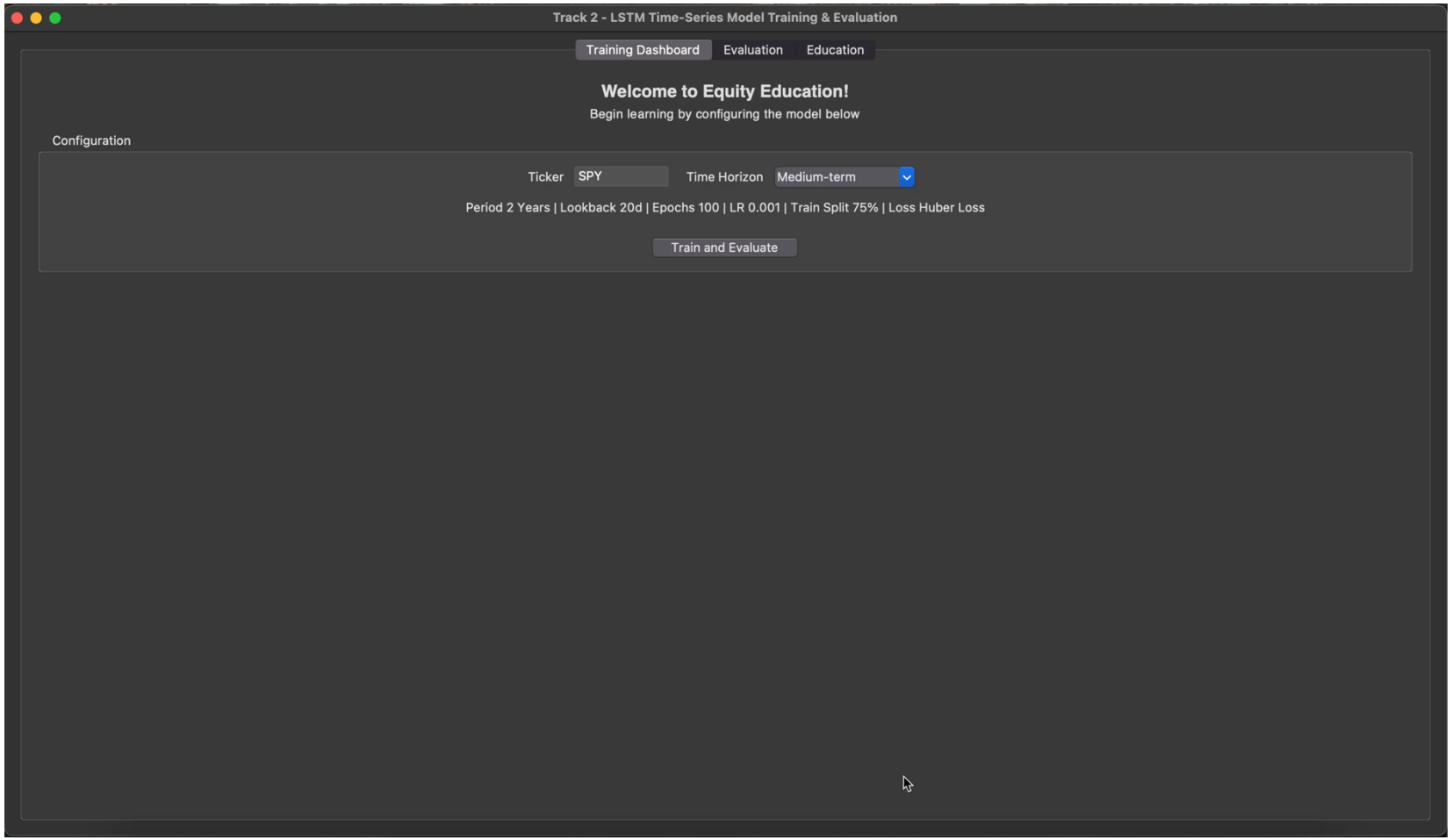
- Fetch historical stock data
- Train a model on the fetched data
- Create a prediction
- Provide prediction and context based on predetermined thresholds
- Take education further with supplemental information

Technical Details

- Collect historical stock data using Yahoo Finance
- Use data to build technical indicators & features (RSI, MAs, S/R)
- Feed sequential data into an LSTM model
- Generate predicted price movement
- Display results in a GUI with charts and supporting context
- Support users through continued Training, Evaluation, and Education interfaces



USER WORKFLOW/DEMO



TESTING, RESULTS, ANALYSIS

- Tested on SPY and AAPL over one trading week
- Model prediction: small & positive
- Actual moves were larger and more volatile
- Model appeared to predict a generally bullish market
- Model handled stable assets better than reactive single stocks
- Proves that the model currently works better for stable/long term holdings rather than short term fluctuations
- Results show value for education and interpretation, but limited reliability for standalone/volatile prediction

	Predicted Move	Actual Move	Predicated Directional Accuracy	Direction Correct?
Day 1	+0.1%	+0.4%	52.9%	Y
Day 2	+0.116%	+2.55%	53.7%	Y
Day 3	+0.08%	0.58%	53.7%	Y
Day 4	+0.22%	-0.07%	54.5%	N
Day 5	+0.08%	+0.98%	53.7%	Y

Table 1: One Week Evaluation of Model, Tracking SPY

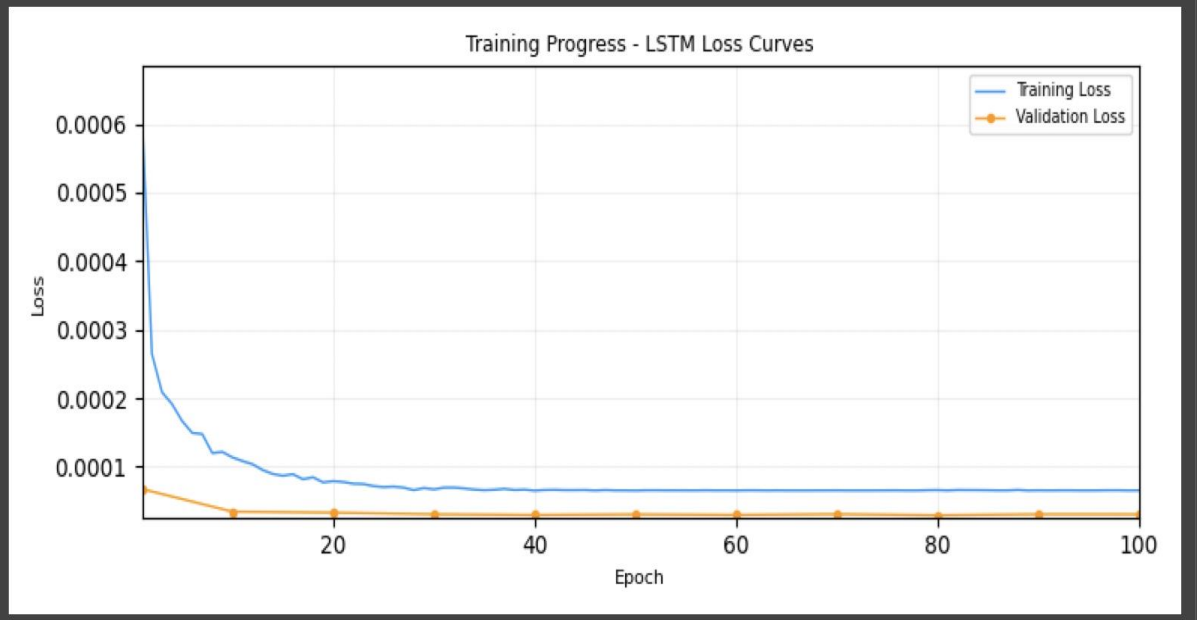
	Predicted Move	Actual Move	Predicted Directional Accuracy	Direction Correct?
Day 1	+0.2%	-2.07%	52.9%	N
Day 2	+0.2294%	+2.13%	52.9%	Y
Day 3	+0.12%	+0.61%	52.9%	Y
Day 4	+0.18%	0.00%	52.9%	Y
Day 5	+0.15%	-0.49%	52.1%	N

Table 2: One Week Evaluation of Model, Tracking AAPL

Training Console

```
[14:33:08] Epoch 1/130  Train 0.000622  Val 0.000068
[14:33:10] Epoch 10/130  Train 0.000114  Val 0.000035
[14:33:11] Epoch 20/130  Train 0.000079  Val 0.000033
[14:33:13] Epoch 30/130  Train 0.000067  Val 0.000031
[14:33:15] Epoch 40/130  Train 0.000065  Val 0.000030
[14:33:17] Epoch 50/130  Train 0.000065  Val 0.000031
[14:33:19] Epoch 60/130  Train 0.000065  Val 0.000030
[14:33:20] Epoch 70/130  Train 0.000066  Val 0.000031
[14:33:22] Epoch 80/130  Train 0.000066  Val 0.000029
[14:33:24] Epoch 90/130  Train 0.000066  Val 0.000031
[14:33:26] Epoch 100/130  Train 0.000066  Val 0.000031
```

Training Loss Graph



CONCLUSION

- Built an LSTM and GUI prototype for educational stock analysis
- Helped connect predictions with indicators and market context
- Data proved to be more consistent for less volatile holdings
- Produced useful interpretation, but limited predictive reliability
- Better suited for education and decision support than direct trading
- Future systems need richer and more in-depth inputs with more advanced modeling to increase predictive accuracy

REFERENCES & RELEVANT LINKS

- Fischer, T., & Krauss, C. (2018). *Deep learning with long short-term memory networks for financial market predictions*. *European Journal of Operational Research*, 270(2), 654–669.

- Project GitHub: https://github.com/joeysquillaci/ECE-57000-Artificial-Intelligence-Final-Project