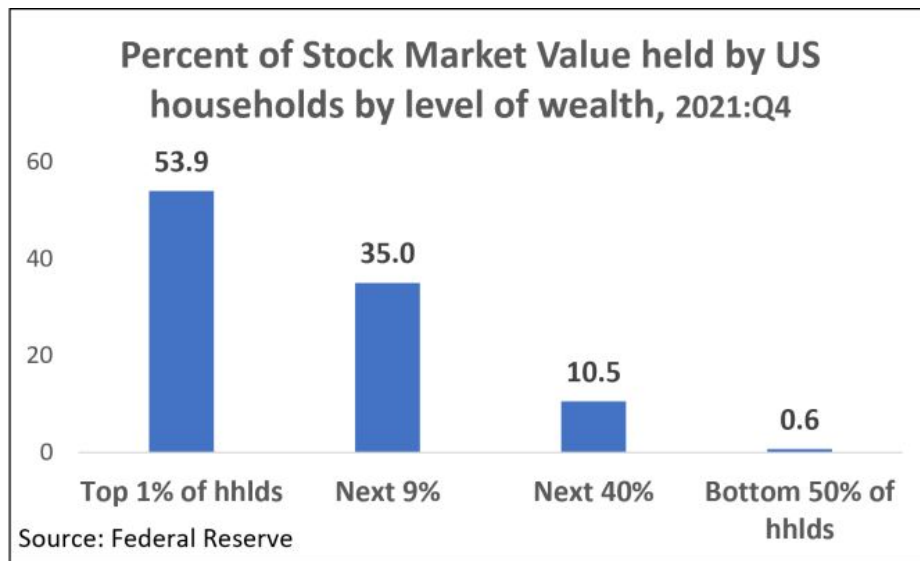# WeTrade
Open-Use Stock Trading Bot

Gus Simanson (Torbert 7), Max Weinstein (Yilmaz 1), Drew Zauel (Yilmaz 1)
Computer Systems Lab
5/21/25

Problem

- Only 34% of households in the bottom half of the US income distribution hold stocks

- Bottom 50% makes up 0.6% of the stock markets value

- Working-class families often lack the resources to hire financial advisors and the time to manage their investments.

Percent of Stock Market Value held by US households by level of wealth, 2021:Q4

53.9	35.0	10.5	0.6
Top 1% of hhlds	Next 9%	Next 40%	Bottom 50% of hhlds

Source: Federal Reserve

Another Problem

- Current investing models only use short term data

- Long term investing is more profitable for individual traders. (Investing.com)

S&P 500 PERFORMANCE FOLLOWING RARE TREND
REVERSALS IN THE S&P 1500 INDEX (2004-2023)

DATE	ONE YEAR	TWO YEARS	THREE YEARS
1/21/2005	8.02%	22.49%	13.47%
9/25/2009	9.99%	8.81%	39.50%
6/8/2012	23.97%	47.05%	56.85%
8/5/2016	13.47%	30.12%	30.32%

	ONE YEAR	TWO YEARS	THREE YEARS
AVG	13.86%	27.12%	35.03%
MED	11.73%	26.30%	34.91%
POS	100.00%	100.00%	100.00%

PAST PERFORMANCE DOES NOT GUARANTEE FUTURE RESULTS.

CIOVACCO CAPITAL MANAGEMENT   FOR ILLUSTRATIVE PURPOSES ONLY

Background

Main Determinants of Stock Price:

- History of Company/Stock

- Current Stock Data

- News/General Sentiment about Company

Other Solutions

1. **Pure Technical Analysis:** Use indicators (MAC-D, RSI, moving averages) to determine buy/sell. No external influences.

Example: StockHero

Pro: With a good strategy, and some luck, can perform very well on stocks

Con: Need to know a lot about the technical side of stocks to consistently choose a good strategy. Shorter term, and more luck based. Subscription based, win or lose
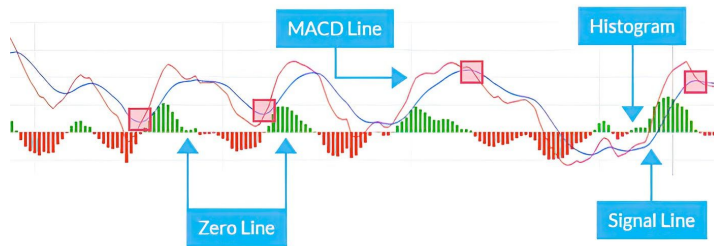
Other Solutions

2. NLP-based Sentiment Analysis: Analyze strictly the news sentiment, but cannot account for price action or technical indicators.

Example: EquBot (IBM Watson)

Pro: Processes a large number of articles per day, has backing from multi-billion dollar companies

Con: Only corporations have access to use, and subscription is expensive. Bad or biased data could lead to bad decisions, in addition to delayed reaction due to the quantity of data it goes through

Why Is Ours Better?

- Ours combines the previous models into one

- Has inputs of stock data, technical indicators, and media sentiment data

- Can react to Technical Indicators changing and News sentiment changing

- Not purely day-trading, can hold long term investments

- Website giving personalization to the behavior of the bot's trades

Impact

- More profitable model, especially in the long term

- Website leads to more personal understanding of the Stock Market

- More profitable holdings for average person

- Competes with big firms, drives innovation

Methods: Training the Model
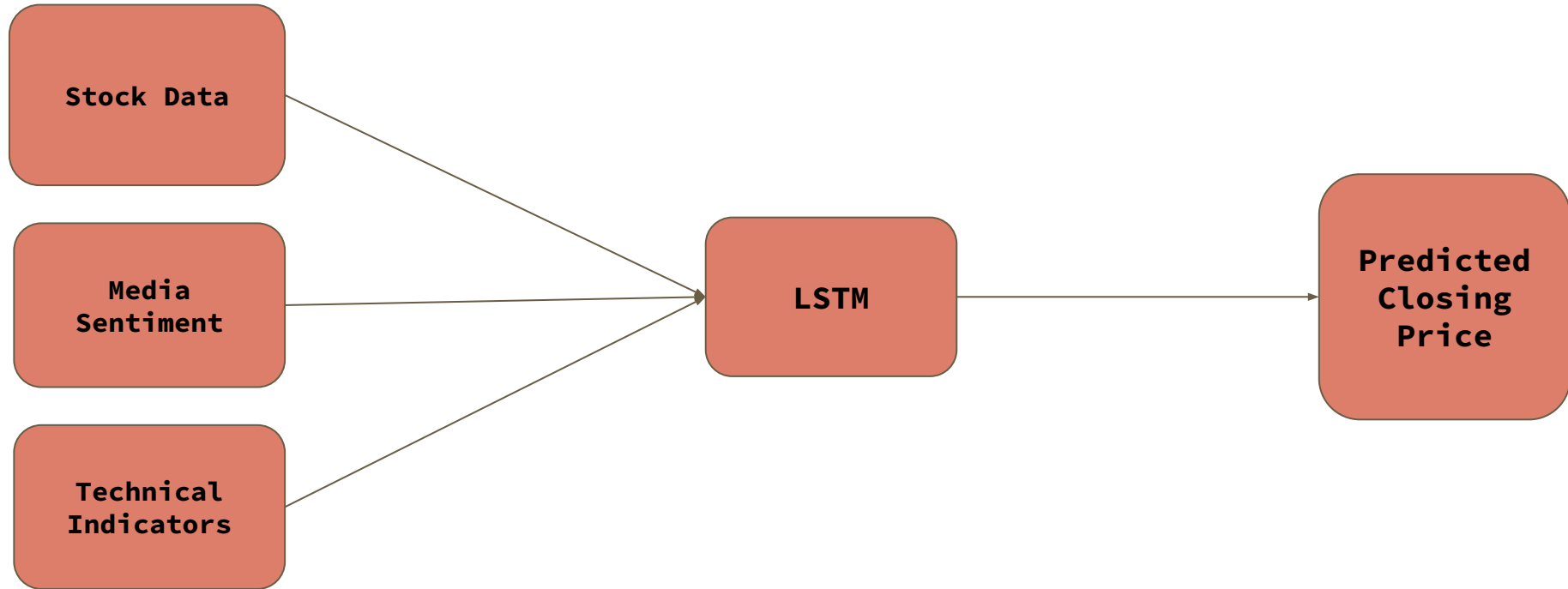
Methods: Stock Data

- Historical Stock data gathered from Alpaca

- Technical Indicators calculated off those values

```python
def get_daily(symbol):
    api_key = "PKB5NC4W8DQB3085WA00"  # Set these in your environment
    api_secret = "7fdN97EYU9T4xDVPZPlHwZ2igs9r0AqDgCg0RL9l"

    # Get daily data for the specified stock and date range
    start_date = date.today() - timedelta(days=5*365)
    api = stock.StockHistoricalDataClient(api_key=api_key, secret_key=api_secret)

    request = StockBarsRequest(
        symbol_or_symbols=symbol,
        timeframe=TimeFrame.Day,
        start=start_date,
        #end=end,
        limit=None,
        sort=Sort.DESC,
    )
```

Methods: Media Sentiment

- **News Scraping**

- **Social Media Scraping**

- **Sentiment Analysis**

- **Historical Aggregation**

Yahoo Scraper

News from the Yahoo Finance Network

Susquehanna Reiterates Positive Rating on Alibaba Group (BABA), Keeps $175 Target
We recently published a list of 11 AI Stocks On Wall Street's Radar. In this article, we are going to take a look at where Alibaba Group Holding Limited (NYSE:BABA) stands against...
Insider Monkey • 16 minutes ago   BABA ☆

QUALCOMM Incorporated (QCOM): A Bull Case Theory
We came across a bullish thesis on QUALCOMM Incorporated (QCOM) on Substack by Christopher Kirincic. In this article, we will summarize the bulls' thesis on QCOM....
Insider Monkey • 13 minutes ago   QCOM ☆

```
task: https://finance.yahoo.com/
task: https://finance.yahoo.com/
task: https://finance.yahoo.com/
task: https://finance.yahoo.com/
Failed: 5
Error: 4
Success: 490
Out of: 499
0.9819639278557114
x@x-ThinkPad-T480s:~/School/seni
```

id	url	title	date	tickers
Fi...	Filter	Filter	Filter	Filter
1	https://finance.yahoo.com/news/wall-stree...	Wall Street's Ambitions in China Run Into a...	2024-01-04 00:00:11.000000	UBSG.SW
2	https://finance.yahoo.com/news/quiet-...	Quiet Income Kings: 3 Under-the-Radar ...	2024-01-01 00:07:00.000000	T,SCCO,AMCR
3	https://finance.yahoo.com/news/returns-...	Returns On Capital Are Showing Encouragi...	2024-01-01 00:09:16.000000	AWZ.SI
4	https://finance.yahoo.com/news/diversified...	Diversified United Investment Insider Ups ...	2024-01-01 00:16:35.000000	DUI.AX
5	https://finance.yahoo.com/news/nanalysis-...	Nanalysis Scientific Corp. Announces Gran...	2024-01-04 00:11:00.000000	NSCIF
6	https://finance.yahoo.com/news/pine-trail-...	Pine Trail REIT Announces Move to Quarter...	2024-01-04 00:12:00.000000	PINE-UN.V
7	https://finance.yahoo.com/news/estimatin...	Estimating The Intrinsic Value Of ALS ...	2024-01-01 00:38:37.000000	ALQ,ALQ.AX
8	https://finance.yahoo.com/news/why-meta-...	Why META Stock May Be the Biggest Tech ...	2024-01-04 00:15:39.000000	META,AMZN
9	https://finance.yahoo.com/news/drug-price...	As Drug Prices Rise, $35 Cap on Insulin ...	2024-01-04 00:16:40.000000	SAN,PFE
10	https://finance.yahoo.com/news/lg-display-...	LG Display Unveils Automotive Display ...	2024-01-01 01:00:00.000000	LPL
11	https://finance.yahoo.com/news/heres-why...	Here's Why We're Not Too Worried About ...	2024-01-01 01:00:38.000000	BRN.AX

Methods: Mass-scraping
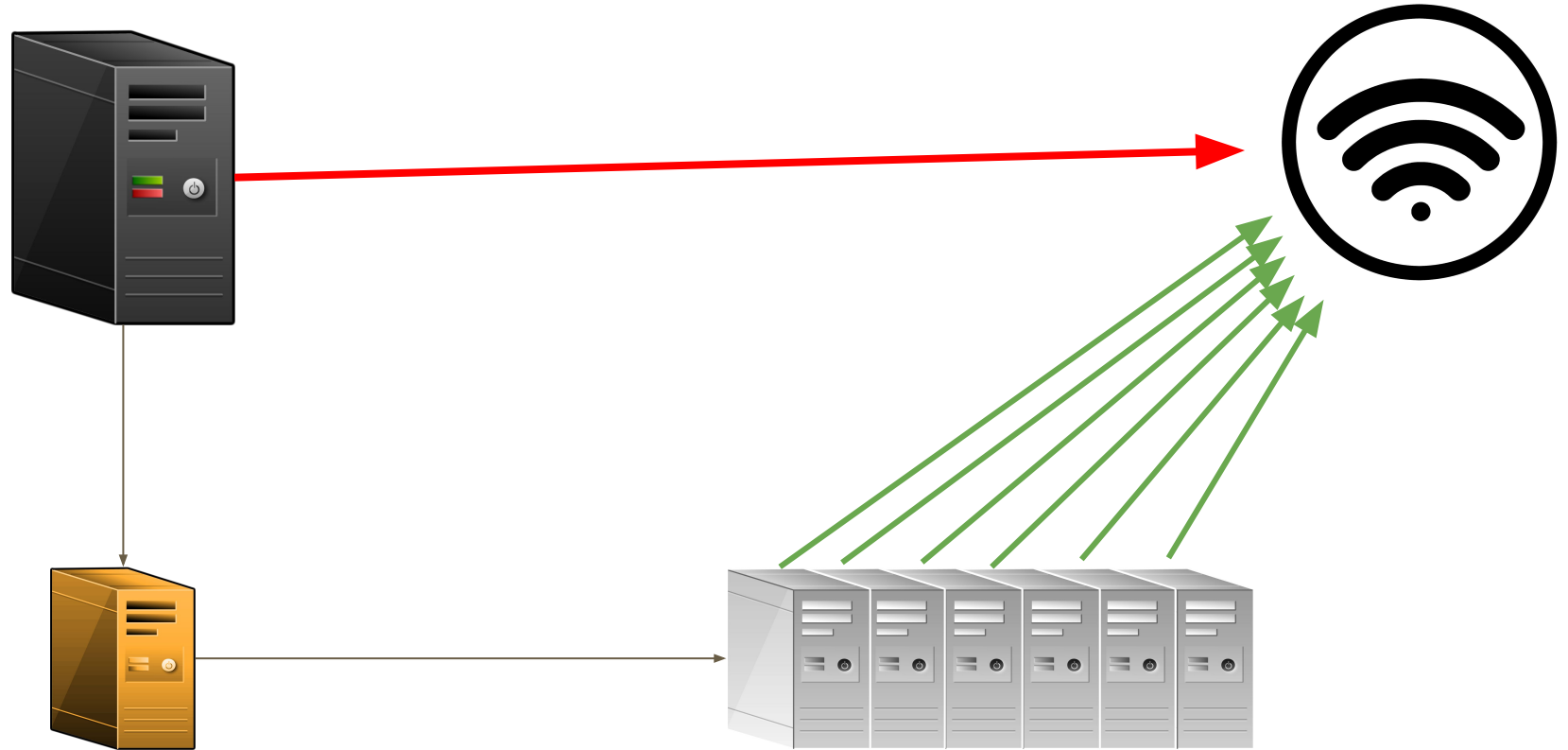
Calculating Sentiment Based on Article

Article

↓

Assigned value [-1, 1] per word based on dictionary

↓

Determine if intensifier / modifier → **Check for negations**

↑

See relationship with neighboring words

↑

Update sentiment of affected words

↑

Compute weighted average of all word scores → **Compute final score normalized back to [-1, 1] range**

Thresholds:

[-0.3, 0.3] : **Neutral**
(0.3, 1] : **Positive**
[-1, -0.3) : **Negative**
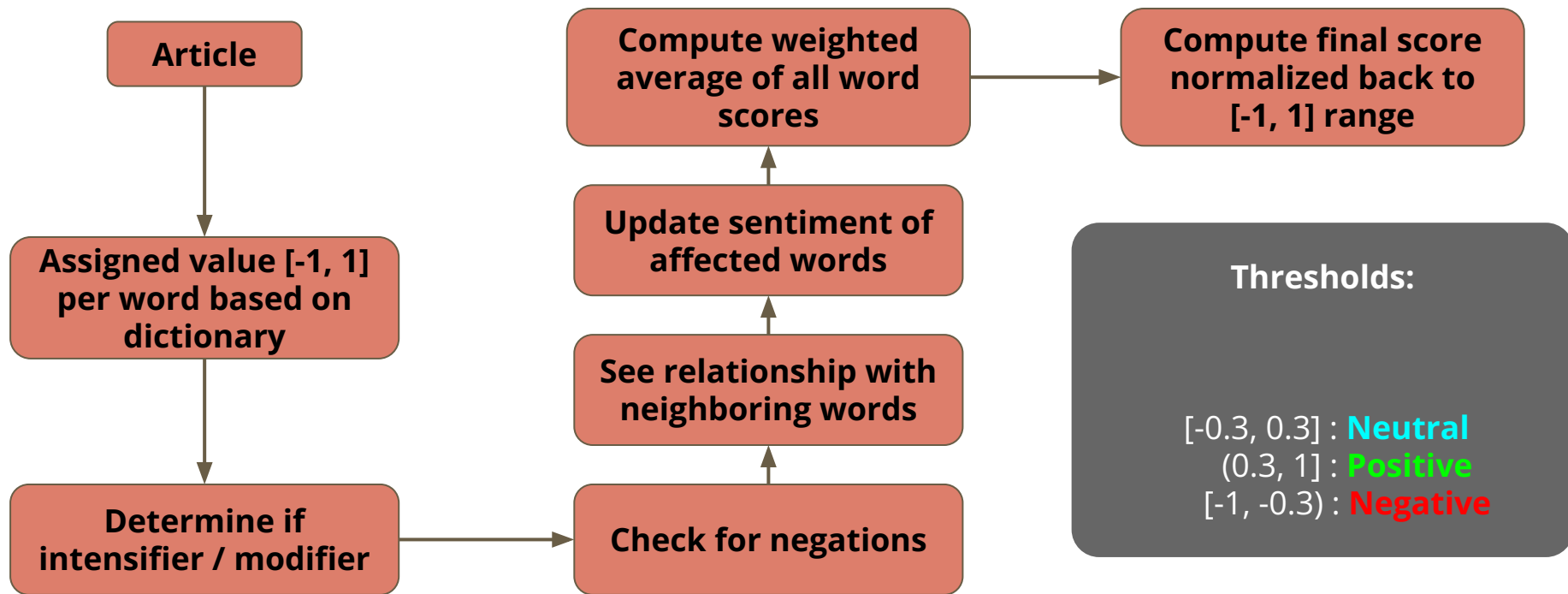
Demo (scraping & sentiment analysis)

Methods: Technical Indicators
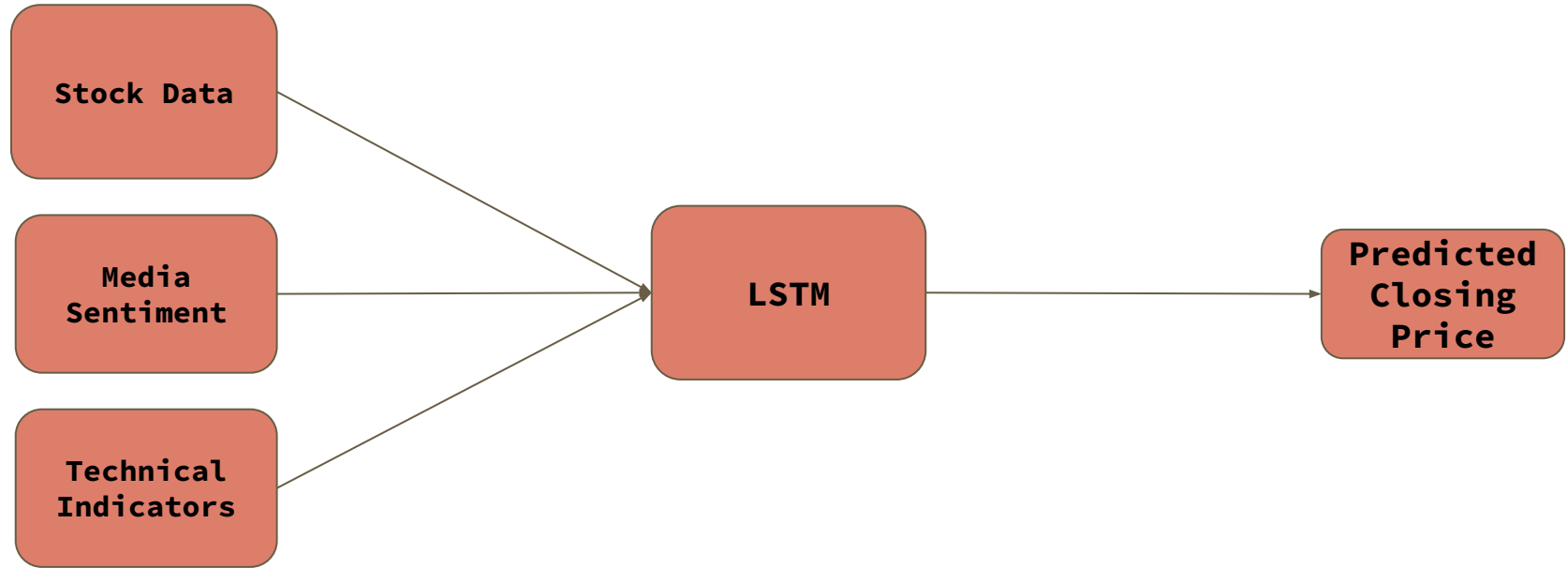
Methods: Technical Indicators

- MACD (Moving Average Convergence Divergence) = Trading Momentum
    - MACD = 12-Period EMA – 26-Period EMA (Exponential Moving Average)
    - Gives entry and exit points for trades (bullish vs bearish)

- RSI (Relative Strength Index)
    - RSI = Average Gain / Average Lose (over 14 days)
    - Speed of price movements

Methods: Technical Indicators

- OBV (On Balance Volume)
  - Measures buying and selling pressure
  - Are there more buyers or sellers?

$$\text{OBV} = \text{OBV}_{prev} + \begin{cases} \text{volume}, & \text{if close} > \text{close}_{prev} \\ 0, & \text{if close} = \text{close}_{prev} \\ -\text{volume}, & \text{if close} < \text{close}_{prev} \end{cases}$$

- SMA (Simple Moving Average)
  - Average price over a small period

Inputs

| Date ▲¹	Close/Last	Volume	Open	High	Low	Close	SMA_5	SMA_10	SMA_20	EMA_5	EMA_10	EMA_20	RSI	MACD	MACD_Signal	MACD_Histogram	ATR	OBV	Sentiment
Filter	Filter	Filter	Filter	Filter	Filter	Filter	Filter	Filter	Filter	Filter	Filter	Filter	Filter	Filter	Filter	Filter	Filter	Filter	Filter
2025-05-19 00:00:00	$208.78	46140530	207.91	209.48	204.26	208.78	211.35	205.832	206.586	209.612	208.065	206.722	51.987	0.695	-0.582	1.277	5.916	1078968140.0	-0.167
2025-05-16 00:00:00	$211.26	54737850	212.36	212.57	209.77	211.26	211.752	204.843	205.805	210.028	207.907	206.505	54.791	0.631	-0.901	1.532	5.693	1125108670.0	-0.26
2025-05-15 00:00:00	$211.45	45029470	210.95	212.96	209.54	211.45	209.206	204.252	205.091	209.412	207.161	206.005	55.002	0.287	-1.284	1.571	5.781	1179846520.0	-0.011
2025-05-14 00:00:00	$212.33	49325830	212.43	213.94	210.58	212.33	206.414	204.439	204.232	208.393	206.208	205.432	55.929	-0.175	-1.677	1.502	5.791	1224875990.0	0.243
2025-05-13 00:00:00	$212.93	51909330	210.43	213.4	209.0	212.93	203.198	204.456	203.723	206.424	204.848	204.706	56.532	-0.852	-2.053	1.201	5.971	1274201820.0	0.102
2025-05-12 00:00:00	$210.79	63775810	210.97	211.268	206.75	210.79	200.314	204.284	203.202	203.171	203.052	203.84	54.922	-1.764	-2.353	0.589	6.247	1222292490.0	0.078
2025-05-09 00:00:00	$198.53	36453920	199.0	200.54	197.535	198.53	197.934	204.219	202.57	199.361	201.332	203.108	43.867	-2.685	-2.5	-0.185	5.939	1158516680.0	0.063
2025-05-08 00:00:00	$197.49	50478870	197.72	200.05	194.68	197.49	199.298	205.294	202.164	199.777	201.955	203.59	42.761	-2.574	-2.454	-0.12	6.234	1122062760.0	0.962
2025-05-07 00:00:00	$196.25	68616940	199.17	199.44	193.25	196.25	202.464	206.382	202.233	200.921	202.947	204.232	41.485	-2.288	-2.424	0.136	6.176	1071583890.0	0.126
2025-05-06 00:00:00	$198.51	51216480	198.21	200.65	197.02	198.51	205.714	207.217	201.041	203.256	204.436	205.073	43.111	-1.764	-2.458	0.694	6.432	1140200830.0	-0.19
2025-05-05 00:00:00	$198.89	69018450	203.1	204.1	198.21	198.89	208.254	207.34	200.188	205.629	205.752	205.763	43.377	-1.299	-2.632	1.333	6.437	1191417310.0	0.766
2025-05-02 00:00:00	$205.35	101010600	206.09	206.99	202.16	205.35	210.504	206.767	199.663	208.999	207.277	206.487	48.05	-0.726	-2.965	2.239	6.984	1260435760.0	-0.12
2025-05-01 00:00:00	$213.32	57365680	209.08	214.56	208.9	213.32	211.29	205.93	199.555	210.824	207.706	206.607	54.814	-0.642	-3.524	2.882	7.149	1361446360.0	0.07
2025-04-30 00:00:00	$212.50	52286450	209.3	213.58	206.67	212.5	210.3	204.025	200.084	209.576	206.458	205.9	54.198	-1.336	-4.245	2.909	7.877	1304080680.0	-0.192
2025-04-29 00:00:00	$211.21	36827630	208.693	212.24	208.37	211.21	208.72	202.989	200.618	208.113	205.116	205.205	53.267	-2.119	-4.972	2.853	9.435	1251794230.0	0.002
2025-04-28 00:00:00	$210.14	38743070	210.0	211.5	207.46	210.14	206.426	202.12	201.164	206.565	203.761	204.573	52.524	-2.957	-5.685	2.728	10.668	1214966600.0	0.168
2025-04-25 00:00:00	$209.28	38222260	206.365	209.75	206.2	209.28	203.03	200.921	201.552	204.778	202.344	203.987	51.954	-3.874	-6.367	2.493	11.774	1176223530.0	0.274
2025-04-24 00:00:00	$208.37	47310990	204.89	208.83	202.94	208.37	200.57	199.035	202.281	202.527	200.802	203.43	51.381	-4.901	-6.991	2.09	12.653	1138001270.0	-0.671
2025-04-23 00:00:00	$204.60	52929170	206.0	208.0	202.799	204.6	197.75	198.083	202.938	199.605	199.121	202.91	49.04	-6.048	-7.513	1.465	13.849	1090690280.0	0.176
2025-04-22 00:00:00	$199.74	52976370	196.12	201.59	195.97	199.74	197.258	194.865	203.896	197.108	197.903	202.732	45.923	-7.039	-7.88	0.841	13.557	1037761110.0	0.207
2025-04-21 00:00:00	$193.16	46742540	193.265	193.8	189.811	193.16	197.814	193.037	204.945	195.792	197.495	203.047	41.419	-7.708	-8.09	0.382	13.296	984784740.0	-0.61
2025-04-17 00:00:00	$196.98	52164680	197.2	198.834	194.42	196.98	198.812	192.559	206.201	197.107	198.458	204.088	43.366	-7.779	-8.185	0.406	13.455	1031527280.0	-0.099
2025-04-16 00:00:00	$194.27	59732420	198.36	200.7	192.37	194.27	197.5	193.18	207.057	197.171	198.787	204.836	41.557	-8.146	-8.287	0.141	13.57	979362600.0	-0.045
2025-04-15 00:00:00	$202.14	51343870	201.855	203.51	199.8	202.14	198.416	196.142	208.105	198.622	199.79	205.948	45.476	-8.219	-8.322	0.103	13.188	1039095020.0	0.013
2025-04-14 00:00:00	$202.52	101352900	211.44	212.94	201.162	202.52	192.472	198.247	208.633	196.863	199.268	206.349	45.669	-8.995	-8.347	-0.648	13.248	1090438890.0	0.043
2025-04-11 00:00:00	$198.15	87435920	186.1	199.54	186.06	198.15	188.26	200.208	209.207	194.034	198.545	206.752	43.088	-9.893	-8.186	-1.707	12.479	989085990.0	0.362
2025-04-10 00:00:00	$190.42	121880000	189.065	194.78	183.0	190.42	186.306	202.183	209.974	191.976	198.633	207.657	38.273	-10.45	-7.759	-2.691	11.745	901650070.0	-0.067
2025-04-09 00:00:00	$198.85	184395900	171.95	200.61	171.89	198.85	188.86	205.526	210.937	192.754	200.458	209.472	41.859	-10.222	-7.086	-3.136	11.153	1023530070.0	0.111

Methods: Training the Model

```python
import torch.optim as optim
from torch.optim.lr_scheduler import ReduceLROnPlateau

# Define model with dropout
class LSTM(nn.Module):
    def __init__(self, input_size, hidden_size, num_stacked_layers, dropout_rate=0.2):
        super().__init__()
        self.hidden_size = hidden_size
        self.num_stacked_layers = num_stacked_layers

        self.lstm = nn.LSTM(input_size, hidden_size, num_stacked_layers, batch_first=True, dropout=dropout_rate)
        self.fc = nn.Linear(hidden_size, 1)

    def forward(self, x):
        batch_size = x.size(0)
        h0 = torch.zeros(self.num_stacked_layers, batch_size, self.hidden_size).to(device)
        c0 = torch.zeros(self.num_stacked_layers, batch_size, self.hidden_size).to(device)

        out, _ = self.lstm(x, (h0, c0))
        out = self.fc(out[:, -1, :])
        return out

# Instantiate model, optimizer, and scheduler
model = LSTM(input_size=5, hidden_size=32, num_stacked_layers=2, dropout_rate=0.2)
model.to(device)
optimizer = optim.Adam(model.parameters(), lr=0.001, weight_decay=1e-4)
scheduler = ReduceLROnPlateau(optimizer, mode='min', factor=0.5, patience=5)
```
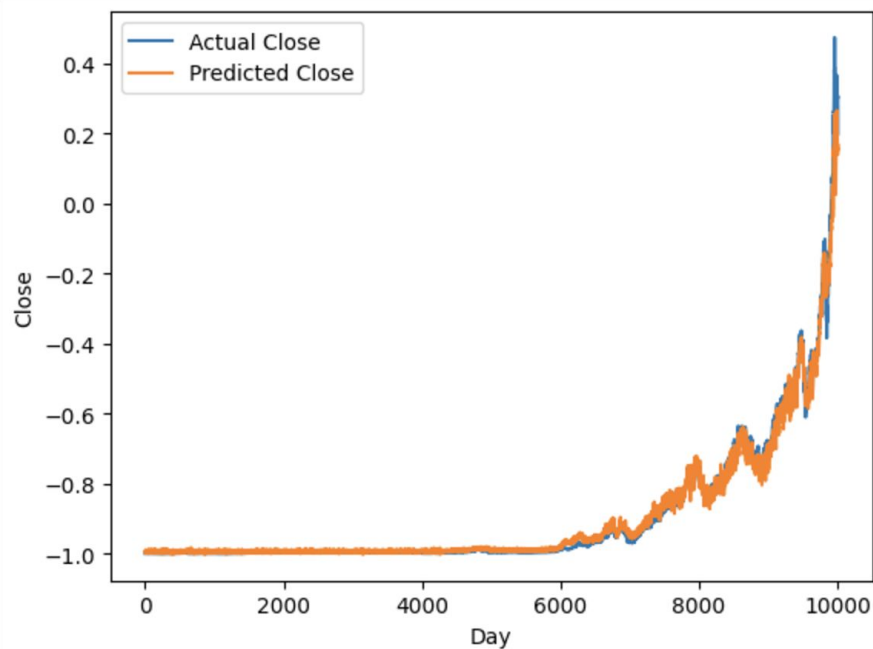
Methods: Predicting Using Trained LSTM

*Data including the last week of the market (Actual prediction on unseen data)
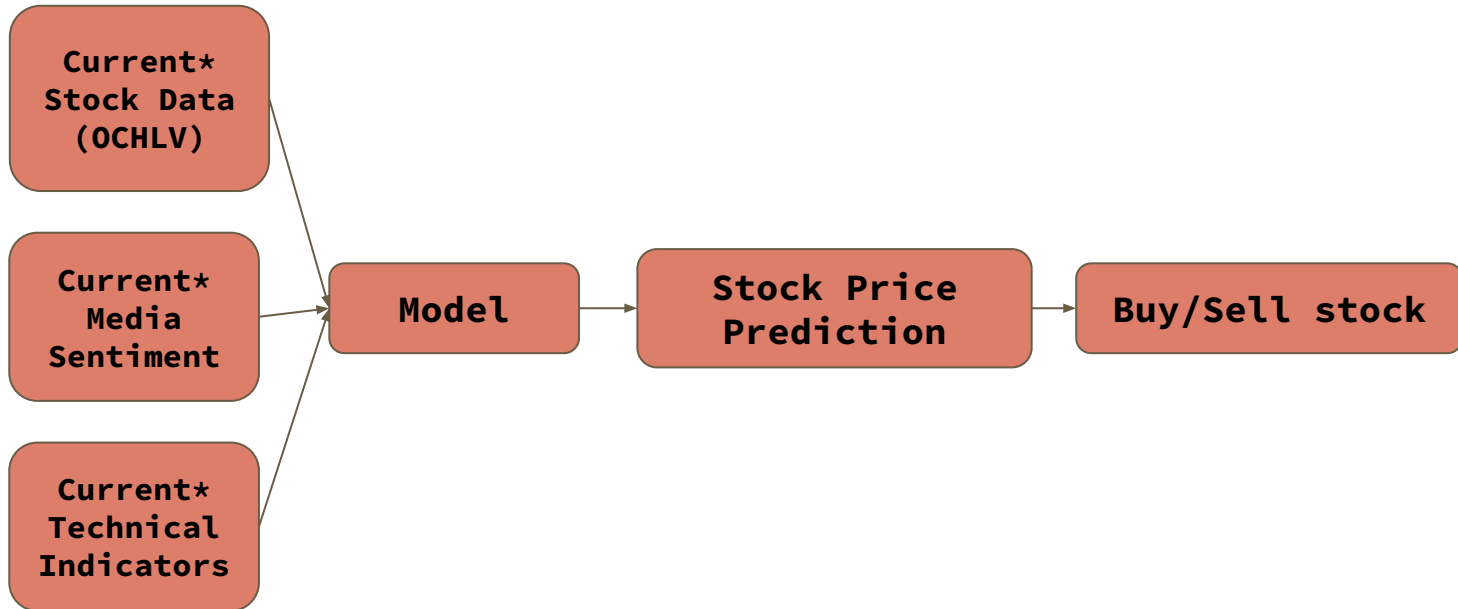
Methods: Trained LSTM's Predictions on Unseen Data
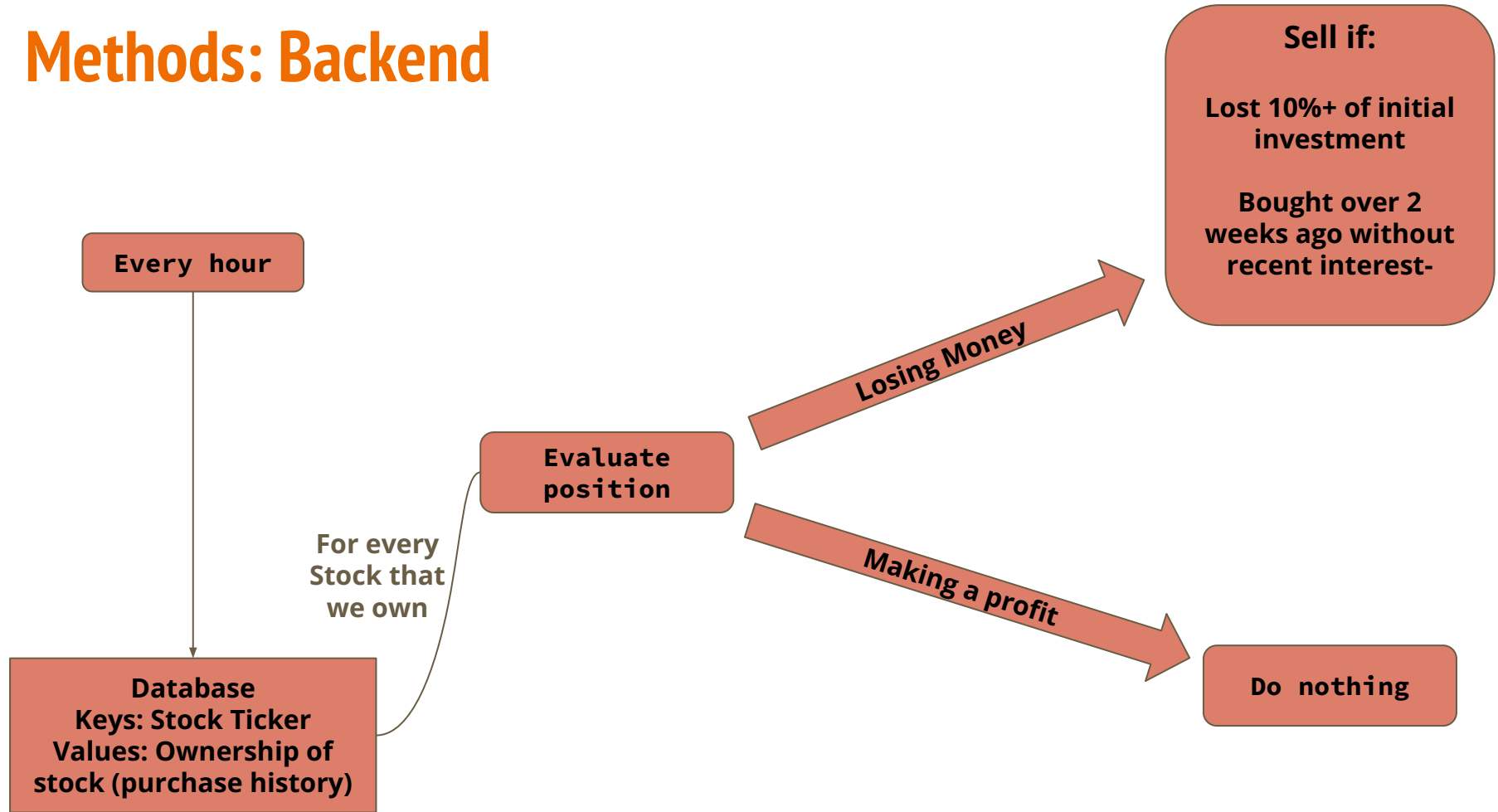
*Data including the last week of the market (Actual prediction on unseen data)
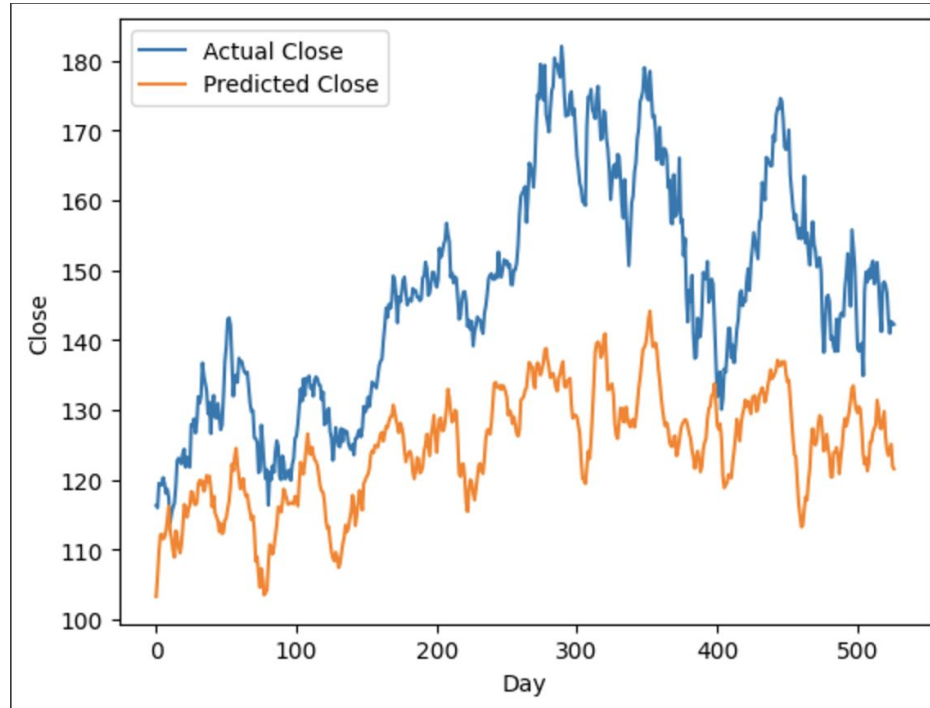
Methods: Backend

Methods: Backend

Every hour

Database
Keys: Stock Ticker
Values: Ownership of
stock (purchase history)

For every
Stock that
we own

Evaluate
position

Losing Money

Making a profit

Sell if:

Lost 10%+ of initial
investment

Bought over 2
weeks ago without
recent interest-

Do nothing

Website

WeTrade

Dashboard   Stocks   Portfolio   Automation

AAPL
Apple Inc.

$178.72
↑ 2.45%

[1D] [1W] [1M] [6M]

$161

$159

$157

$155

$153

04/14   04/16   04/18   04/20   04/22   04/24   04/26   04/28   04/30   05/02   05/04   05/06   05/08   05/10   05/13

Market Cap	Volume	P/E Ratio	Dividend Yield
$2.82T	59.7M	29.4	0.58%

Holdings

Buy/Sell

Shares	Avg. Price	Value	Profit/Loss
150	$145.32	$26808.00	+$5010.00 (23.00%)

Recent News

Apple's stock rises on strong quarterly earnings
⊕ CNBC • ⏱ 5 hours ago

Analysts predict continued growth for Apple in 2023
⊕ Bloomberg • ⏱ 1 day ago

Apple's new MacBook Pro receives rave reviews
⊕ The Verge • ⏱ 2 days ago

Trading Weights

Aggressiveness Factor   75%

Controls how quickly the bot responds to market changes

Bullish Factor   60%

Determines bias toward buying vs. selling positions

Active   Trading with current weights   **Apply**

Market Overview

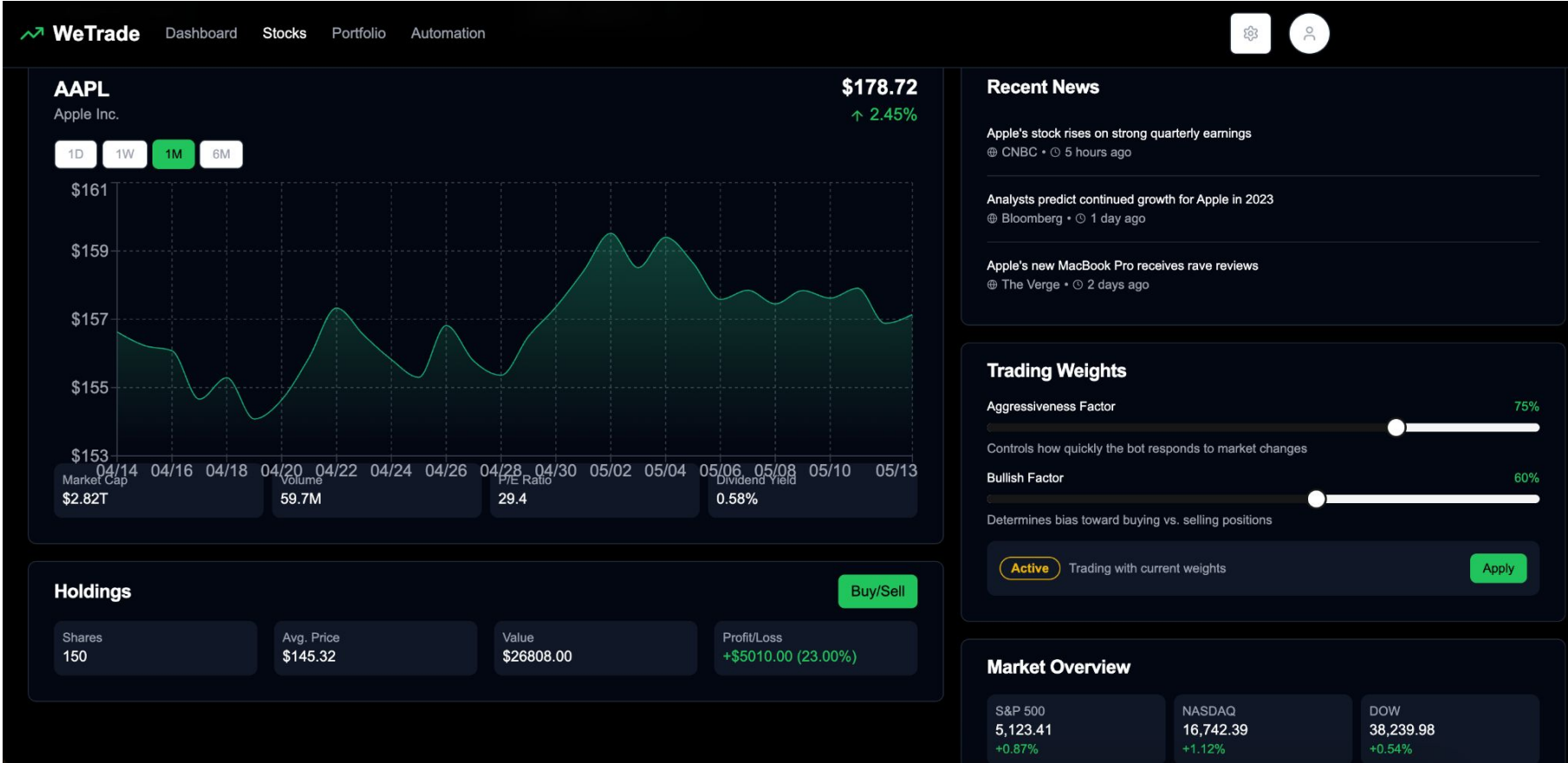| S&P 500	NASDAQ	DOW
5,123.41	16,742.39	38,239.98
+0.87%	+1.12%	+0.54%

Results

- In backtesting, the model demonstrated sufficient predictive accuracy for live trading implementation

- In the first week of trading the model has made a 4% profit

- Website is operational and integrated

   with LSTM model

Your portfolio

$ 104,212.75 +4.21

May 21, 07:02 AM EDT

Apr 21   Apr 30   May 11   May 20

Limitations

- Compared to major companies we have less up to date stock data. (HFT bots compete for information transmitted in milliseconds)

- We are limited because of the news sources' bias

- We are limited by our time frame

Conclusion and Future Work

- In the future we will further develop long term investing

- Combines historical data, technical indicators, and sentiment analysis into a single, responsive system for smarter, long-term investing.

- Our user-adjustable website encourages financial literacy and tailored investment strategies.

References

- Investopedia
- Alpha Vantage API
- Alpaca API
- MACD Explained (Youtube)
- Federal Reserve
- Medium.com
- Rising Wave

THANKS!

Any questions?