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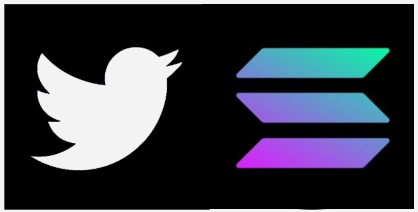
THE UNIVERSITY OF CHICAGO

Twitter Sentiment Analysis for Real-Time Solana Trading

Real Time Intelligent Systems Final Project



2022

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Project Overview

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Why This Project?

- Cryptocurrency trading volumes have skyrocketed to as high as $300B USD/day
- With no underlying asset, cryptocurrency valuations are often volatile and “hype-driven”
- Twitter activity can signal both positive and negative interest in a coin.
- Viral tweets can often have an near-immediate effect on the market
- The goal of this project is to create a profitable real time trading system that can generate signals in real time based on the sentiment of a tweet.

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Project Steps

Data Collection

- **Twitter** API for historical tweet data
- **CryptoCompare** API for historical Solana price data
- **Binance** API for live Solana price data

Data Engineering

- Label tweets with 24h trailing return
- Tokenize historical and real time tweets to standardize length

Model Training

- Train **LSTM** model on two weeks of historical data
- **Predict** 24-hour returns

Trading Strategy

- Utilize **sentiment analysis** to predict price movement
- Transform price predictions into **trading signals**

Real-Time Trading

- Stream Twitter data in **real-time**
- Generate trading signals and track PNL
- **Execute** long/buy and short/sell orders

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Data Collection

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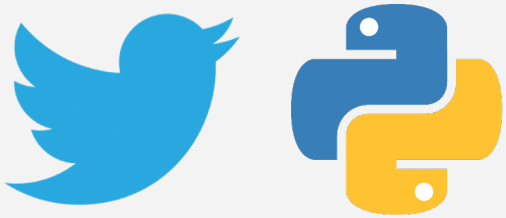
Data Collection with APIs

Twitter Data

- Developer account with elevated access to Twitter API
- Tweepy library to access the Twitter API through Python
  - Search_recent_tweets function to collect historical tweets
  - Stream.filter function to stream tweets in real time



Price Data

- Cryptocompare web-socket API to collect historical Solana price data
  - From symbol - SOL
  - To symbol - USD
- Binance web-socket API to collect real time Solana price data
  - From symbol - SOL
  - To symbol - USDT

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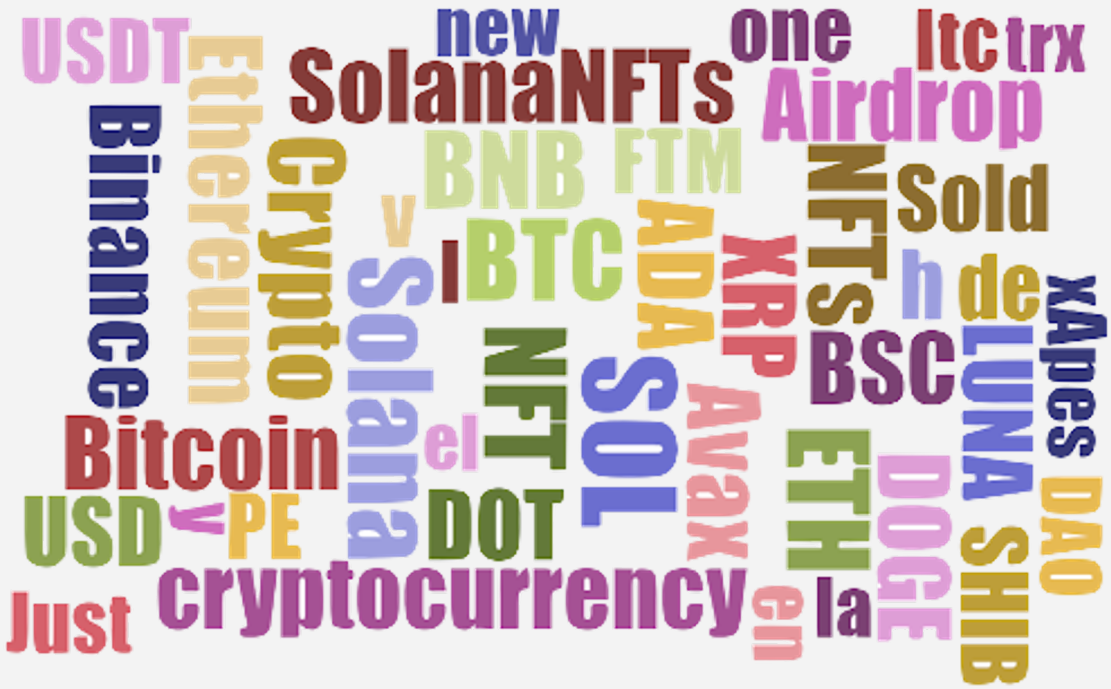
Text Analysis



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Data Engineering

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Data Engineering

- Associate tweet with 24-hour trailing returns minute-by-minute
- Remove punctuation and tokenize vectors on most common 1000 words to limit overfitting small samples
- Embedding layer to reduce input dimensionality
- Split train and test sets by time to avoid data leakage

Time	Followers	Text
2022-03-11 20:16:43	21880	Whats the highest price your favorite [...]
2022-03-11 20:16:44	17	This project is going to be great [...]

+

Time	Close	Move	Percent
2022-03-11 20:16:00	80.68	1.11	0.013758
2022-03-11 20:17:00	80.78	1.05	0.012998

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Time	Followers	Text	Returns
2022-03-11 20:16:43	21880	Whats the highest price your favorite [...]	0.012998
2022-03-11 20:16:44	17	This project is going to be great [...]	0.012998

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Model Training

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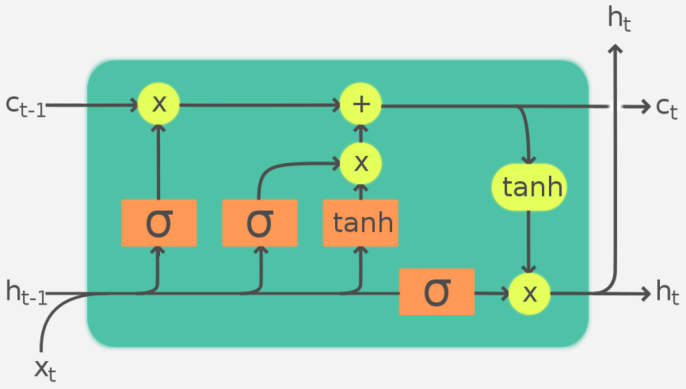
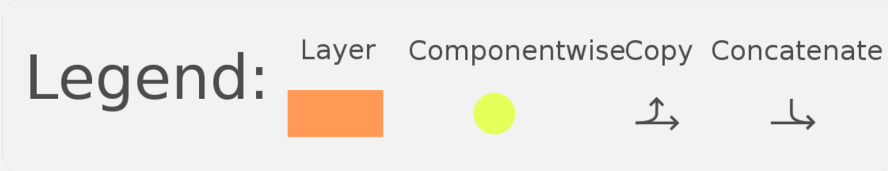
Model Selection

LSTM

- Allows us to associate words with price movement
- Long short-term memory (LSTM) models are a form of recurrent neural network with the ability to retain information over long sequences
- When applied to text recognition, allows for pattern recognition of phrases or word combinations separated by long stretches
- Implemented using the Keras library with MSE loss function, adam optimizer





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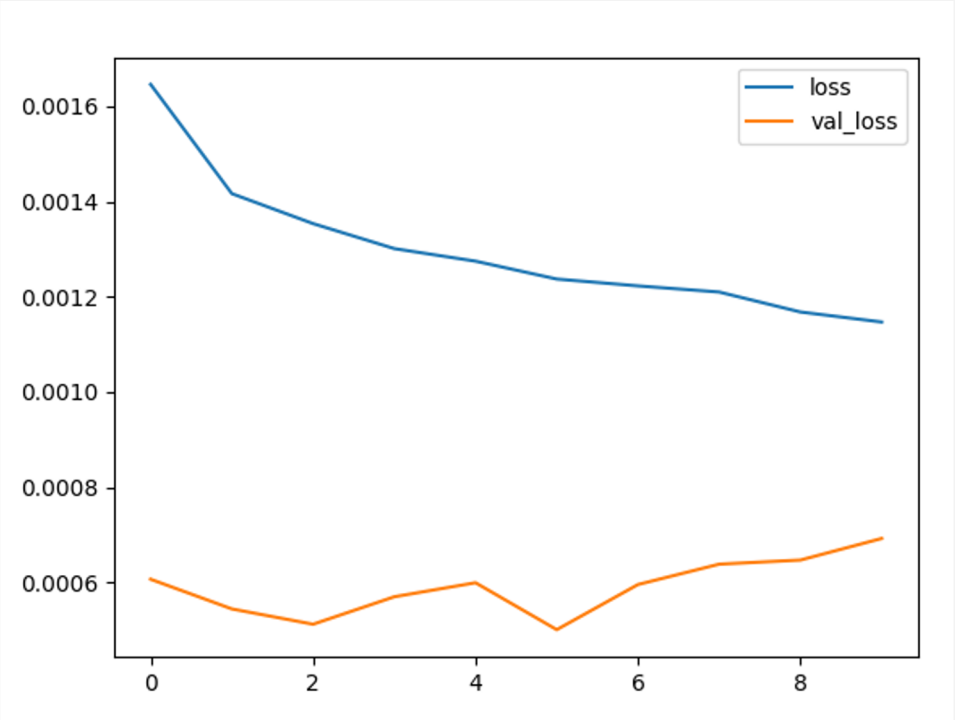
Model Training

- Training set of 13,000 Tweets collected over 2 weeks
- Validation set time frame had significantly lower variance than training set
- Training beyond 5 epochs did not improve validation loss
    - 5 epochs used for final model



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Model Predictions

Positive

- Memecoin
- Pengoicy
- Airdrop
- Project
- Ada
- Xrp
- Nftart

Negative

- Bnb
- Binance
- Avax
- Cro
- Tez
- Shill
- Chill
- Poly

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Trading Strategy

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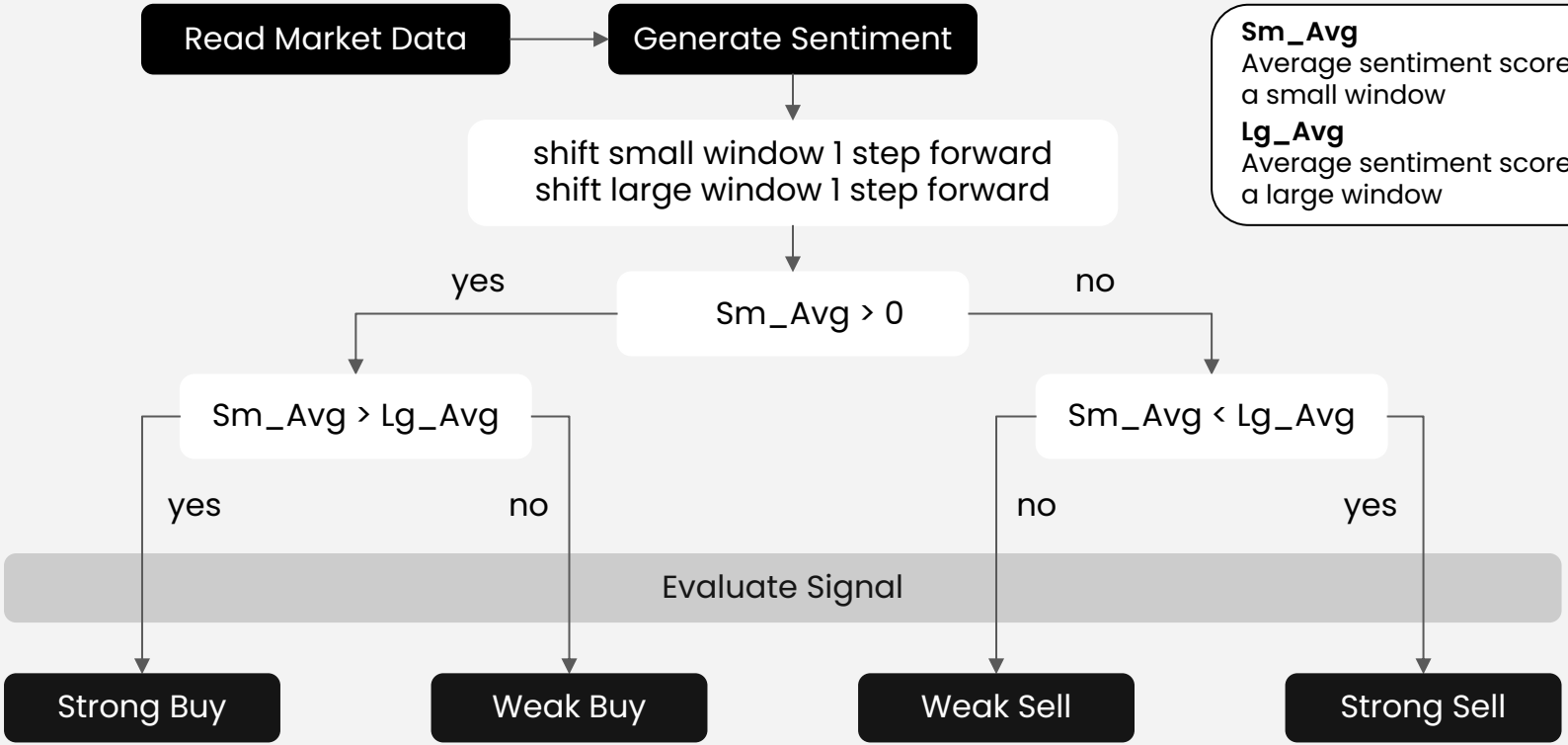
Sentiment Interpretation



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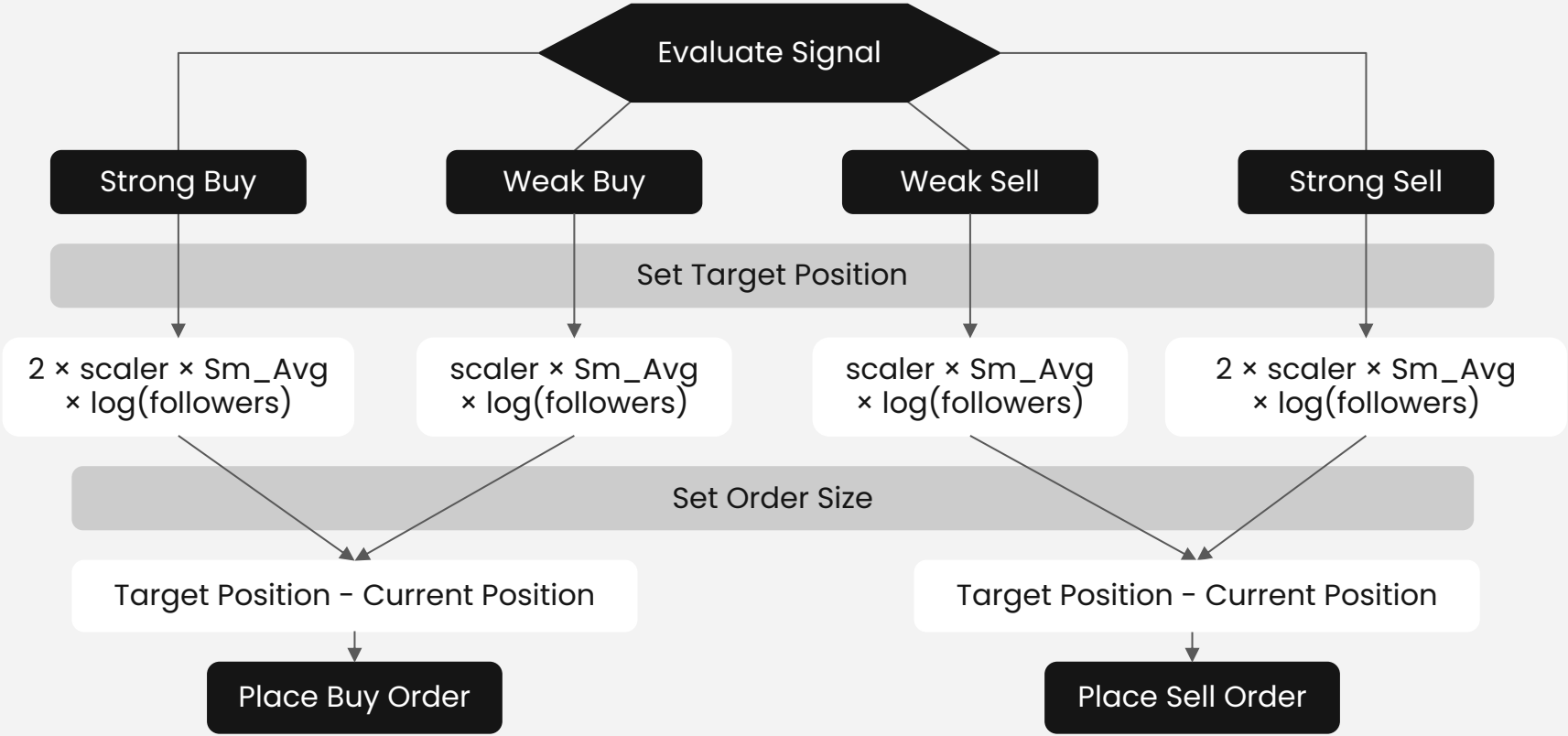
Trading Algorithm



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Real-Time Trading

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Real-Time Trading

Trading Strategy Class

- Track positions, cash, holdings, profits and losses
- Define **trading strategy** and initialize parameters
- Instantiate queues to record tweet sentiment
- Create a **real time twitter stream** instance

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- **Trade** method to connect to twitter stream and begin trading
- **On_market_update** method to generate signal
- **Check_signal** method to execute orders

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- **Stop** method to disconnect from twitter stream and stop trading
- **Close** current position and liquidate all holdings

Twitter Stream Class

- Parent class inheriting **tweepy.Stream**
- Establish a **streaming connection with Twitter** API
- Start and stop streaming tweets based on its **trading strategy superclass** instance

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- Extract tweet fields in real time
- Perform **sentiment analysis** on extracted text
- Pass an **update** containing sentiment, price, and followers to the trading system

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- **Disconnect** from twitter stream
- Pass a “disconnect update” to instruct trading system to **close position** at current price

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Next Steps

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Next Steps

- Gather tweets over a larger time frame and on multiple cryptocurrencies
- Gather data from other sources
  - Reddit
  - News
  - Discord
  - Telegram
- Explore whether phrase patterns and tweet activity translate across cryptocurrencies or are unique to each currency
- Utilize model predicted risk and return to refine sizing
- Alternative models (GRU, BERT)

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Real-Time Demo

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