# Building a code and data repository for teaching algorithmic trading

## Final Presentation

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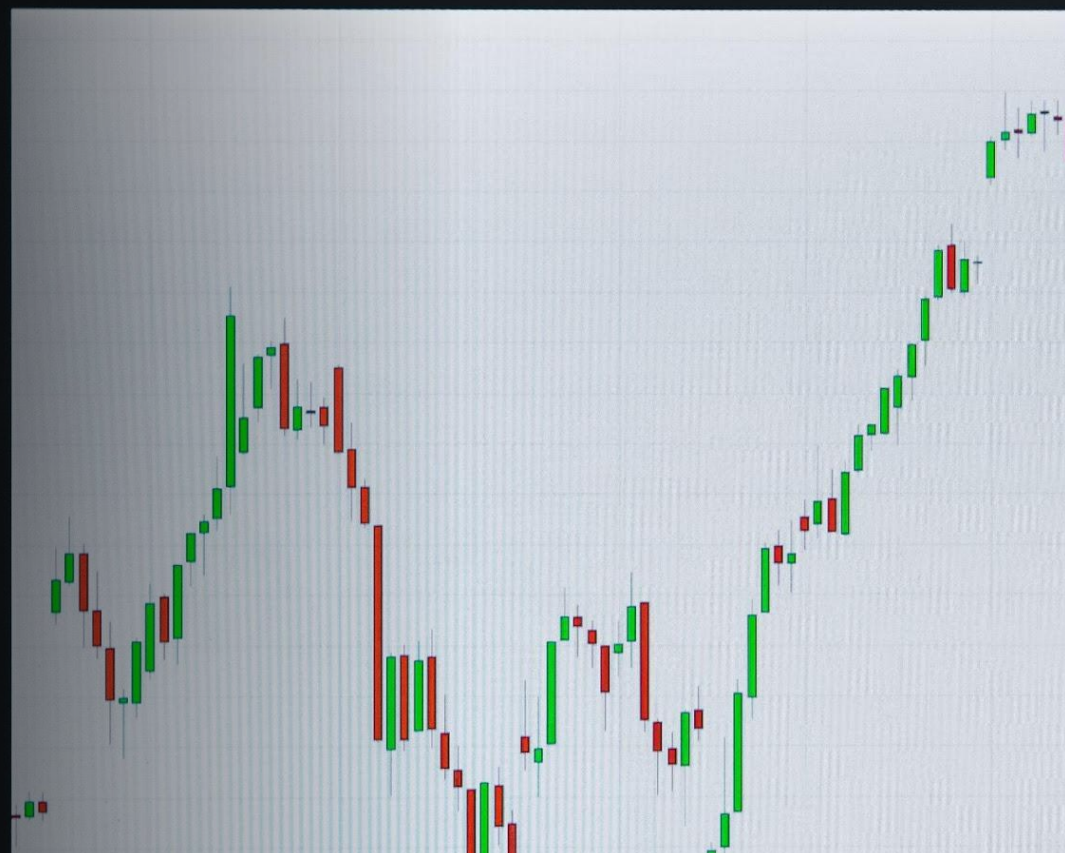


# Introduction

## Algorithmic Trading in a nutshell


Collect & pre-process relevant data.

Analyse the data to generate signals.

Use a broker's API.

# Introduction

## The Growth and Future of Algo Trading

經濟通 etnet

04/10/2017

電腦化時代 演算交易人才渴市

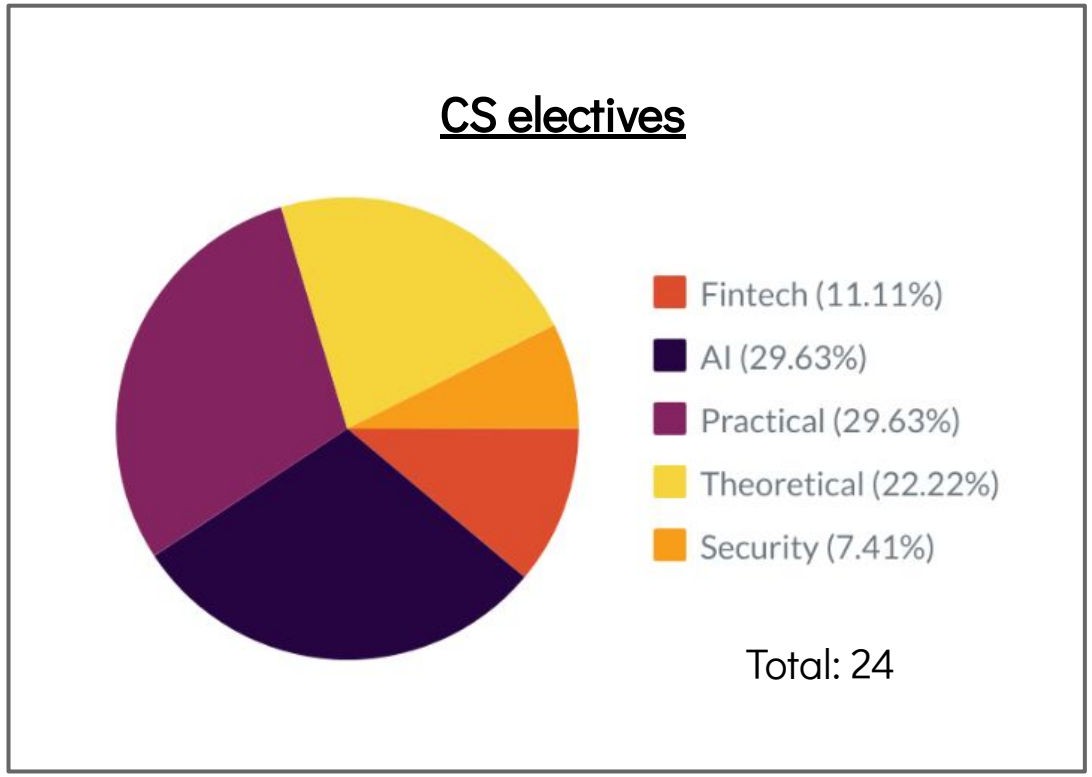
#演算交易

**Translation:** "*Rising Demand for Algorithmic Trading Talents in the Information Age*"

(Source: etnet news)

# Project Background

## Courses offered at HKU CS




- Growing proportion of FinTech courses
- No courses focusing on algo trading in the current **BASc(FinTech) Curriculum**

## Hong Kong...

- As a financial hub with one of the world's biggest stock exchange

⇒ Indispensable to learn the skill

# Project Background

## Other courses at HKU that involve algo trading

| HKU Faculty of Business and Economics |
| --- |
| **FINA3237** Hedge Fund |
| **FINA4354** Financial Engineering |
| **FINA4359** Big Data Analytics Applied Toward Quantitative Finance |
| **FINA4350** Text Analytics and Natural Language Processing in Finance |

**Course content**

**Module 1-4:** Data science
**Module 5-6**: Quantitative trading strategies
**Module 7**: Basic machine learning

## Proposed curriculum:

- Larger focus on programming, backtesting & trading
- Less time spent on teaching the basics (e.g. Python basics)

# Project Background

## Online learning resources for algo trading

### Finance

Investopedia

Medium

### Code

Udemy

GitHub

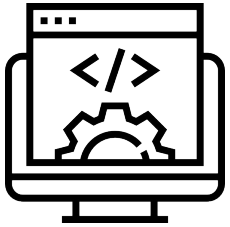
**Findings:**

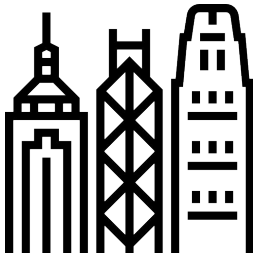
1. Scattered
2. US-focused
3. Assumed with preliminary knowledge

# Objectives

## Educational objectives

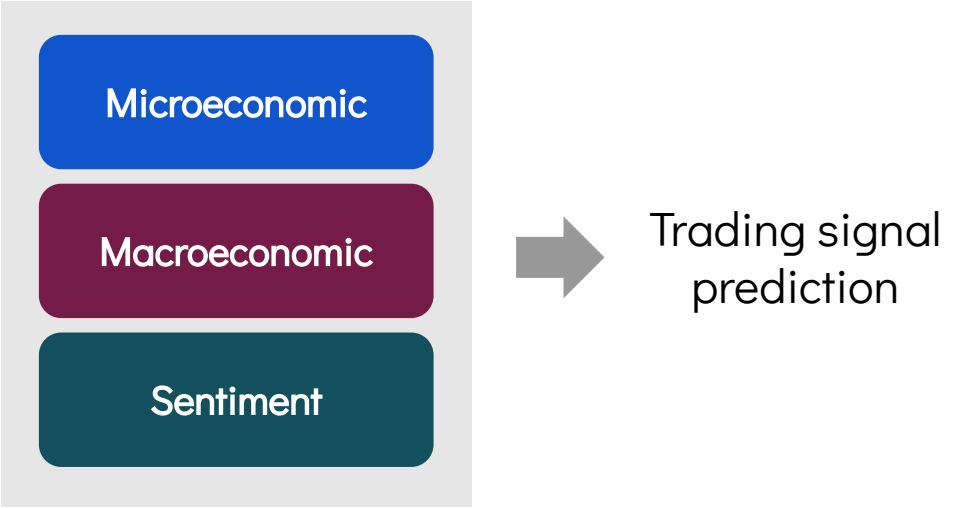
- Build an open-source repository that puts together the concepts & knowledge necessary for algo trading
- Resources & data in Hong Kong context





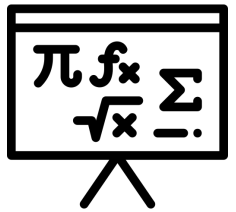
## Research objectives

- Create a database for stock analysis
- Backtesting & experiments with multi-feature trading signal prediction model



# Project Overview

## Design of the code & data repository

</> Code × Tutorial 

**Github repo**

Example programs
Constantly maintained
Inline comments

**Documentation website**

Financial concepts
Math equations
Step-by-step guide

# Project Overview

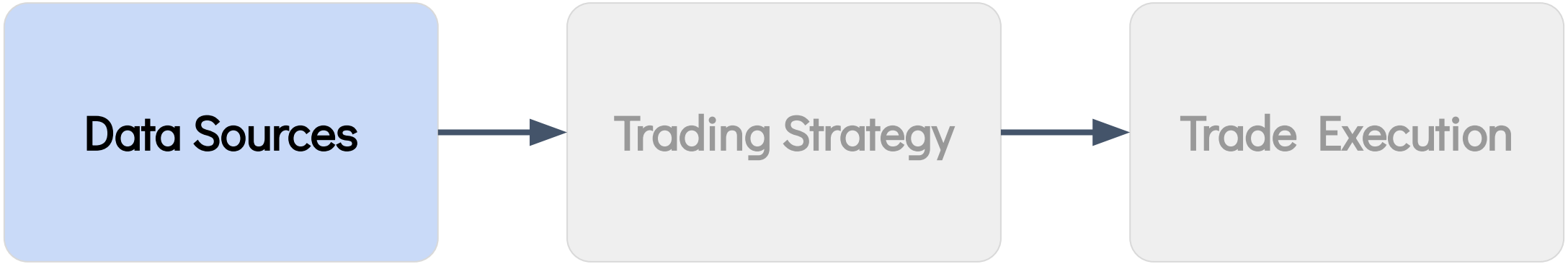
## Design of the code & data repository


Database + Code for updating database

Conventional strategies + Advanced strategies

Paper Trading with Interactive Brokers

# Part 1 – Database

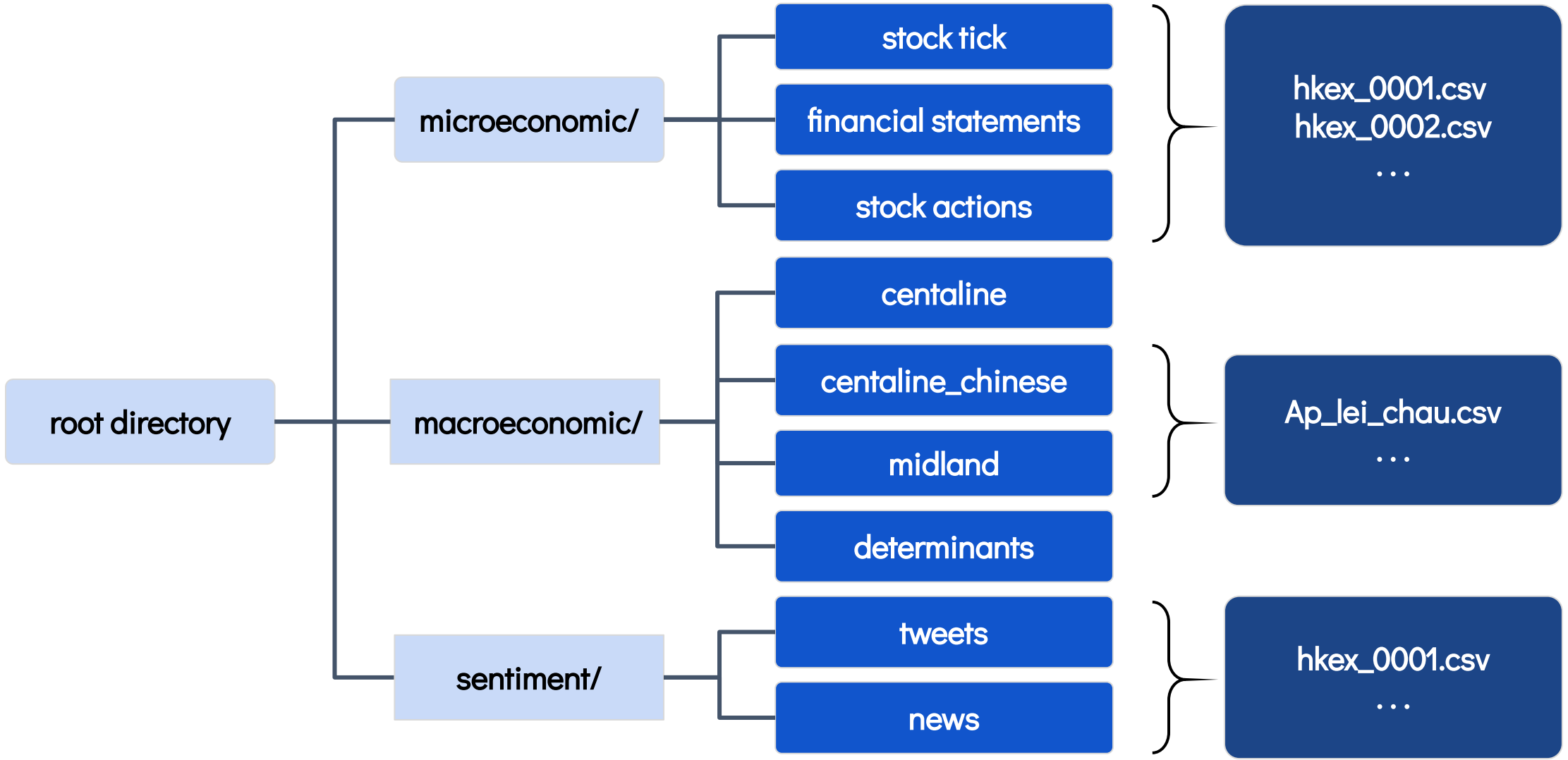



Database + Code for pre-processing

Python, Yahoo! Finance API, Beautiful Soup

1. **Microeconomic data**
2. **Macroeconomic data**
3. **Sentiment data**

# Database Structure



# Database Fact Sheet

| Microeconomic | No. of rows | Size |
|---|---|---|
| Ticker symbol list | 28,003 | 1441 KB |
| 1-day stock tick | 48,597,879 | 4.36 GB |
| 1-min stock tick | 152,452,357 | 13.11 GB |
| Financial statements | 254,176 | 131.1 MB |
| Stock actions | 288,021 | 5.87 MB |
| Company info | 4602 | 18.66 MB |
| **Total** | 201,625,038 | 17.56 GB |

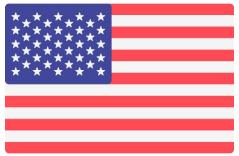
| Macroeconomic | No. of rows | Size |
|---|---|---|
| Centaline Property (EN) | 251,660 | 21.7 MB |
| Centaline Property (ZH) | 191,695 | 20.7 MB |
| Midland Realty | 166,481 | 26.2 MB |
| Economic indicator | 212 | 25 KB |
| **Total** | 610,048 | 68.85 MB |

| Sentiment | No. of rows | Size |
|---|---|---|
| HK News (aastock) | 1,139,768 | 126.9. MB |
| US News (finviz) | 636,263 | 88.4 MB |
| Tweets | 2,202,230 | 406.5 MB |
| **Total** | 3,978,261 | 621.8 MB |

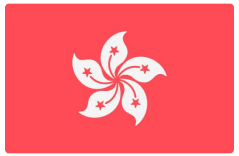
# Microeconomic Data

For each **ticker symbol**:

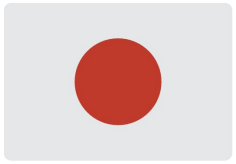
1. Ticker symbol list
2. 1-day stock tick
3. 1-min stock tick
4. Income statement
5. Balance sheet
6. Statement of cash flow
7. Company info
8. Stock actions data



**NASDAQ -** 3598
**NYSE -** 2498



**HKEX** - 1481



**TSE -** 3574

**SSE -** 1823
**SZSE -** 2579

Extract of **hkex_0001.csv**:

(1-day stock tick)

| Date | Open | High | Low | Close | Volume |
|---|---|---|---|---|---|
| 4/1/2000 | 33.0374514 | 33.367817 | 32.3767166 | 32.3767166 | 3194413 |
| 5/1/2000 | 30.890019 | 31.3855906 | 29.9815228 | 30.1466827 | 6058531 |
| 6/1/2000 | 30.3944727 | 30.5596326 | 28.0818181 | 28.6599941 | 10440480 |
| 7/1/2000 | 29.0729631 | 29.4033304 | 28.5773917 | 29.2381229 | 6049796 |
| 10/1/2000 | 30.2292635 | 30.7248383 | 29.4859295 | 29.4859295 | 5195405 |
| 11/1/2000 | 30.2292671 | 30.5596327 | 29.5685359 | 30.2292671 | 6175861 |

*More examples available in the report.

# Microeconomic Data

## Makefile demo

To-add in pptx file

# Macroeconomic Data

## Hong Kong residential market transactions records

- **Centaline Property (English)**: 2017 to 2020
- **Centaline Property (Chinese)**: 2018 to present
- **Midland Realty**: 2018 to present

With features describing the transaction
E.g. district, address, price, gross area, saleable area, reg date, etc...

## Economic Data

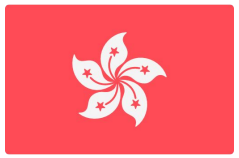
- **Census and Statistics Department**: since 2017 to present

中原地產 CENTALINE PROPERTY
中原地產代理有限公司 牌照號碼 C-000227

美聯物業 MIDLAND REALTY
Founded in 1973
香港聯交所上市公司(1200)成員

政府統計處
Census and Statistics Department

# Sentiment Data



**HKEX** - 1481

News from aastock.com

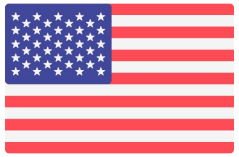
1. Research Report
2. Result Announcement
3. Industry News

> **1** Million news entries since 2011

| | dates | news | ticker | newstype |
|---|---|---|---|---|
| 0 | 2021-02-25 | Li Ka-shing Recaptures Forbes' HK Richest Man... | 1 | news-daily |
| 1 | 2021-02-25 | Li Ka-shing Plotting to Form SPAC, Mulling to... | 1 | news-daily |
| 2 | 2021-02-09 | CKH's HPH Trust 2020 NP Climbs 57%; 2H20 DPU ... | 1 | news-daily |
| 3 | 2021-01-19 | A.S. Watsons, Grab Enter Into Health & Beauty... | 1 | news-daily |
| 4 | 2021-01-12 | HSI Widens Gain to Over 200 Pts, Nearly 1-Yr ... | 1 | news-daily |
| ... | ... | ... | ... | ... |
| 1139763 | 2017-03-19 | SHENZHENEXPRESS (00548.HK) FY Net Profit RMB1.... | 80737 | news-indus |
| 1139764 | 2017-03-19 | ANHUIEXPRESSWAY (00995.HK) Forms Fund Partnership | 80737 | news-indus |
| 1139765 | 2017-03-18 | SHENZHENEXPRESS (00548.HK) 2016 Net Profit Dow... | 80737 | news-indus |
| 1139766 | 2017-03-17 | CRTG Spurts 21% on Soaring Volume; Plans to Bu... | 80737 | news-indus |
| 1139767 | 2017-03-17 | CRTG Issues New Shares to Buy Forage Biz, Invo... | 80737 | news-indus |

1139768 rows × 4 columns

*pandas dataframe for news from aastock.com*



**NASDAQ** - 3598
**NYSE** - 2498

1. News from finviz.com
2. Historical tweets from Twitter standard API

> **2** Million tweets in US MKT

Around 0.7 million news in US MKT

since January 2021

| | tweets | ticker | sector |
|---|---|---|---|
| 0 | b'RT @TradezTiger: Why Investors Like $CBBT? \... | AACG | Consumer Services |
| 1 | b'RT @TradezTiger: Why Investors Like $CBBT? \... | AACG | Consumer Services |
| 2 | b'RT @TradezTiger: Why Investors Like $CBBT? \... | AACG | Consumer Services |
| 3 | b'RT @TradezTiger: Why Investors Like $CBBT? \... | AACG | Consumer Services |
| 4 | b'RT @TradezTiger: Why Investors Like $CBBT? \... | AACG | Consumer Services |
| ... | ... | ... | ... |
| 1389428 | b'$PSWW Real company, real development, real D... | ZYXI | Health Care |
| 1389429 | b'$SE\nZYXI\n$TIGR\nQFIN\n$YSG\nYI\n$PRCH\n... | ZYXI | Health Care |
| 1389430 | b"RT @Tickeron: $ZYXI's in Downtrend: Moving A... | ZYXI | Health Care |
| 1389431 | b"$ZYXI's in Downtrend: Moving Average Converg... | ZYXI | Health Care |
| 1389432 | b'@michael2017l Would you consider $ZYXI in sa... | ZYXI | Health Care |

1389433 rows × 3 columns

*pandas dataframe for tweets in NASDAQ*

# Data License

### Microeconomic Data

- Yahoo! Finance - Redistribution restricted
- IR Bank (Japan) - OK
- Simfin (US) - OK
- Baostock (Mainland) - OK

### Macroeconomic Data

- Centaline Property - Redistribution restricted
- Midland Property - Redistribution restricted
- Census and Statistics Department - OK

### Sentiment Data

- aastock.com - Redistribution restricted
- finviz.com - OK
- Tweets - OK

Solutions:

1. **Data scraping code**
2. **Centralised storage**
3. **Fair dealing**
   - Non-commercial
   - Reasonable proportion

# Part 2 – Trading Strategy

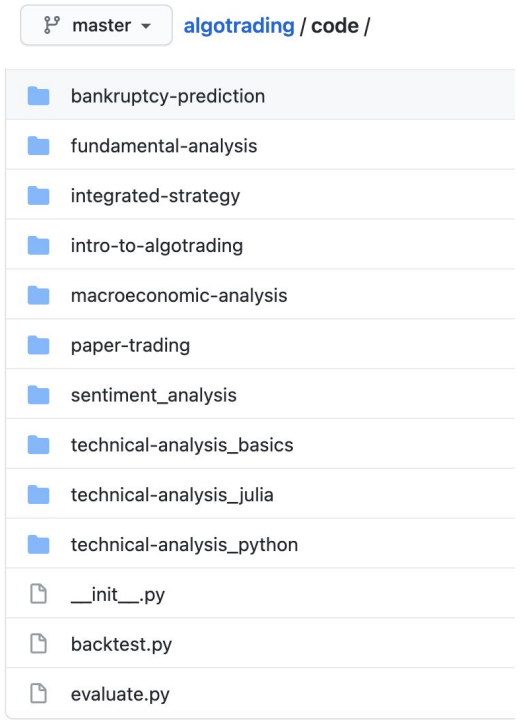

Conventional strategies
+ Advanced strategies

Python, Julia (snippets)

# Code Examples Fact Sheet

| Microeconomic | Examples | Format |
|---|---|---|
| Data scraping / update | 46 | Python + Jupyter Notebook |
| Intro to Algo Trading | 3 | Jupyter Notebook |
| Technical Analysis | 16 | Python |
| Fundamental Analysis | 1 | Jupyter Notebook |
| Bankruptcy Prediction | 1 | Jupyter Notebook |
| Julia for Algo Trading | 2 | Julia + Jupyter Notebook |
| **Macroeconomic** | | |
| Data scraping | 3 | Python |
| Exploratory Data Analysis | 6 | Jupyter Notebook |
| **Sentiment** | | |
| Data scraping | 3 | Jupyter Notebook/Python |
| Sentiment Analysis | 3 | Jupyter Notebook/Python |

| Integrated | Examples | Format |
|---|---|---|
| Paper Trading | 6 | Python |
| Baseline + LSTM models | 3 | Python |
| **Total** | 91 | |




on GitHub repo

# Technical Analysis

## TREND

- Moving Average Crossovers
- Moving Average Convergence Divergence (MACD)
- Parabolic Stop and Reverse (Parabolic SAR)

## VOLATILITY

- Bollinger Bands
- Average True Range (ATR)
- Standard Deviation

Total number of indicators = 16

## MOMENTUM

- Commodity Channel Index (CCI)
- Relative Strength Index (RSI)
- Rate of Change (ROC)
- Stochastic Oscillator (STC)
- True Strength Index (TSI)
- Money Flow Index (MFI)
- Williams %R

## VOLUME

- Chaikin Oscillator
- On-Balance Volume (BOV)
- Volume Rate of Change

# Technical Analysis

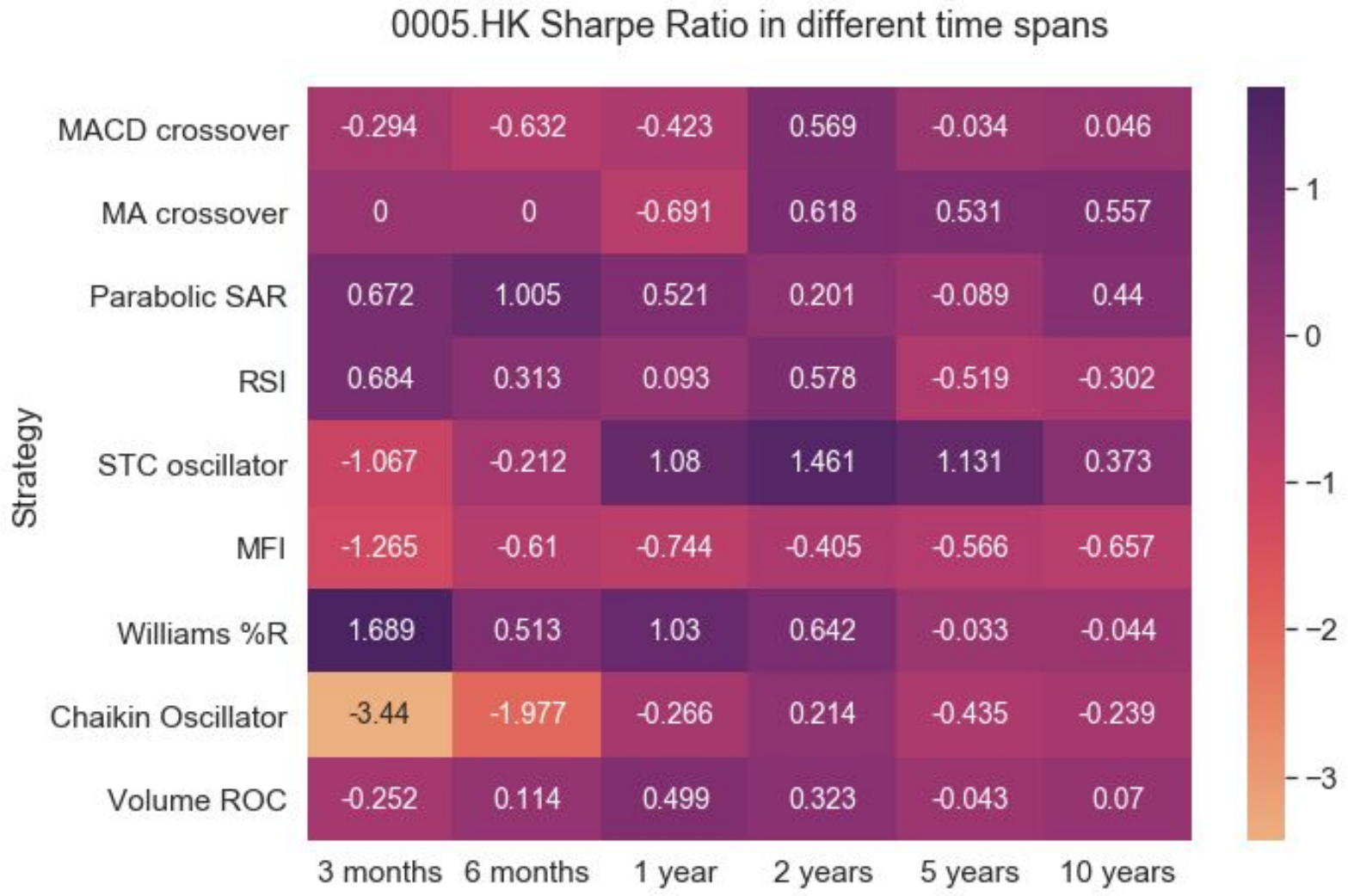
## Code demo

To-add in pptx file

# Technical Analysis – Experiment (1)

**Independent variable (varying):**
Strategy & Time (start date)

**Controlled variables (constant):**
Ticker = 0005.HK

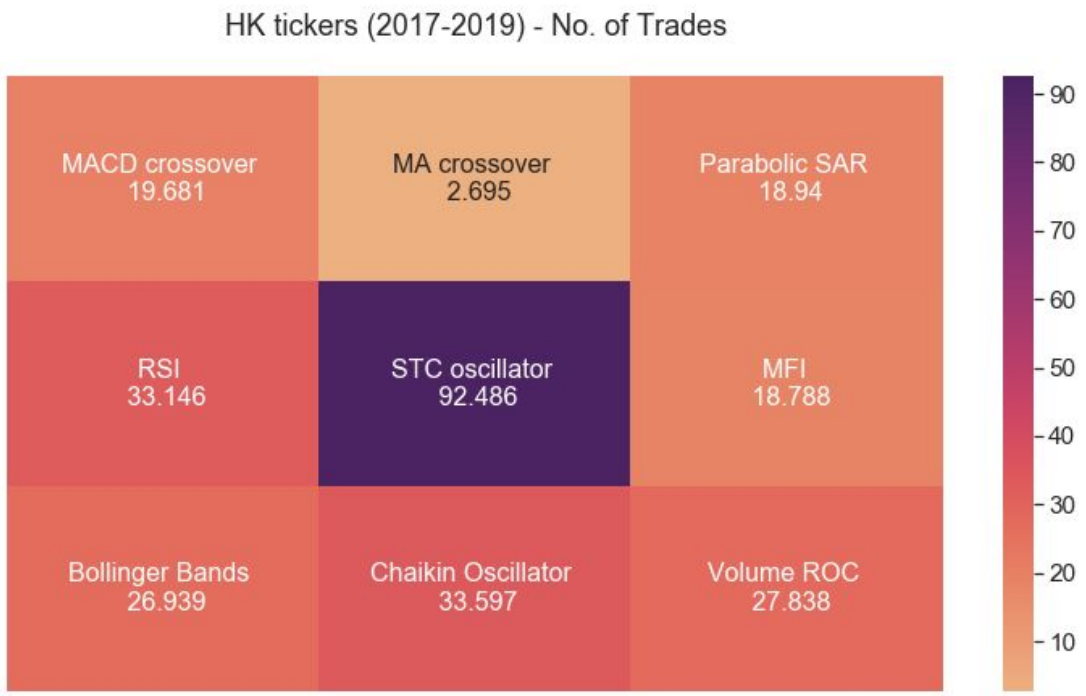


# Technical Analysis – Experiment (2)

**Independent variable (varying):** Strategy

**Controlled variables (constant):** Ticker = set of all tickers in HKEx, Time period = 2017-2019 and 2019-2021

## 1. No. of Trading Signals

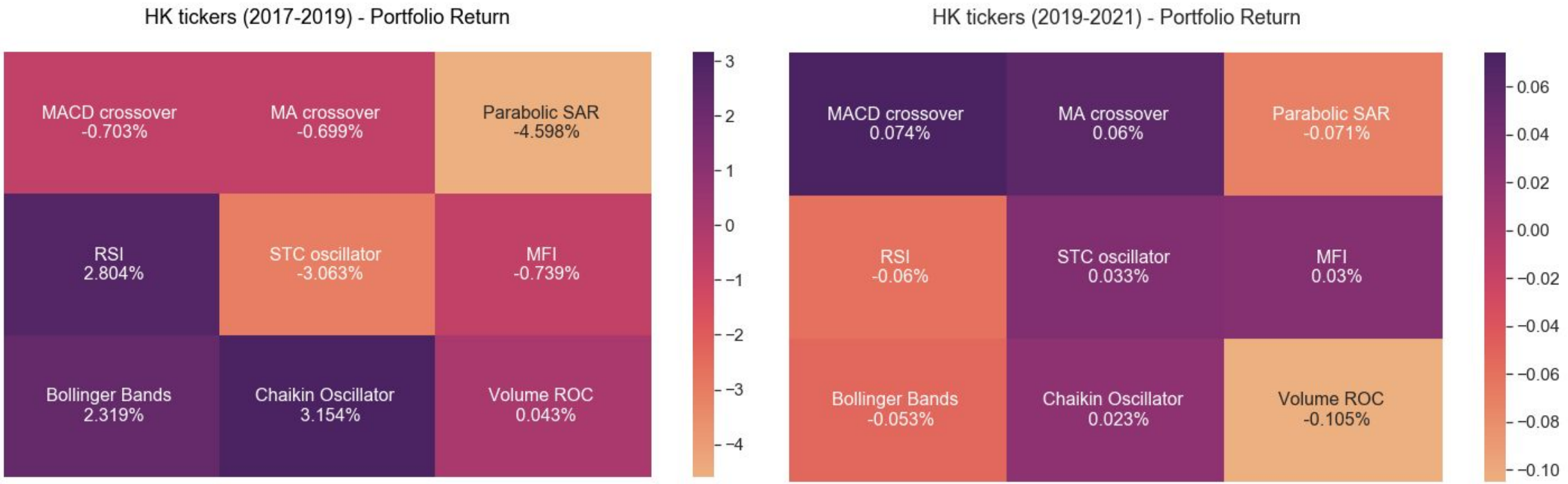



# Technical Analysis – Experiment (2) (cont'd)

**Independent variable (varying):** Strategy

**Controlled variables (constant):** Ticker = set of all tickers in HKEx, Time period = 2017-2019 and 2019-2021

## 2. Portfolio Return



# Fundamental Analysis

## SHORT-TERM SOLVENCY RATIO

- Current ratio
- Quick ratio
- Cash ratio
- Networking capital to current liabilities

## FINANCIAL LEVERAGE RATIO

- Total debt ratio
- Debt to equity
- Equity ratio
- Long-term debt ratio
- Times interest earned ratio

## TURNOVER RATIO

- Average collection period
- Inventory turnover ratios
- Receivable turnover
- Fixed asset turnover
- Total asset turnover

## PROFITABILITY RATIO

- Gross profit margin
- Net profit margin
- Return on assets (ROA)
- Return on equity (ROE)
- Earning per share (EPS)

# Fundamental Analysis

**Step #1** Compute **profitability** ratios:

- Return on Assets (**ROA**)
- Return on Equity (**ROE**)

## Ratio analysis (example)

| Ticker | Total asset turnover | Total debt ratio | Debt equity ratio | Equity ratio | Long-term debt ratio | Times interest earned ratio | Gross profit margin | Net profit margin | ROA | ROE | EPS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **1301** | 2.361250 | 0.706839 | 2.425762 | 0.291389 | 0.172012 | 7.753363 | 0.092355 | 0.007759 | 1.83 | 6.23 | 188.51 |
| **1332** | 1.403804 | 0.649464 | 2.155975 | 0.301239 | 0.204180 | 14.852078 | 0.193904 | 0.021402 | 3 | 9.64 | 47.46 |
| **1333** | 1.714197 | 0.698941 | 2.780364 | 0.251385 | 0.263612 | 13.058958 | 0.130434 | 0.013850 | 2.37 | 9.45 | 238.23 |
| **1352** | 2.005881 | 0.823191 | 5.230879 | 0.157371 | 0.487066 | 5.282051 | 0.078331 | 0.005640 | 1.13 | 7.13 | 54.22 |
| **1376** | 1.243356 | 0.564001 | 1.385869 | 0.406966 | 0.000000 | 128.159818 | 0.156968 | 0.019293 | 2.82 | 6.55 | 109.39 |

**Step #2** Sort by ROA, select **top 10%** of ticker symbols with highest ROA

*Detailed code implementation in the repository.

# Macroeconomic Analysis

1. **Macroeconomic Analysis**
   - Relationship between economic data and the Hong Kong stock price

     Data source: Spacious.hk, Census and Statistics Department

2. **Economic Indicator analysis**
   - Relationship between monthly average house price per saleable area and economic data

     Data source: Centaline Property, Census and Statistics Department

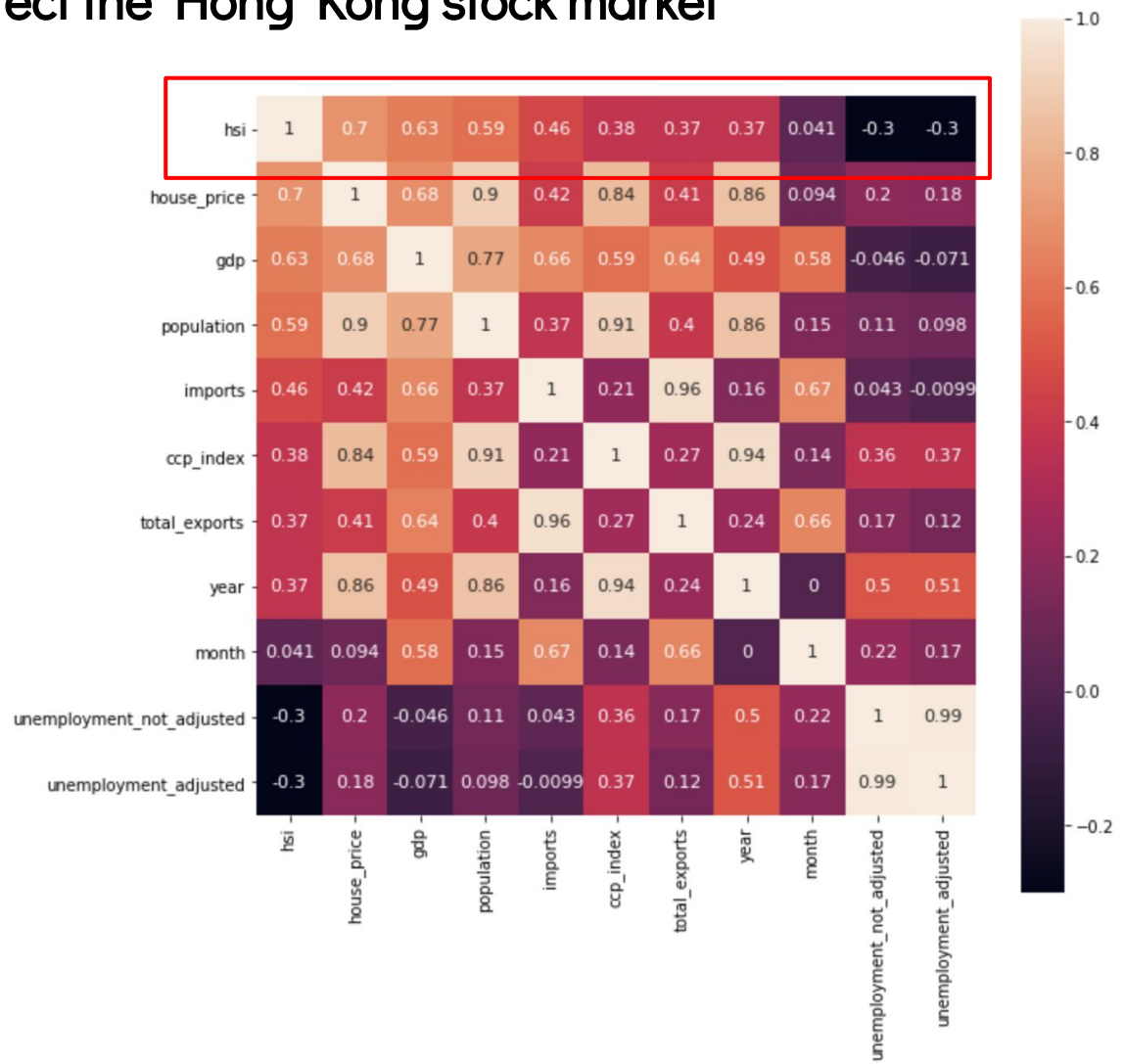
3. **Transaction record analysis**
   - Relationship between house price and features of the transaction (e.g district, gross area,..)

     Data source: Midland Realty

# Macroeconomic Analysis

## Explore how the macroeconomic indicators affect the Hong Kong stock market (2016 - 2020)

| Feature | Correlation coefficient with HSI |
|---|---|
| House Price | 0.7 |
| GDP | 0.63 |
| Population | 0.59 |
| Imports | 0.51 |
| Composite consumer price index | 0.38 |
| Total exports | 0.37 |
| Year | 0.37 |
| Unemployment rate (not seasonally adjusted) | -0.3 |
| Unemployment rate (seasonally adjusted) | -0.3 |



# Macroeconomic Analysis – Pandemic

## The impact of COVID-19 pandemic on correlation in economic indicators

- Before Pandemic (Apr 2018 to Dec 2019)
- After Pandemic (Jan 2020 to Mar 2021)

*unexpected results

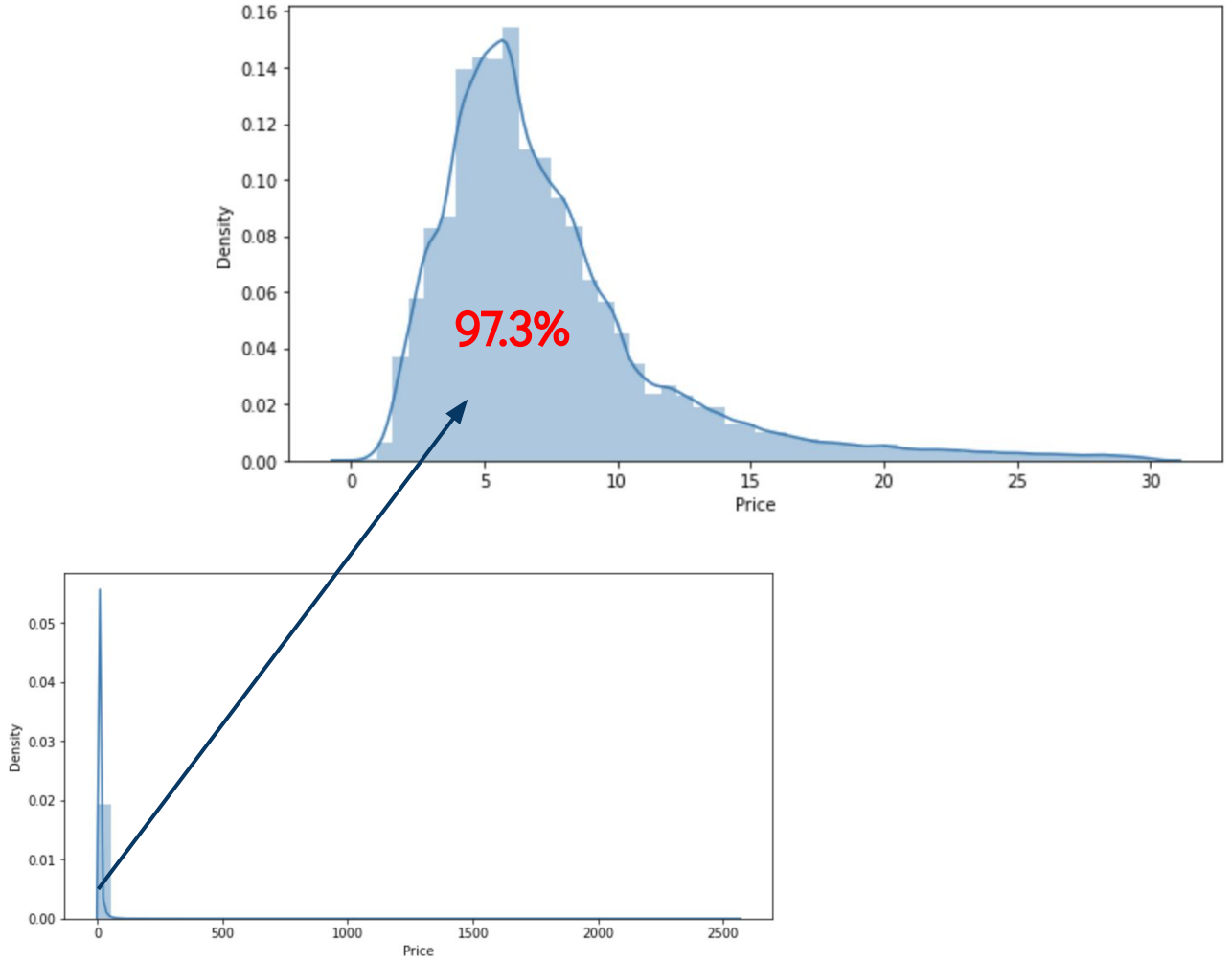
| Feature | Correlation coefficient with HSI |
|---|---|
| House Price | 0.41 |
| Unemployment rate (seasonally adjusted) | -0.21 |
| Imports | -0.24 |
| Unemployment rate (not seasonally adjusted) | -0.34 |
| Total exports | -0.36 |
| Composite consumer price index | -0.41 |
| Population | -0.48 |
| GDP | -0.77 |

| Feature | Correlation coefficient with HSI |
|---|---|
| GDP | 0.56 |
| Composite consumer price index | 0.44 |
| Unemployment rate (seasonally adjusted) | 0.34 |
| Unemployment rate (not seasonally adjusted) | 0.15 |
| House price | 0.14 |
| Total exports | 0.041 |
| Imports | 0.034 |
| Population | -0.42 |

# The Hong Kong Real Estate Market

## House price distribution (2017 - 2020)

| Description | Price (million HKD) |
|---|---|
| Count | 251660 |
| Mean | 8.80 |
| Standard Deviation | 14.9 |
| Minimum | 0.4 |
| 25% | 4.65 |
| 50% | 6.40 |
| 75% | 9.81 |
| Maximum | 2566 |



# The Hong Kong Real Estate Market

## Correlation with monthly average house price per saleable area (2017 - 2020)

| Feature | Correlation coefficient |
|---|---|
| Population | 0.67 |
| Year | 0.6 |
| Composite consumer price index | 0.59 |
| GDP | 0.55 |
| Imports | 0.46 |
| Total exports | 0.41 |
| Month | 0.22 |
| Unemployment rate (not seasonally adjusted) | -0.49 |
| Unemployment rate (seasonally adjusted) | -0.61 |

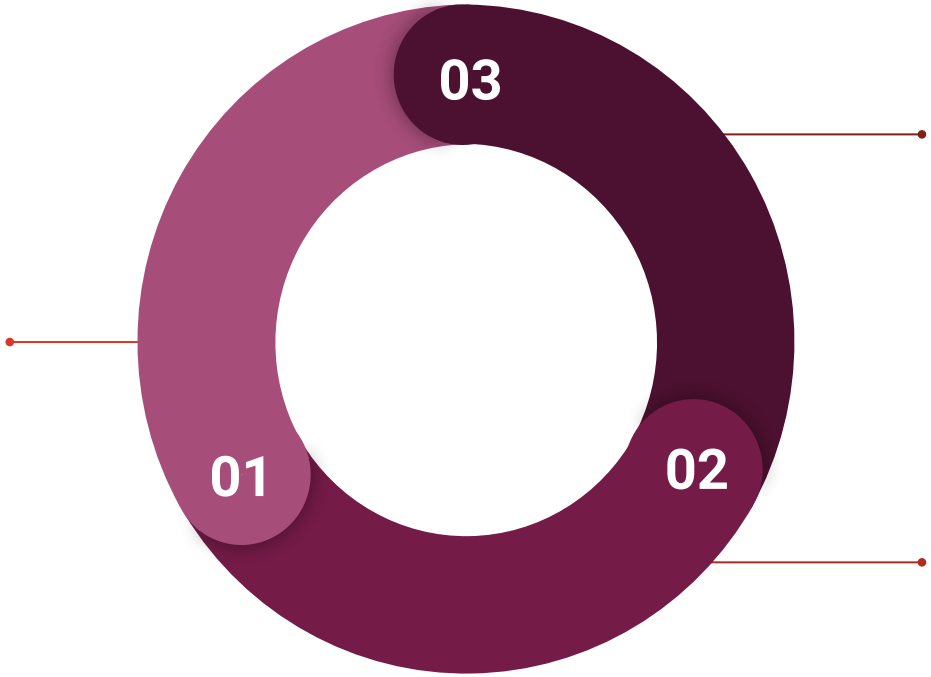
# Sentiment Analysis – Vader

- Lexicon and rule based sentiment analysis tool
- Specifically attuned to sentiments in social media

| Label Function | |
|---|---|
| Positive sentiment (= 2) | compound score > 0.01 |
| Negative sentiment (= 0) | compound score < −0.01 |
| Neutral sentiment (= 1) | -0.01 ≥ compound score ≤ 0.01 |

### Import Necessary Libraries

- pandas
- nltk.sentiment.vader
- nltk.downloader.download ('vader_lexicon')
- analyser = SentimentIntensityAnalyzer( )




### Get sentiment label

Go through the label function

### Get Compound Vader score

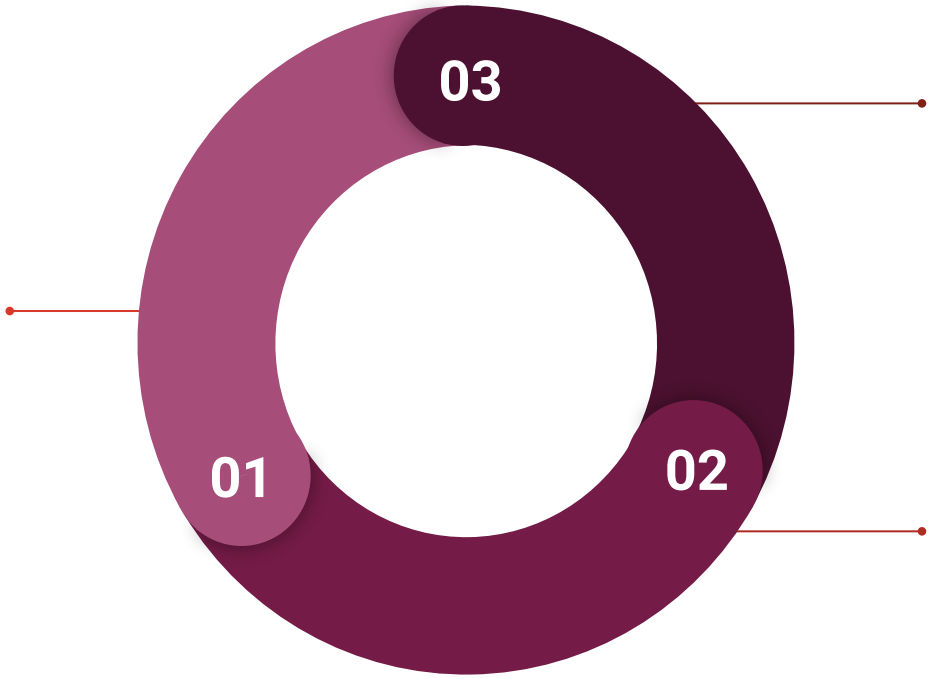
1. Append a compound score to every news row
2. Group the mean compound VADER score by date

# Sentiment Analysis – TextBlob

- Python library for NLP
- Returns **polarity** and **subjectivity** of a sentence. Polarity lies between [-1,1]

### Import Necessary Libraries

- pandas
- from textblob import TextBlob




### Get sentiment label

Go through the threshold function

### Get Compound TextBlob score

1. Append a normalized score (-1 to 1) to every news row
2. Group the mean textblob score by date

# Sentiment Analysis – Loughran-McDonald Dictionary

- Manually constructed dictionary
- Contains 7 sentiment dimensions, only used positive, negative and uncertain

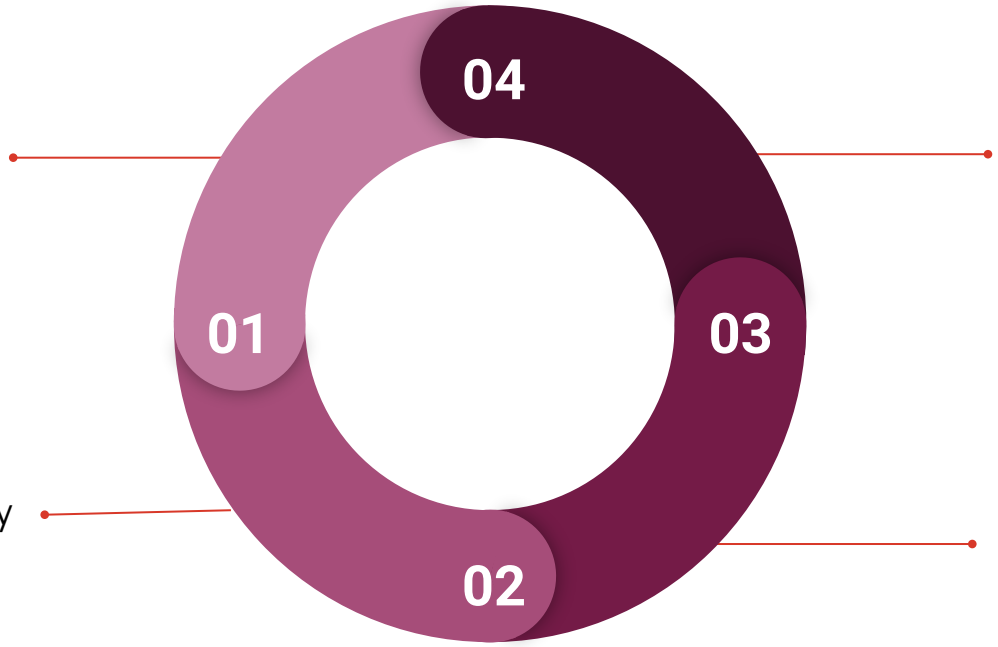
| Label Function | |
|---|---|
| Positive sentiment (= 2) | len(words_new_pos) > len(words_new_neg) |
| Negative sentiment (= 0) | len(words_new_pos) < len(words_new_neg) |
| Neutral sentiment (= 1) | len(words_new_pos) == len(words_new_neg) |

## Import Necessary Libraries

- pandas
- from nltk.tokenize import WordPunctTokenizer as wpt
- import math

## Build dictionary

1. Load in Loughran master dictionary
2. Get the list of stopwords, positive words, negative words and stoplist




## Get sentiment label

Go through the label function

## Process news

1. Tokenize the words in each news using wpt
2. remove stop words

# Sentiment Analysis – HKEX equity market

Market sentiment from March 2011 to March 2021

| | dates | compound_vader_score | vader_label | textblob_label |
|---|---|---|---|---|
| 0 | 2011-03-18 | 0.296000 | 2 | 1 |
| 1 | 2011-03-21 | 0.000000 | 1 | 1 |
| 2 | 2011-03-22 | -0.476700 | 0 | 1 |
| 3 | 2011-03-24 | 0.221057 | 2 | 2 |
| 4 | 2011-03-25 | 0.061100 | 2 | 0 |
| ... | ... | ... | ... | ... |
| 2957 | 2021-02-27 | -0.110815 | 0 | 1 |
| 2958 | 2021-02-28 | 0.089387 | 2 | 1 |
| 2959 | 2021-03-01 | 0.078058 | 2 | 2 |
| 2960 | 2021-03-02 | 0.076328 | 2 | 2 |
| 2961 | 2021-03-03 | 0.142956 | 2 | 2 |

2962 rows × 4 columns

Act as market sentiment

Merge with individual daily label

| | dates | vader_label | textblob_label |
|---|---|---|---|
| 0 | 2017-01-02 | NaN | NaN |
| 1 | 2017-01-03 | NaN | NaN |
| 2 | 2017-01-04 | NaN | NaN |
| 3 | 2017-01-05 | NaN | NaN |
| 4 | 2017-01-06 | NaN | NaN |
| ... | ... | ... | ... |
| 1083 | 2021-02-25 | 2 | 2 |
| 1084 | 2021-02-26 | 2 | 0 |
| 1085 | 2021-03-01 | 1 | 1 |
| 1086 | 2021-03-02 | 0 | 0 |
| 1087 | 2021-03-03 | NaN | NaN |

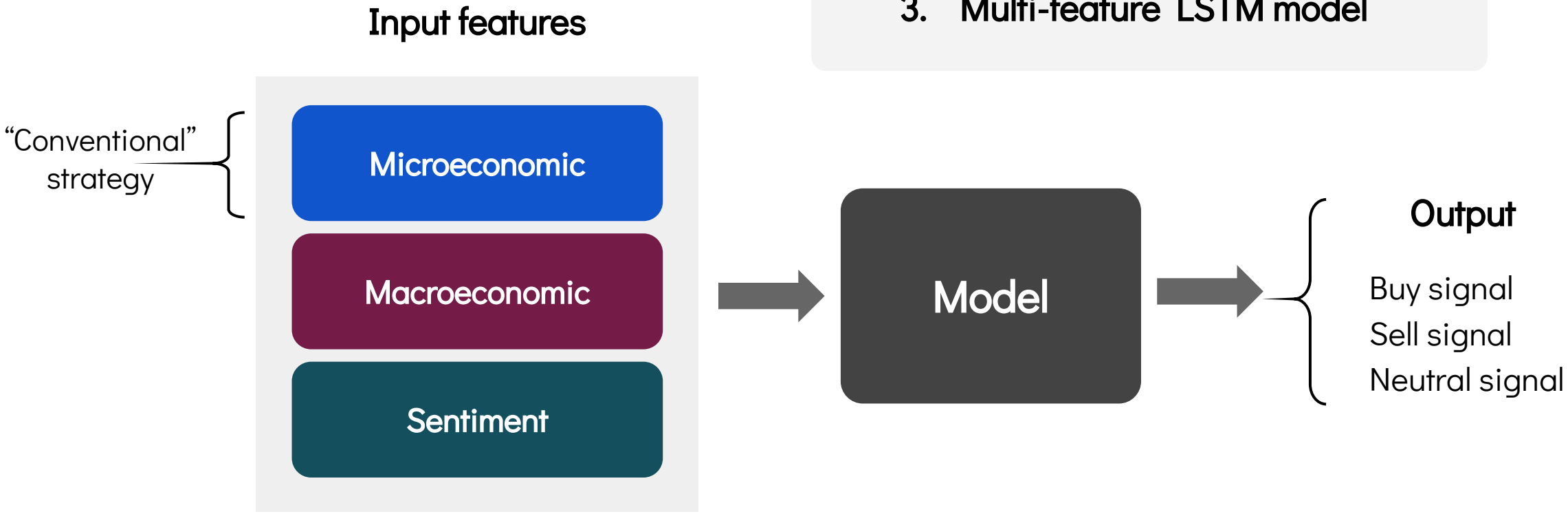
[1088 rows x 3 columns]

*result screenshot of 6618.HK*

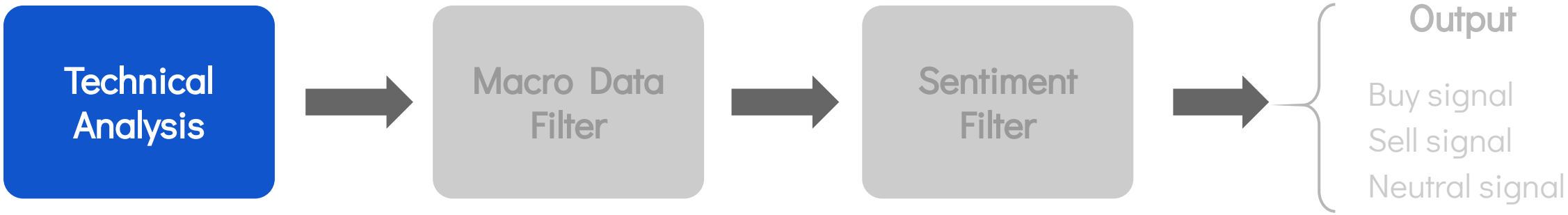
# Integrated Strategy

In the repository:

1. **Baseline model**
2. **Single-feature LSTM model**
3. **Multi-feature LSTM model**



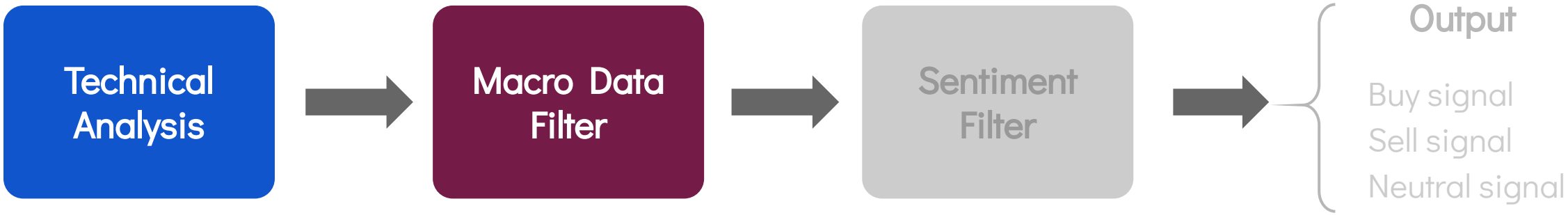
# Baseline Model




## 1) Technical Analysis

- Choose a technical analysis strategy (e.g. MACD crossover)
- Obtain the signals dataframe

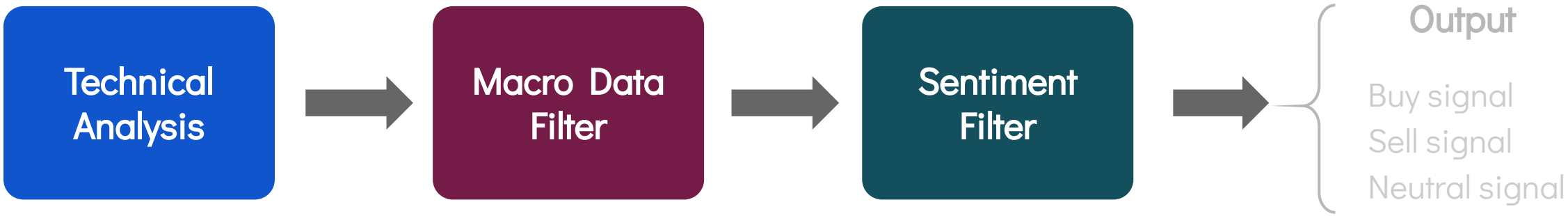
# Baseline Model




## 2) Macroeconomic Data Filter

- Get the stock's sensitivities to (GDP, unemployment rate, avg property price)
- Get normalised economic indicator data
- Eliminate buy / sell signals that contradicts with macro trend

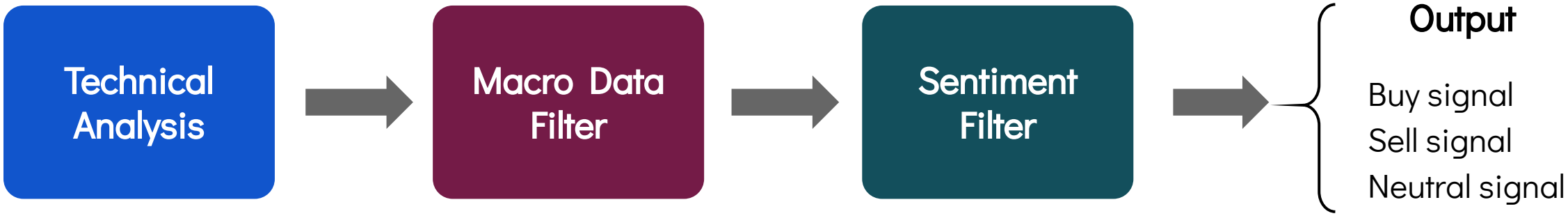
# Baseline Model




### 3) Sentiment Data Filter

- Get the stock's related news and tweets
- Get the stock's sentiment labels
- Eliminate buy / sell signals that contradicts with sentiment labels

# Baseline Model



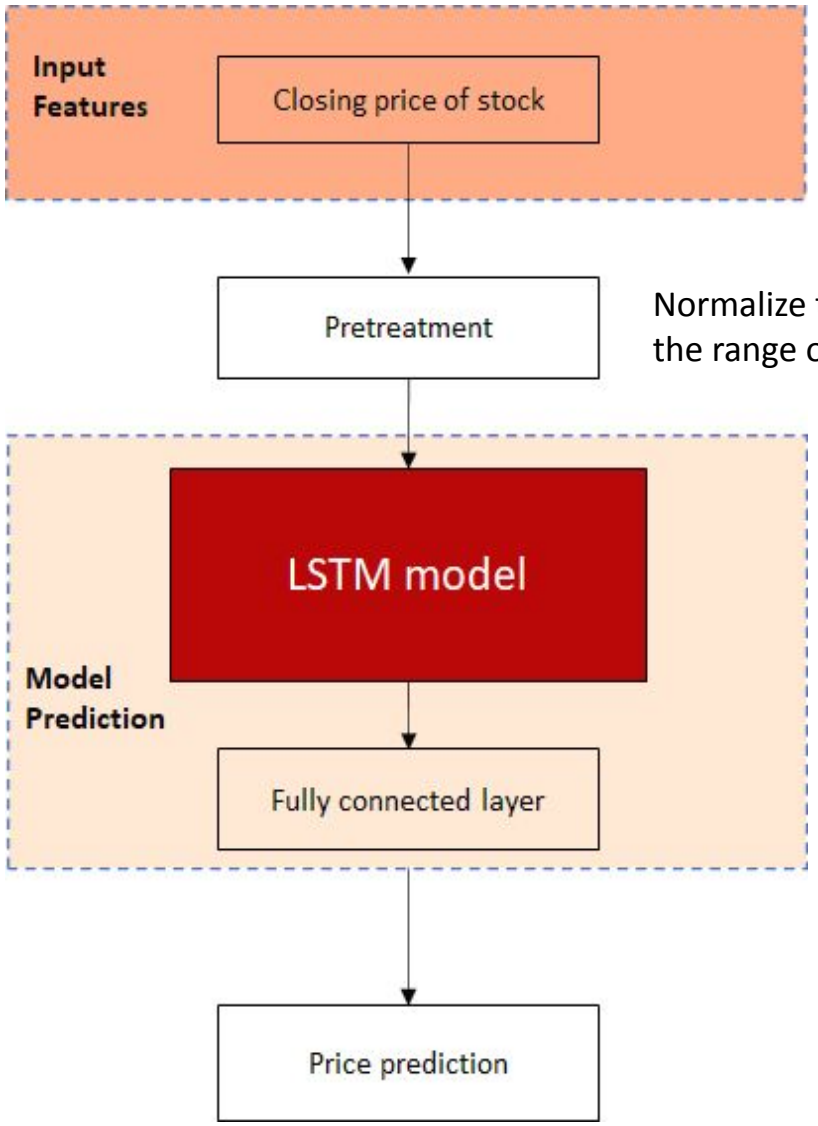

**4) Output: filtered signals**

- Buy signal == +1
- Sell signal == -1
- Neutral signal == 0

Pass filtered signals to backtester function to compute:

- **Portfolio return**
- **Sharpe ratio etc.**

# Single-feature LSTM Model



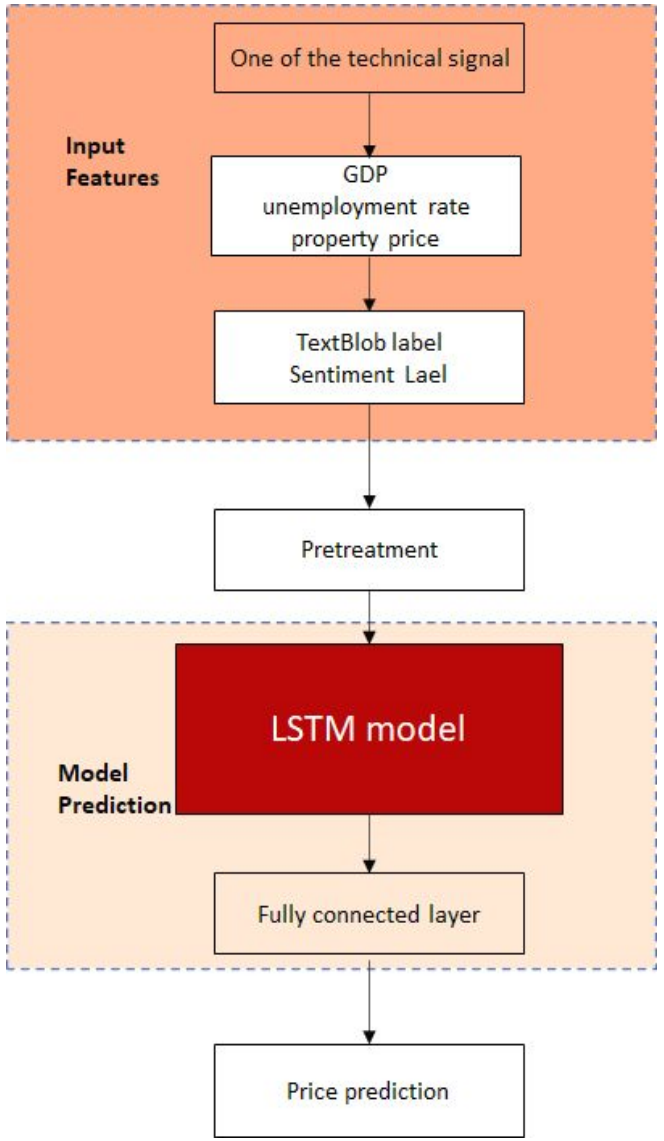

## Output

- If undervalued ⇒ **Buy** signal == +1
- Elif overvalued ⇒ **Sell** signal == −1
- Else ⇒ **Neutral** signal == 0

Pass filtered signals to backtester function to compute:

- **Portfolio return**
- **Sharpe ratio etc.**

# Multi-feature LSTM Model




batch size = 72
epochs = 100
lr = 0.01

**Output**

- If undervalued ⇒ **Buy** signal == +1
- Elif overvalued ⇒ **Sell** signal == −1
- Else ⇒ **Neutral** signal == 0

Pass filtered signals to backtester function to compute:

- **Portfolio return**
- **Sharpe ratio etc.**

# Experiment results

Tested on **29 tickers in HKEx**, date = 2020-06-10 to 2021-03-03

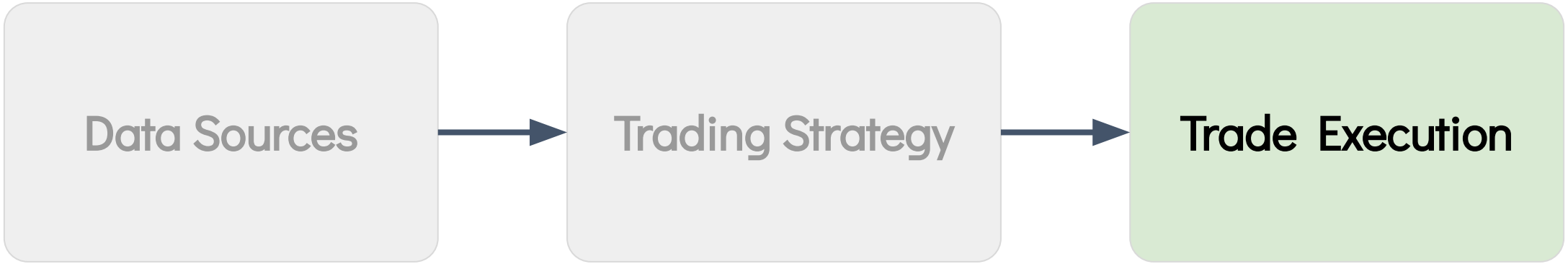
| **Baseline model** | $\overline{\text{ret}}$ | $\sigma_{\text{ret}}$ | $\overline{\text{sharpe}}$ | $\sigma_{\text{sharpe}}$ | $n$ |
|---|---|---|---|---|---|
| Baseline with MACD | 5.458% | 12.157% | 0.677 | 1.002 | 7.724 |
| Baseline with RSI | 2.998% | 9.927% | 0.543 | 1.226 | 14.931 |
| Baseline with STC | 3.782% | 9.423% | 0.604 | 0.946 | 34.586 |
| **Single-feature LSTM model** | | | | | |
| S_LSTM | 3.010% | 14.757% | 0.016 | 0.164 | 15.535 |
| **Multi-feature LSTM model** | | | | | |
| M_LSTM with MACD | 1.837% | 4.722% | 0.266 | 1.300 | 4.143 |
| M_LSTM with RSI | 4.817% | 14.802% | 1.190 | 0.129 | 4.464 |
| M_LSTM with STC | -2.718% | 7.554% | -0.433 | 1.046 | 47.214 |
| *Max.* | 5.458% | 14.802% | 1.190 | 1.300 | 47.214 |
| *Min.* | -2.718% | 4.722% | -0.433 | 0.129 | 4.143 |
| *Mean* | 2.741% | 10.477% | 0.409 | 0.830 | 14.085 |

**Major findings:**

- Baseline model has the best overall performance
- Some indicators (e.g. RSI) perform better when used as a **machine learning input**.

  ⇒ Able to capture information that macroeconomic data or sentiment labels could not capture

# Part 3 – Trade Execution




Paper Trading with
Interactive Brokers (IB)

Python, IB API

# Paper Trading – InteractiveBrokers

**Interactive Brokers Python Native APIs**

- Connect to IB Trader Workstation
- Request market data
- Manage order
- Request Account summary

**Apply trading strategy to real-time trading via Python code**

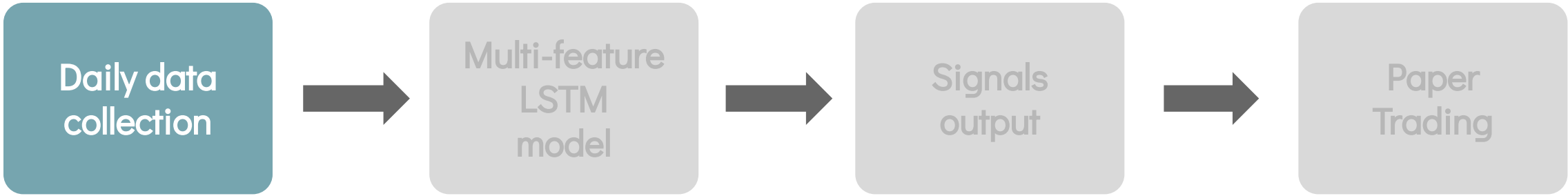
# Paper Trading

## Code demo

To-add in pptx file

# Daily Trading Strategy

## Putting it all together

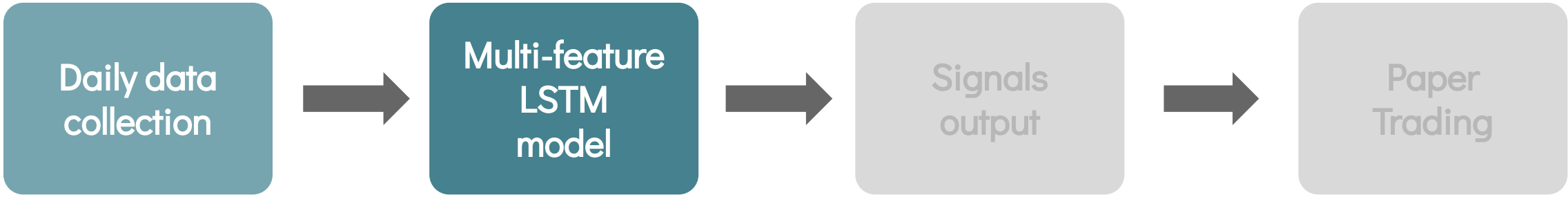



## 1) Daily data collection

- Collect today's stock price
- Load most recent macroeconomic data
- Collect today's news data → generate sentiment label

# Daily Trading Strategy

## Putting it all together

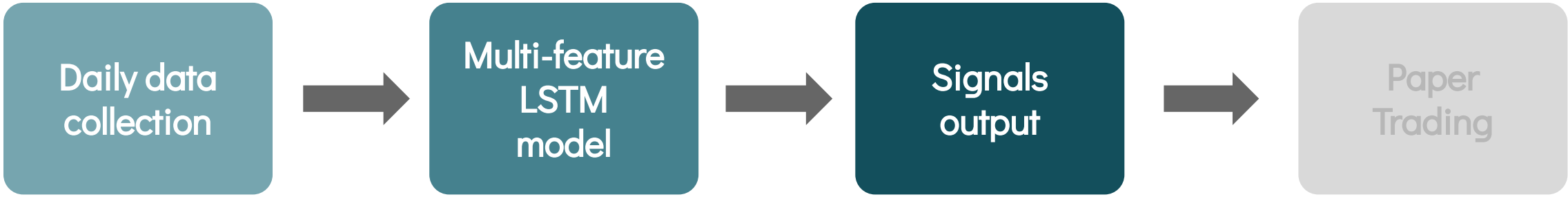



## 2) Multi-feature LSTM model

- Load trained model
- Make prediction of trading signal

# Daily Trading Strategy

## Putting it all together

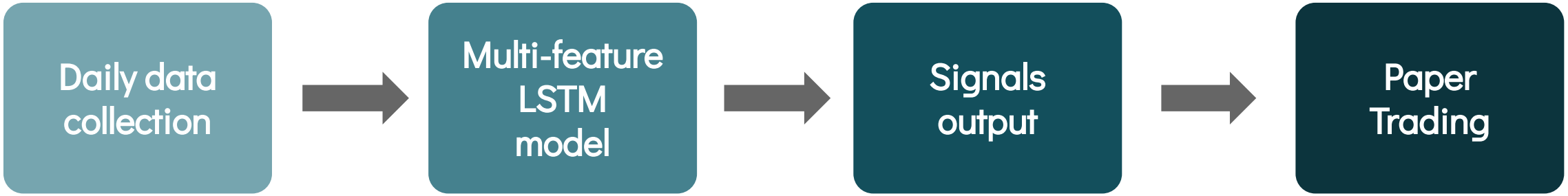



## 3) Signals output

- Output from LSTM saved as csv

# Daily Trading Strategy

## Putting it all together




## 4) Paper Trading

- Load signals output
- Connect to IB Trader Workstation
- Execute order according to signal output

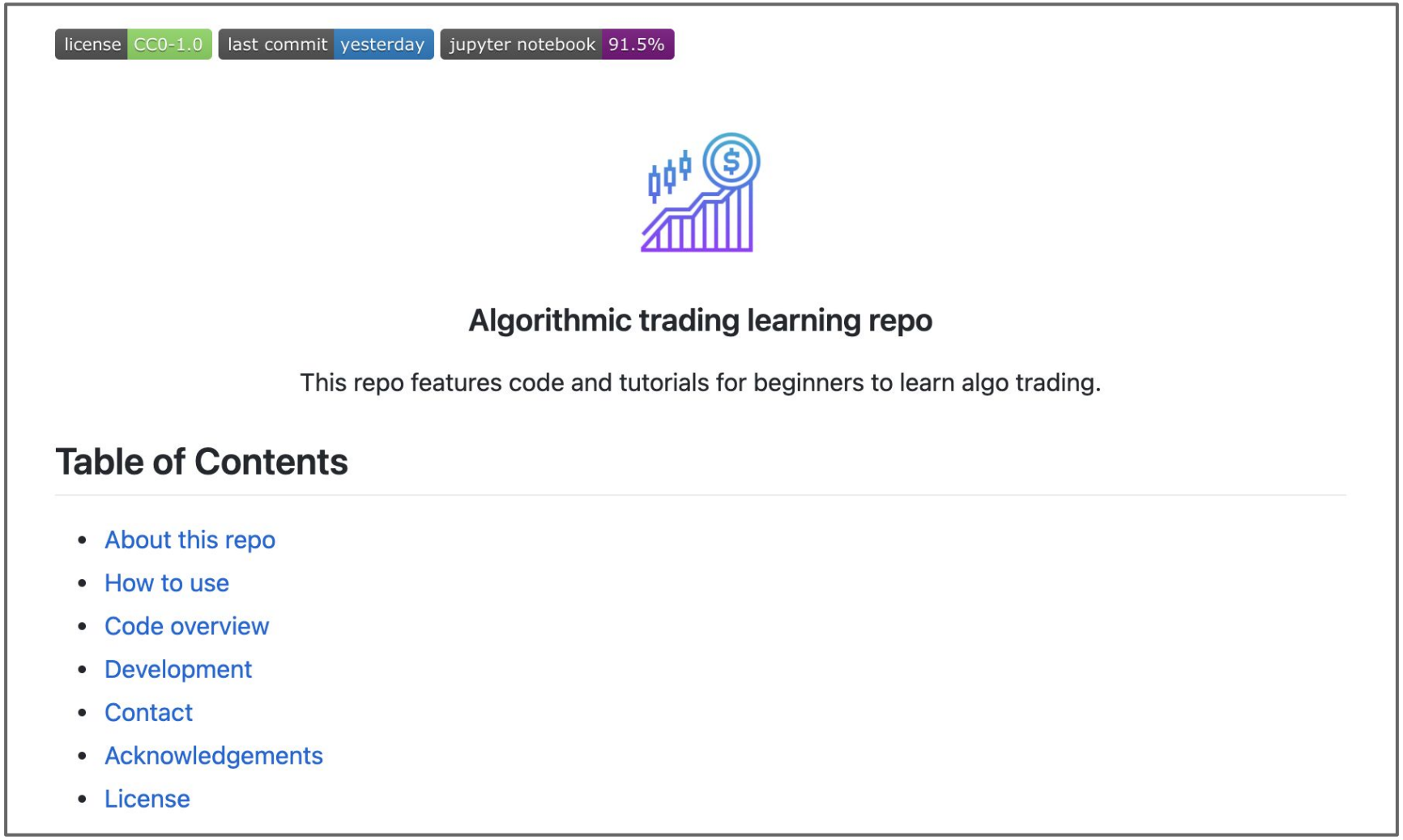
# Daily Trading Strategy

## Code demo

To-add in pptx file

# Deliverable

https://github.com/awoo424/algotrading



# Documentation website

Live demo

https://algo-trading.readthedocs.io/

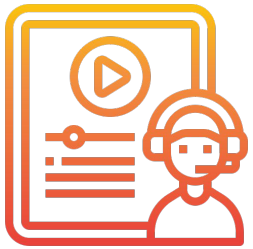
# Vision

## Anticipated outcome

**Stakeholder:** Students

- Learn algorithmic trading in a local (Hong Kong) context
- X Spoon-feeding education → Learn by getting their hands dirty
- Application of interdisciplinary knowledge

**Stakeholder:** Instructors



- Well-organised database for research & teaching
- Repository that delves into the topic from multiple perspectives
- Resources easy to be edited & maintained in long-term

# Conclusion

## What we have done

An *all-in-one* code & data repository that assists students and amateur investors to go from zero to hero in algorithmic trading.

## Looking forward...

- Enlarge community of contributors
- More code snippets and examples
- Feedback from users to improve code + documentation

# Team

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# Building a code and data repository for teaching algorithmic trading

Thank you :)

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