**DISCRIPTION  
Short-Term Forecasting (Intraday to Weekly)  
Sample size:** 2 years of data from the tech company

**Data frequency:** Daily  
**Use Case:** Technical analysis

**OOP:**

**Analys of three type of the goal:**

**Pursuing Returns**: Suitable for risk-tolerant investors, with aggressive strategies offering high return potential but higher volatility.

**Controlling Risk**: Suitable for conservative investors, focusing on capital preservation and stable, lower returns.

**Arbitrage**: Suitable for professional investors or institutions, leveraging market inefficiencies for low-risk, low-return opportunities.

To achieve the short forecasting goal, we well focus on Pursuing Returns, basically use the trend and momentum indicators to create the buy/sell signals.

**Analys of the data fetching and cleaning:**

Initially I want to use the Investing.com, However there are several reasons we give up this source and decide to use other data:

1. The investing.com require the API login to fetching the data
2. The data is easy to directly overview on the website but it requires several steps to extract the particular period of the data

Then we choose to use the stock price data from the Yahoo finance which is really easy to fetch.

**Analys of the Price Action Analysis：**

**(It can identify the signal and work for all kind of markets)**

1. **Swing Low and High**

**Description：**

A swing point is a price point from which a minor or major trend reversal happens. It is a price action term that shows turning price points on the candlestick chart. Swing points act as key levels where price may reverse.

**Virtues:**

1. The Swing point can identify the trend of the stock
2. Swing show the potential support and resistance line

**Shortcoming:**

1. Lagging: since the Swing points need to be determined by the future data. So it may not sensitive to the instant change in market
2. Not always accurate and need to combine with other TA methods

**Analys of the momentum indicators:**

**(The momentum indicator is useful when stock went through Range-bound Market)**

1. **RSI**

**Description:** for this indicator, is to list the up changes and the down changes in one table we calculate the RS rate by using sum(Up changes)/ sum(abs(down changes)) and compute the RSI by 100 – 100/(1+RS), When RSI is above 70, is conclude as the overbought and when the RSI is lower than 30 concluded as the oversold.

**Virtues:**

First the RSI is really simply and direct indicator to compute

As another oscillator, it also share the same advantage with momentum oscillator. And RSI is the most commonly used indicator

When the RSI is remain 50 or above this probabily means the trend will go on

**Shortcoming:**

Lagging

It can tell you the potential trend and reversal but it can’t really tell you the specific point to buy or sell.

Is not worked well on the long-term forecasting

1. **Fibonacci**

**Description：**Base on the Fibonacci number, it create the support line that assume that the stock will remine on the certain support line and once price cross the line then the next support line will be found by Fibonacci series which are 23.6% 38.2%,  61.8% etc.

**Virtues:**

1. It can Identify the support and potential Resistance level
2. Group behavior: as more and more people believe there are some support happened on the Fibonacci line, they will have the certain bought/sold behavior which will make the support more and more reliable.

**Shortcoming:**

1. The idea of Fibonacci is kind of abstract and metaphysics, the start of the idea is base on the Fibonacci series that commonly exist in the nature. So the result of the Fibonacci may show the great mistake compare to other more rigorous TA methods
2. Level of Fibonacci can be so hard to determine

**Analys of the Trend indicators:**

**(The Trend indicators are useful when in the Trending market)**

1. **Exponential Moving Average (EMA)**

**Description**

The Exponential Moving Average (EMA) is a technical indicator that smooths price data, giving more weight to recent prices. It helps identify trends, support/resistance levels, and trading signals (e.g., crossovers).

**Virtues**

1. Trend Identification: Rising EMA = uptrend; falling EMA = downtrend.
2. Responsive to Price Changes: More reactive than SMA, ideal for short-term trading.
3. Dynamic Support/Resistance: Acts as support in uptrends and resistance in downtrends.

**Shortcomings**

1. Lagging Indicator: Based on past prices, may not predict future movements accurately.
2. False Signals: Frequent crossovers in choppy markets can lead to losses.
3. Dependence on Period Selection: Effectiveness depends on the chosen period (e.g., 10-day, 50-day).

**Buy/Sell signal**

**Buy timing**:

* + In an uptrend, buy near swing lows during pullbacks.
  + Buy when the price breaks above the previous swing high.

**Sell timing**:

* + In a downtrend, sell near swing highs during rebounds.
  + Sell when the price breaks below the previous swing low.

**Target Price**:

* + Set target prices based on the distance between previous swing highs and lows.(Target = current high + (previous high – previous low))

**Combine Indicators for Buy/Sell Signals**

**Buy Signal:**

1. **Fibonacci**: Price retraces to a key Fibonacci level (e.g., 38.2%, 50%, 61.8%).
2. **EMA**: Price is above the long-term EMA (confirms uptrend).
3. **RSI**: RSI is oversold (< 30) or shows bullish divergence.

**Sell Signal:**

1. **Fibonacci**: Price retraces to a key Fibonacci level (e.g., 38.2%, 50%, 61.8%).
2. **EMA**: Price is below the long-term EMA (confirms downtrend).
3. **RSI**: RSI is overbought (> 70) or shows bearish divergence.

**Analyze of Optimizing Strategy Parameters:**

By adjusting strategy parameters like the Fibonacci levels, RSI overbought/oversold level and windows of EMA,

1. **Grid Search**:

**Description:** Traverse all possible parameter combinations to find the optimal solution.

**Virtues**: Comprehensive, ensures no optimal combination is missed.

**Shortcoming**: Computationally intensive and time-consuming.

1. **Bayesian Optimization**:

**Description:** Select parameters based on a probabilistic model, gradually approaching the optimal solution.

**Virtues**: Efficient, suitable for high-dimensional parameter spaces.

**Shortcoming**: Complex implementation, relies on third-party libraries.

**Analyze of Simulated Trading**:

* + Validate the strategy through simulated trading before live trading.
  + Use broker platforms or Python frameworks (e.g., Backtrader, Zipline).
  + Adjust the strategy based on simulation results to ensure market adaptability.

**Visualization and user-free application**

**References:**

1. Investopedia: Exponential Moving Average (EMA) - https://www.investopedia.com/terms/e/ema.asp
2. FBS Analytics: EMA Trading Tips –

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1. ResearchGate: Piecewise Linear Regression - https://www.researchgate.net/publication/357932259\_Piecewise\_Linear\_Regression
2. IEEE Xplore: Fourier Transformation in Stock Data Analysis - <https://ieeexplore.ieee.org/document/7023581>
3. A Novel Method of Trend Lines Generation Using Hough Transform Method