2024 LeekHarvester

Algorithm Trading System

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Overview

This system includes two main modules.

02

Backtest Module

Do backtest and moniter strategy.

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Live Trading Module

Do live trading and tca.

Overview

A

Backtest Module

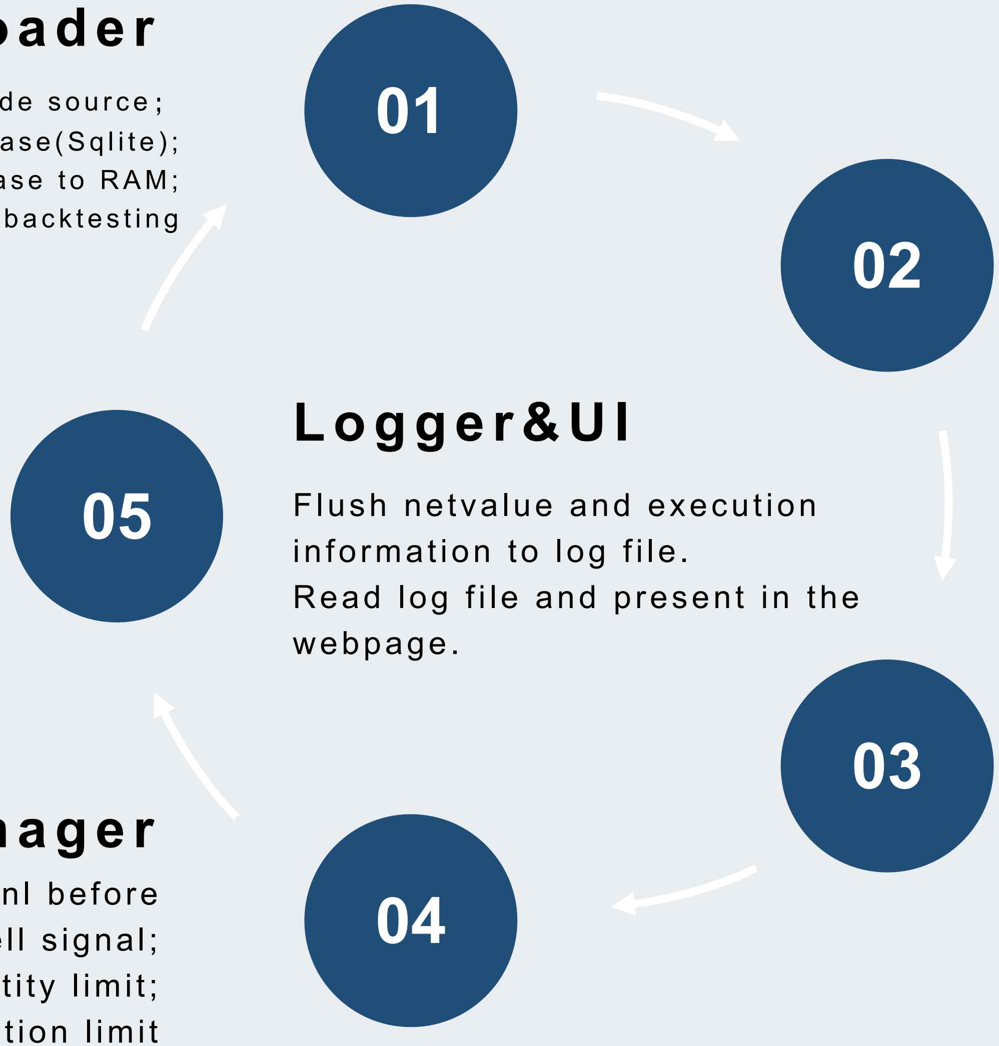
Data_Loader, Account, Order_Excection, Strategy, Backtest

B

Live Trading Module

TradingBot

Backtest



DataLoader

Get data from outside source;
Store data in local database(Sqlite);
Aquire data from database to RAM;
Process data requirement during backtesting

Account & Evaluation

Manage position and netvalue;
Get buy and sell signal and adjust the position;
Calculate the return metrics such as Sharpe Ratio, MaxDrawdown

OrderExecution

Process order signal from strategy;
Send buy or sell information (quantity,price)to Account

RiskManager

Check position and pnl before sending buy or sell signal;
Check order quantity limit;
Check execution limit

Strategy

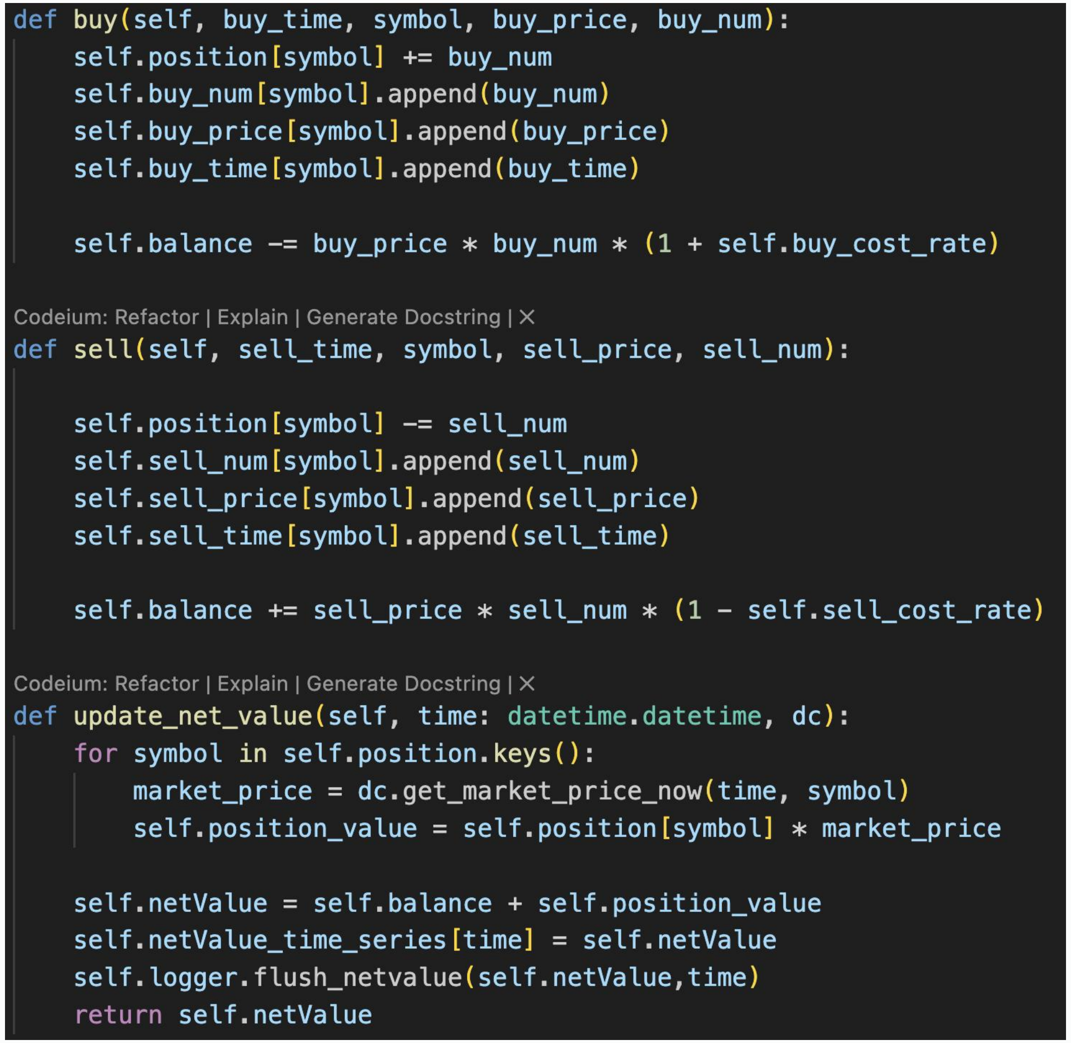
Generate signal according to the some logic and send the signal to OrderExecution

Logger&UI

Flush netvalue and execution information to log file.
Read log file and present in the webpage.

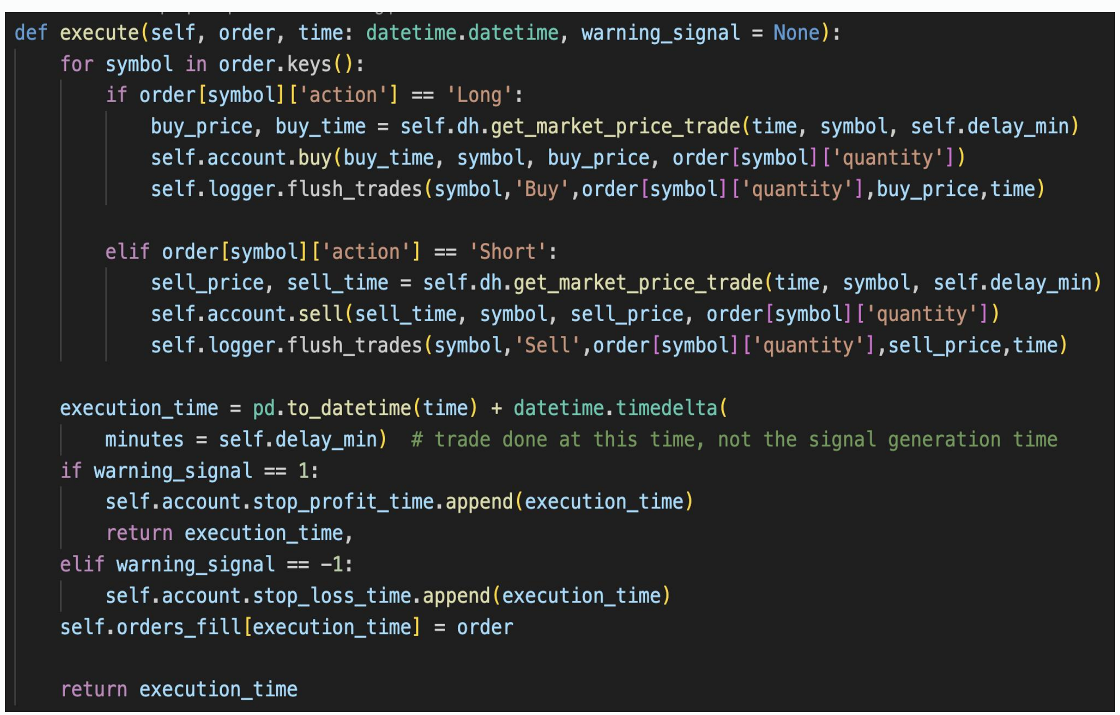
Backtest

Account



```
def buy(self, buy_time, symbol, buy_price, buy_num):
    self.position[symbol] += buy_num
    self.buy_num[symbol].append(buy_num)
    self.buy_price[symbol].append(buy_price)
    self.buy_time[symbol].append(buy_time)

    self.balance -= buy_price * buy_num * (1 + self.buy_cost_rate)

Codeium: Refactor | Explain | Generate Docstring | X
def sell(self, sell_time, symbol, sell_price, sell_num):

    self.position[symbol] -= sell_num
    self.sell_num[symbol].append(sell_num)
    self.sell_price[symbol].append(sell_price)
    self.sell_time[symbol].append(sell_time)

    self.balance += sell_price * sell_num * (1 - self.sell_cost_rate)

Codeium: Refactor | Explain | Generate Docstring | X
def update_net_value(self, time: datetime.datetime, dc):
    for symbol in self.position.keys():
        market_price = dc.get_market_price_now(time, symbol)
        self.position_value = self.position[symbol] * market_price

    self.netValue = self.balance + self.position_value
    self.netValue_time_series[time] = self.netValue
    self.logger.flush_netvalue(self.netValue,time)
    return self.netValue
```

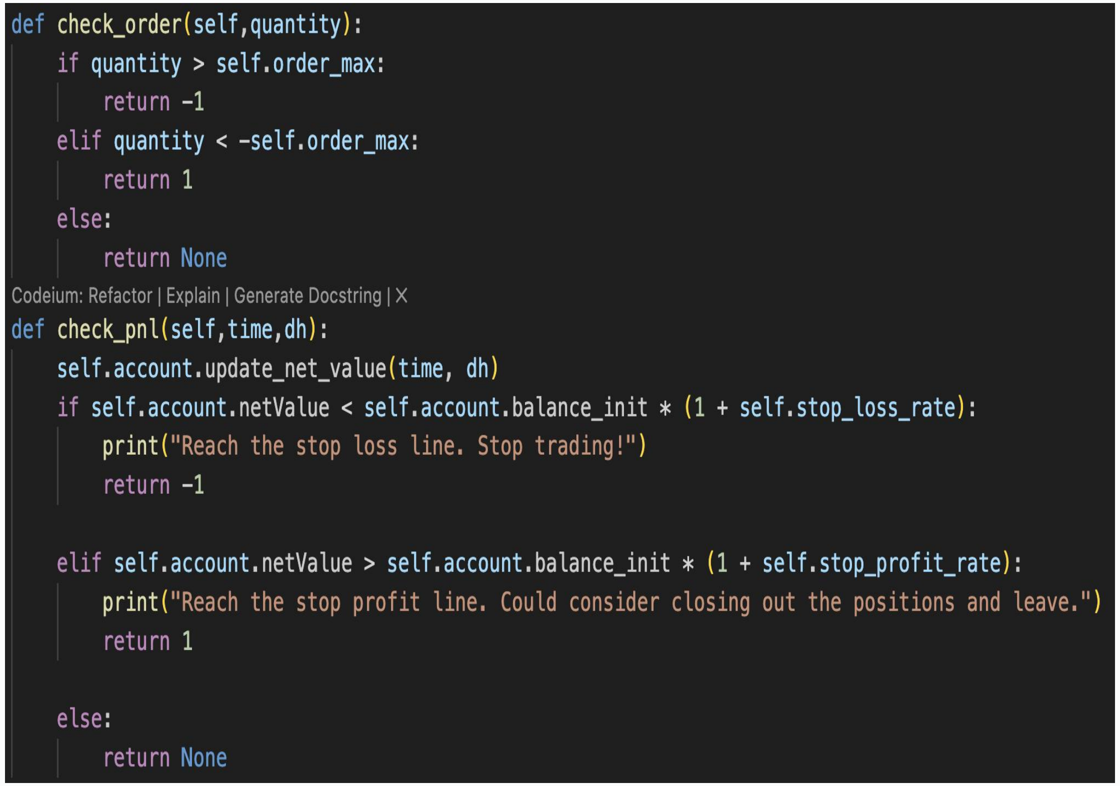
OrderExecution



```
def execute(self, order, time: datetime.datetime, warning_signal = None):
    for symbol in order.keys():
        if order[symbol]['action'] == 'Long':
            buy_price, buy_time = self.dh.get_market_price_trade(time, symbol, self.delay_min)
            self.account.buy(buy_time, symbol, buy_price, order[symbol]['quantity'])
            self.logger.flush_trades(symbol,'Buy',order[symbol]['quantity'],buy_price,time)

        elif order[symbol]['action'] == 'Short':
            sell_price, sell_time = self.dh.get_market_price_trade(time, symbol, self.delay_min)
            self.account.sell(sell_time, symbol, sell_price, order[symbol]['quantity'])
            self.logger.flush_trades(symbol,'Sell',order[symbol]['quantity'],sell_price,time)

    execution_time = pd.to_datetime(time) + datetime.timedelta(
        minutes = self.delay_min)  # trade done at this time, not the signal generation time
    if warning_signal == 1:
        self.account.stop_profit_time.append(execution_time)
        return execution_time,
    elif warning_signal == -1:
        self.account.stop_loss_time.append(execution_time)
    self.orders_fill[execution_time] = order

    return execution_time
```

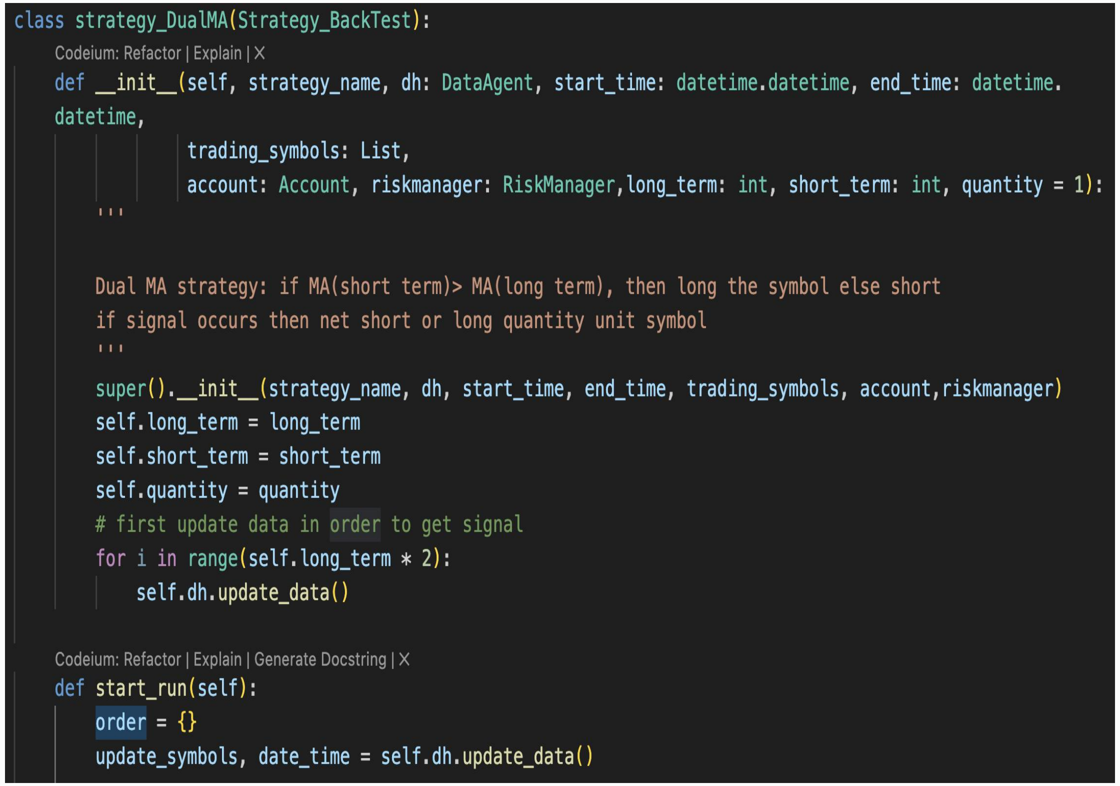
Backtest

RiskManager



```
def check_order(self,quantity):
    if quantity > self.order_max:
        return -1
    elif quantity < -self.order_max:
        return 1
    else:
        return None
Codeium: Refactor | Explain | Generate Docstring | X
def check_pnl(self,time,dh):
    self.account.update_net_value(time, dh)
    if self.account.netValue < self.account.balance_init * (1 + self.stop_loss_rate):
        print("Reach the stop loss line. Stop trading!")
        return -1

    elif self.account.netValue > self.account.balance_init * (1 + self.stop_profit_rate):
        print("Reach the stop profit line. Could consider closing out the positions and leave.")
        return 1

    else:
        return None
```

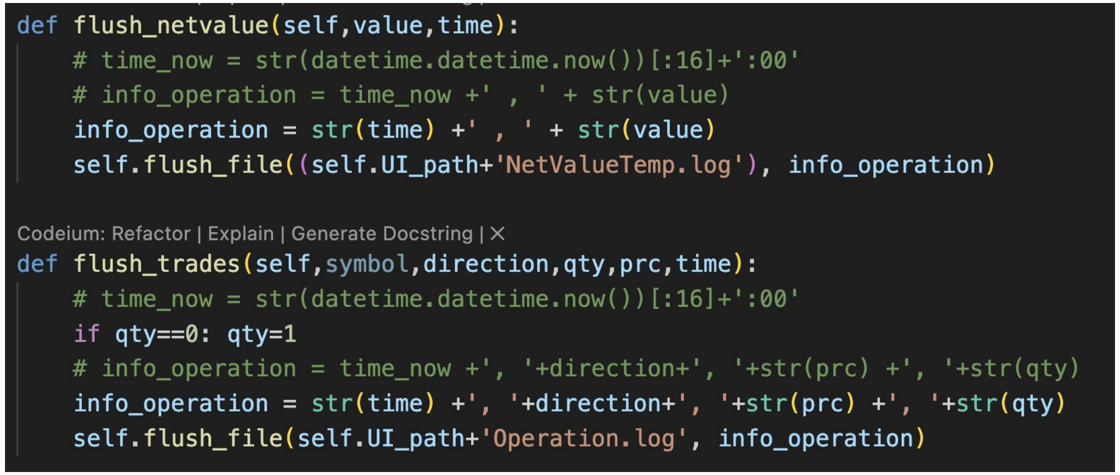
Strategy



```
class strategy_DualMA(Strategy_BackTest):
    Codeium: Refactor | Explain | X
    def __init__(self, strategy_name, dh: DataAgent, start_time: datetime.datetime, end_time: datetime.
    datetime,
                trading_symbols: List,
                account: Account, riskmanager: RiskManager,long_term: int, short_term: int, quantity = 1):
        '''

        Dual MA strategy: if MA(short term)> MA(long term), then long the symbol else short
        if signal occurs then net short or long quantity unit symbol
        '''
        super().__init__(strategy_name, dh, start_time, end_time, trading_symbols, account,riskmanager)
        self.long_term = long_term
        self.short_term = short_term
        self.quantity = quantity
        # first update data in order to get signal
        for i in range(self.long_term * 2):
            self.dh.update_data()

    Codeium: Refactor | Explain | Generate Docstring | X
    def start_run(self):
        order = {}
        update_symbols, date_time = self.dh.update_data()
```

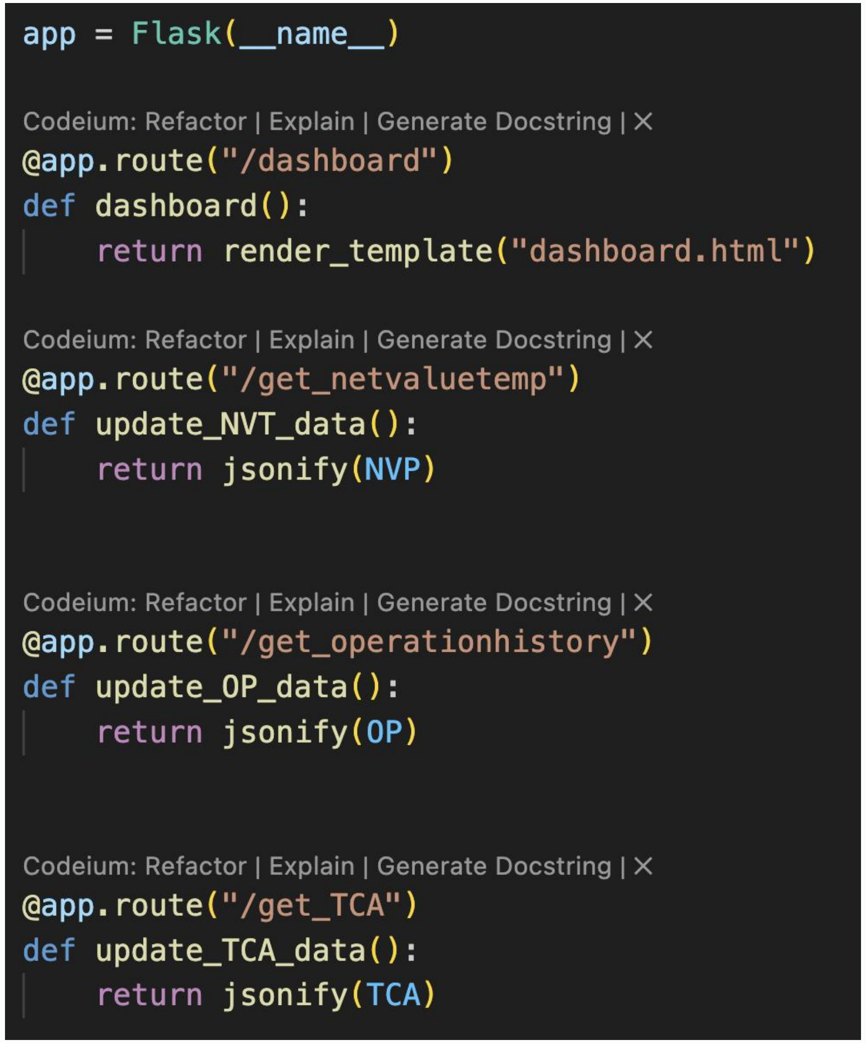
Backtest

Logger



```
def flush_netvalue(self,value,time):
    # time_now = str(datetime.datetime.now())[:16]+':00'
    # info_operation = time_now +' , ' + str(value)
    info_operation = str(time) +' , ' + str(value)
    self.flush_file((self.UI_path+'NetValueTemp.log'), info_operation)

Codeium: Refactor | Explain | Generate Docstring | ×
def flush_trades(self,symbol,direction,qty,prc,time):
    # time_now = str(datetime.datetime.now())[:16]+':00'
    if qty==0: qty=1
    # info_operation = time_now +', '+direction+', '+str(prc) +', '+str(qty)
    info_operation = str(time) +', '+direction+', '+str(prc) +', '+str(qty)
    self.flush_file(self.UI_path+'Operation.log', info_operation)
```

UI



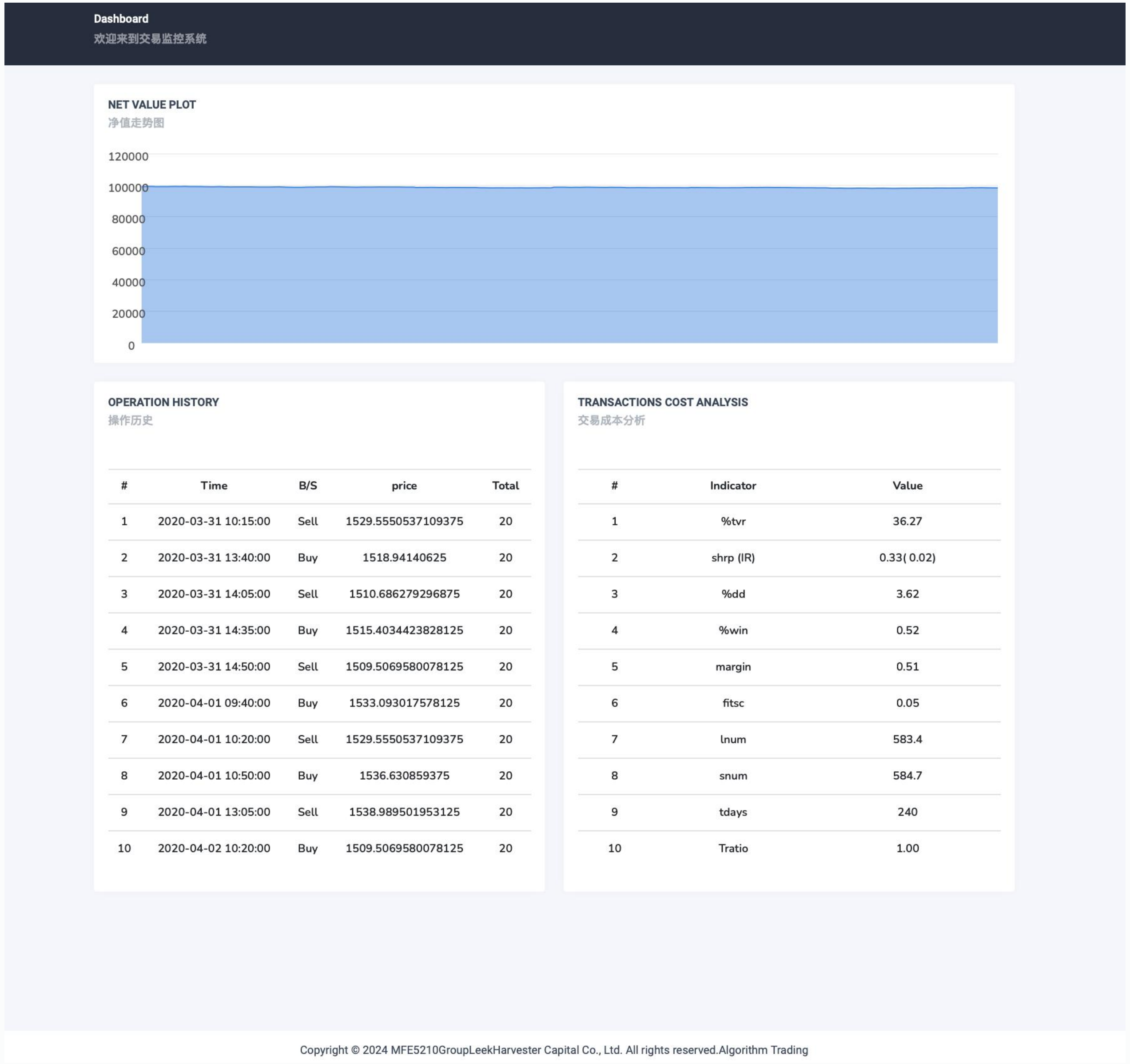
```
app = Flask(__name__)

Codeium: Refactor | Explain | Generate Docstring | ×
@app.route("/dashboard")
def dashboard():
    return render_template("dashboard.html")

Codeium: Refactor | Explain | Generate Docstring | ×
@app.route("/get_netvaluetemp")
def update_NVT_data():
    return jsonify(NVP)


Codeium: Refactor | Explain | Generate Docstring | ×
@app.route("/get_operationhistory")
def update_OP_data():
    return jsonify(OP)


Codeium: Refactor | Explain | Generate Docstring | ×
@app.route("/get_TCA")
def update_TCA_data():
    return jsonify(TCA)
```

Backtest

Paper Trading Demo

Parameters:

- Symble: SZ.000001
- Frequency: 5 min
- Period: 2020-01-02 - 2020-04-02 10:30:00
- Strategy: Dual Moving Average(10,5)



Dashboard

欢迎来到交易监控系统

NET VALUE PLOT

净值走势图

OPERATION HISTORY

操作历史

#	Time	B/S	price	Total
1	2020-03-31 10:15:00	Sell	1529.5550537109375	20
2	2020-03-31 13:40:00	Buy	1518.94140625	20
3	2020-03-31 14:05:00	Sell	1510.686279296875	20
4	2020-03-31 14:35:00	Buy	1515.4034423828125	20
5	2020-03-31 14:50:00	Sell	1509.5069580078125	20
6	2020-04-01 09:40:00	Buy	1533.093017578125	20
7	2020-04-01 10:20:00	Sell	1529.5550537109375	20
8	2020-04-01 10:50:00	Buy	1536.630859375	20
9	2020-04-01 13:05:00	Sell	1538.989501953125	20
10	2020-04-02 10:20:00	Buy	1509.5069580078125	20

TRANSACTIONS COST ANALYSIS

交易成本分析

#	Indicator	Value
1	%tvr	36.27
2	shrp (IR)	0.33(0.02)
3	%dd	3.62
4	%win	0.52
5	margin	0.51
6	fitsc	0.05
7	lnum	583.4
8	snum	584.7
9	tdays	240
10	Tratio	1.00

Live Trading

TradingBot

01

Connet to live data source and fetch data;
Manage strategy and account

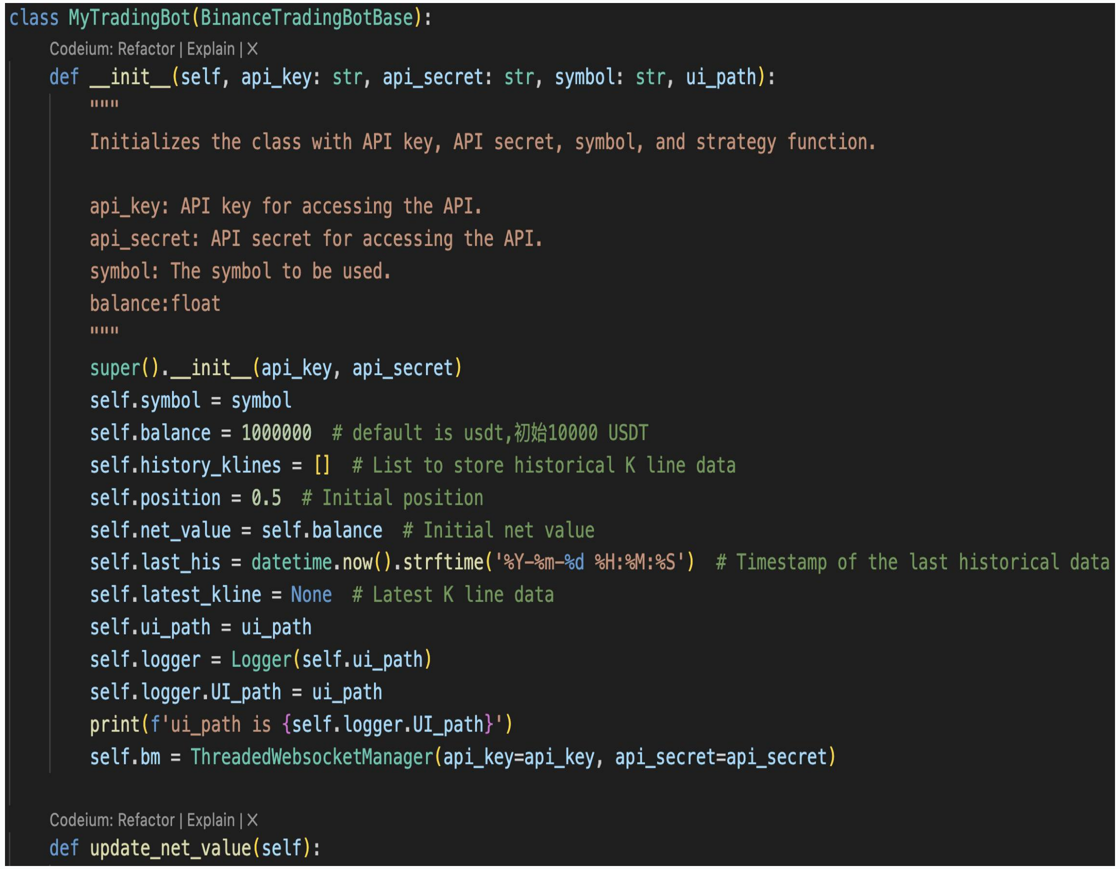
TCA

02

Calculate the transaction cost metrics, such as average execution price,inplementation shortfall,RPM

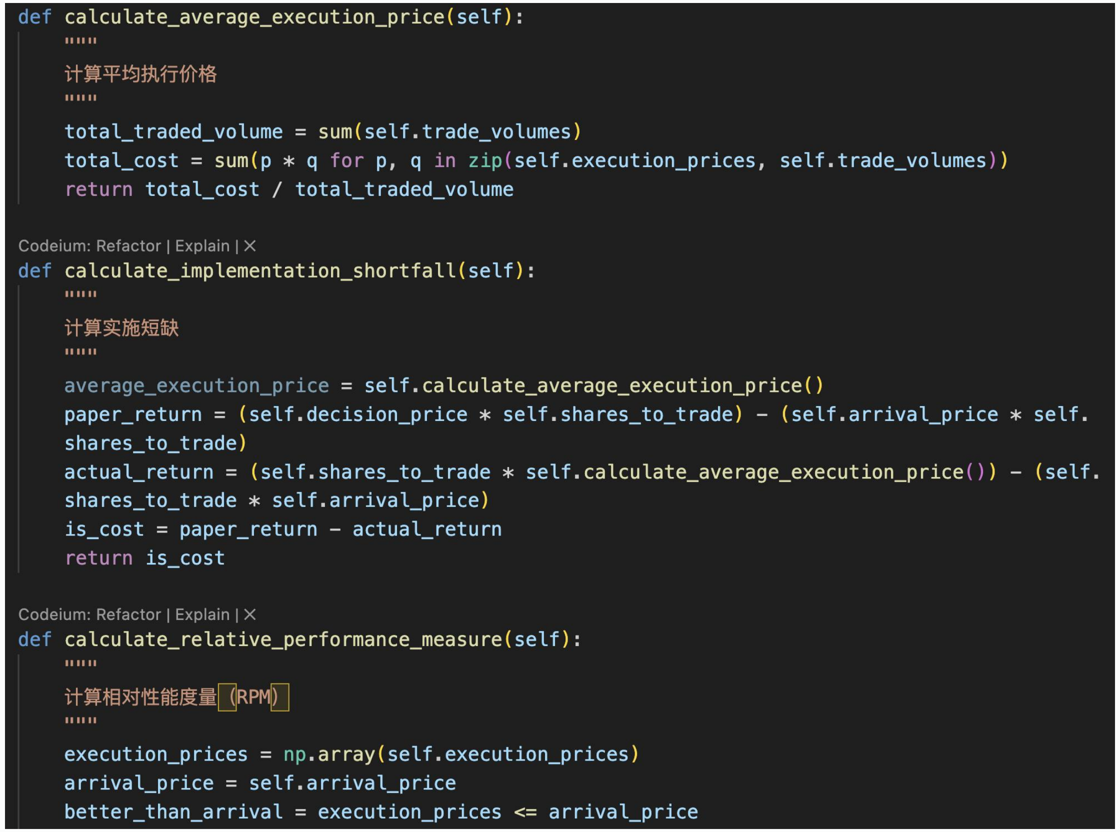
Live Trading

TradingBot



```
class MyTradingBot(BinanceTradingBotBase):
    Codeium: Refactor | Explain | X
    def __init__(self, api_key: str, api_secret: str, symbol: str, ui_path):
        """
        Initializes the class with API key, API secret, symbol, and strategy function.

        api_key: API key for accessing the API.
        api_secret: API secret for accessing the API.
        symbol: The symbol to be used.
        balance:float
        """
        super().__init__(api_key, api_secret)
        self.symbol = symbol
        self.balance = 1000000  # default is usdt,初始10000 USDT
        self.history_klines = []  # List to store historical K line data
        self.position = 0.5  # Initial position
        self.net_value = self.balance  # Initial net value
        self.last_his = datetime.now().strftime('%Y-%m-%d %H:%M:%S')  # Timestamp of the last historical data
        self.latest_kline = None  # Latest K line data
        self.ui_path = ui_path
        self.logger = Logger(self.ui_path)
        self.logger.UI_path = ui_path
        print(f'ui_path is {self.logger.UI_path}')
        self.bm = ThreadedWebsocketManager(api_key=api_key, api_secret=api_secret)

    Codeium: Refactor | Explain | X
    def update_net_value(self):
```

TCA



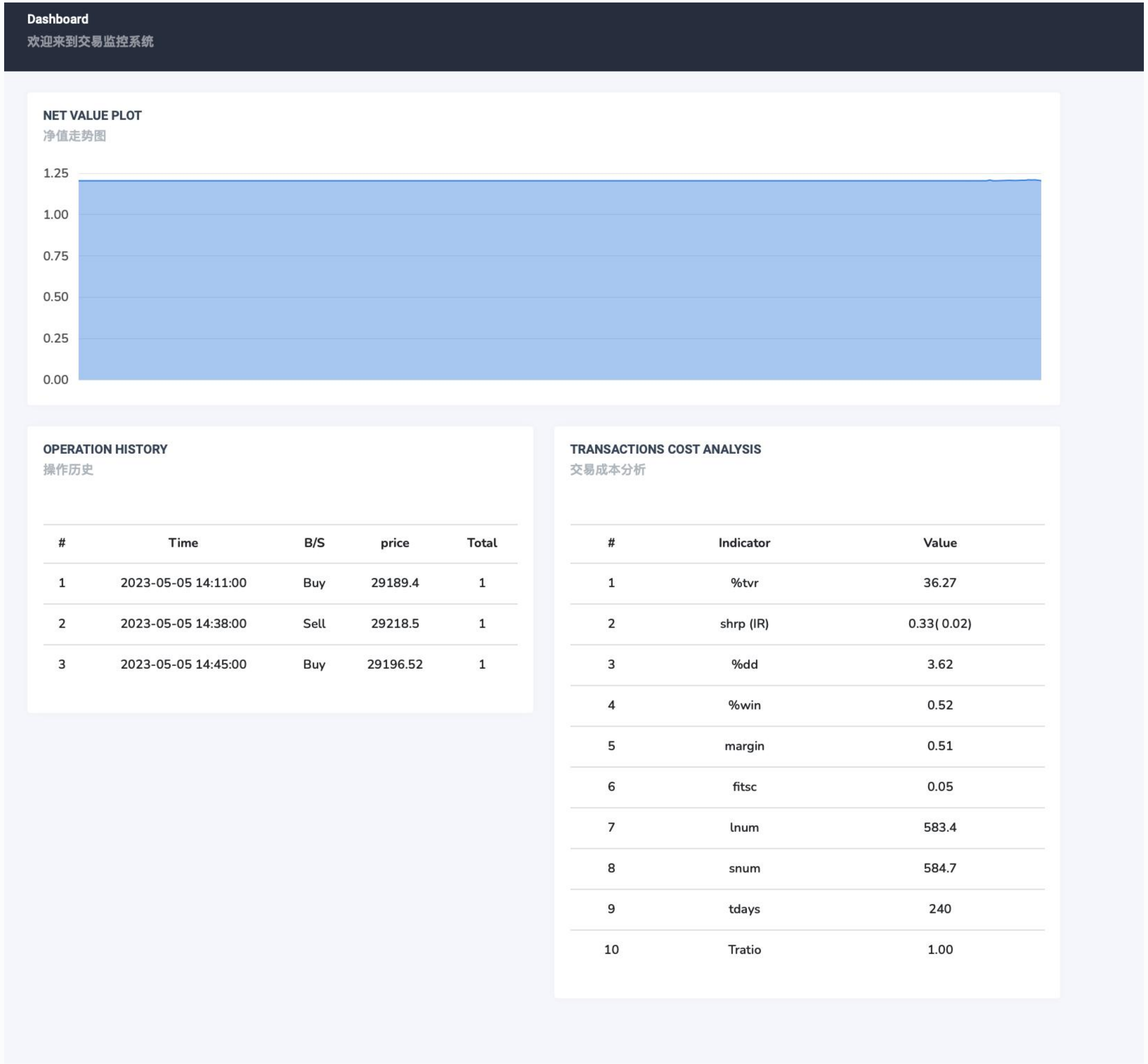
```
def calculate_average_execution_price(self):
    """
    计算平均执行价格
    """
    total_traded_volume = sum(self.trade_volumes)
    total_cost = sum(p * q for p, q in zip(self.execution_prices, self.trade_volumes))
    return total_cost / total_traded_volume

Codeium: Refactor | Explain | X
def calculate_implementation_shortfall(self):
    """
    计算实施短缺
    """
    average_execution_price = self.calculate_average_execution_price()
    paper_return = (self.decision_price * self.shares_to_trade) - (self.arrival_price * self.
    shares_to_trade)
    actual_return = (self.shares_to_trade * self.calculate_average_execution_price()) - (self.
    shares_to_trade * self.arrival_price)
    is_cost = paper_return - actual_return
    return is_cost

Codeium: Refactor | Explain | X
def calculate_relative_performance_measure(self):
    """
    计算相对性能度量（RPM）
    """
    execution_prices = np.array(self.execution_prices)
    arrival_price = self.arrival_price
    better_than_arrival = execution_prices <= arrival_price
```

Live Trading

LiveTrading Demo

Parameters:

- Symble: BTCUSDT
- Frequency: 1 min
- Period: Live
- Strategy: Dual Moving Average(10,5)



Dashboard
欢迎来到交易监控系统

NET VALUE PLOT
净值走势图

OPERATION HISTORY
操作历史

#	Time	B/S	price	Total
1	2023-05-05 14:11:00	Buy	29189.4	1
2	2023-05-05 14:38:00	Sell	29218.5	1
3	2023-05-05 14:45:00	Buy	29196.52	1

TRANSACTIONS COST ANALYSIS
交易成本分析

#	Indicator	Value
1	%tvr	36.27
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3	%dd	3.62
4	%win	0.52
5	margin	0.51
6	fitsc	0.05
7	lnum	583.4
8	snum	584.7
9	tdays	240
10	Tratio	1.00

Future Improvements

- Better pattern design.
- Better strategy.
- Multiple accounts management.
- ...

Thanks!