



# KDSH – Zelta Labs

## Algorithmic Trading Model

Team Ctrl+Alt+Defeat

Aditya J  
Somyajeet C  
Jagori B  
Shristi S

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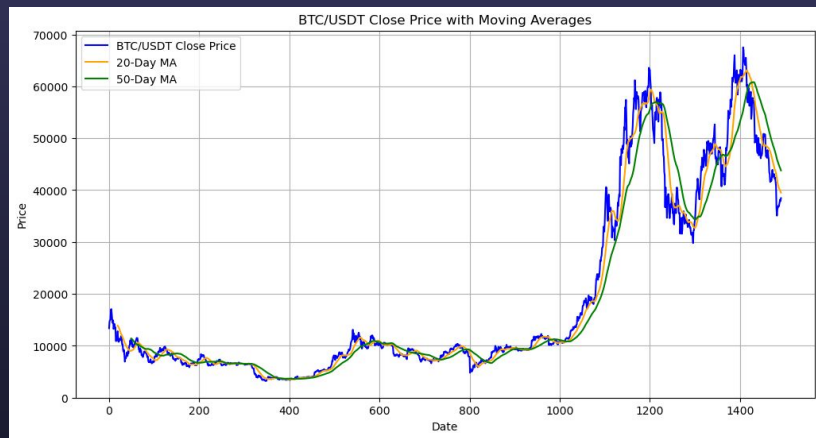
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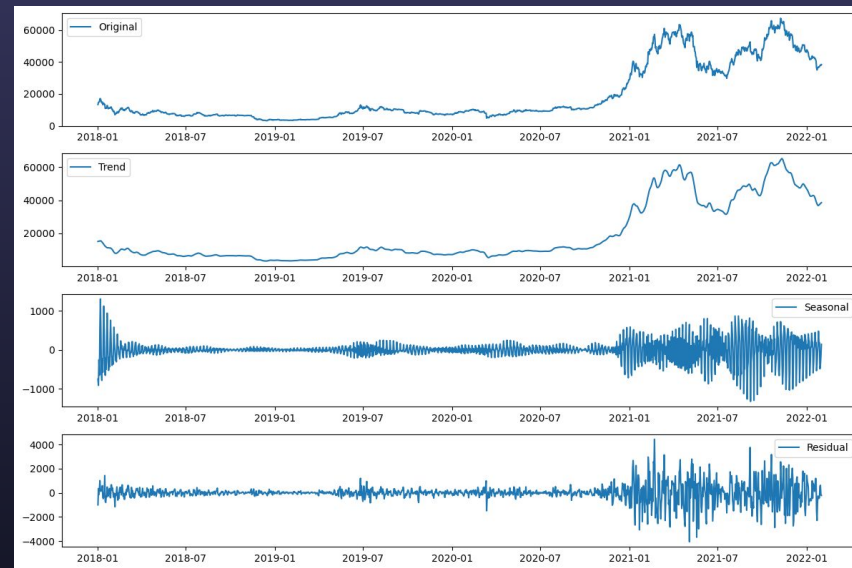
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# EXPLORATORY DATA ANALYSIS

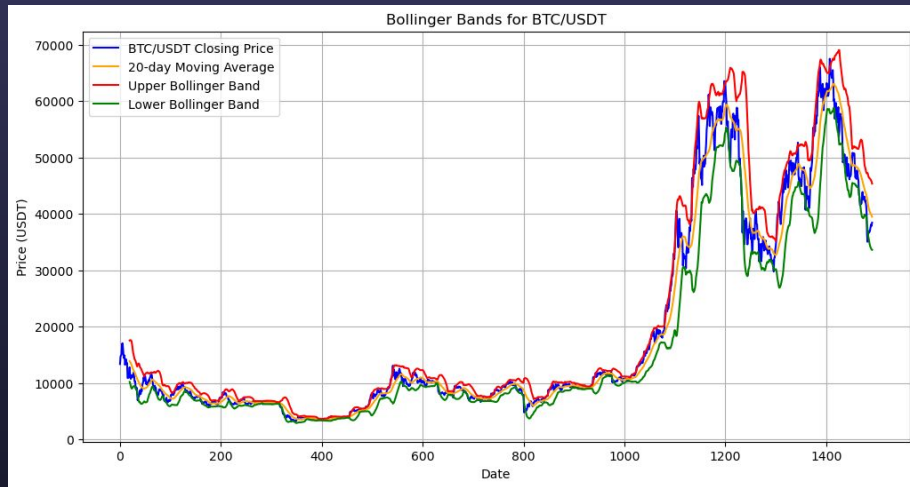


Moving Averages

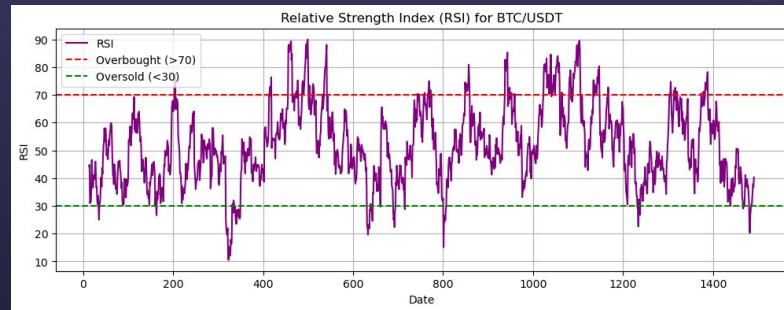


STL Analysis

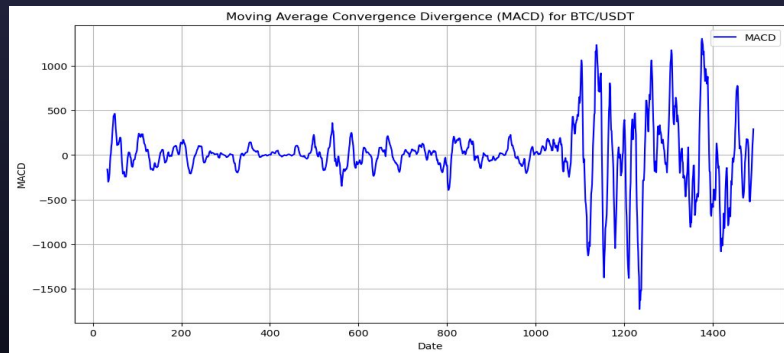
# EXPLORATORY DATA ANALYSIS



Bollinger Bands

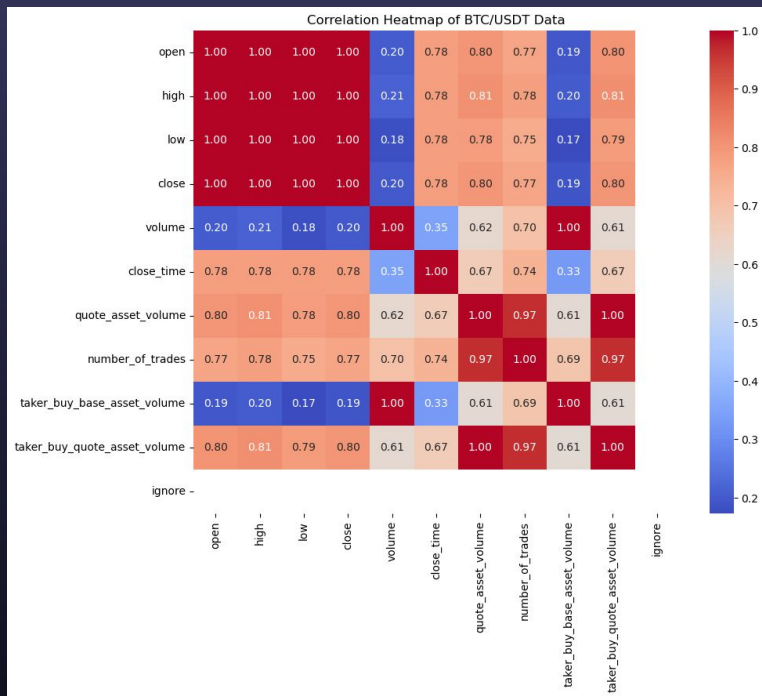


RSI

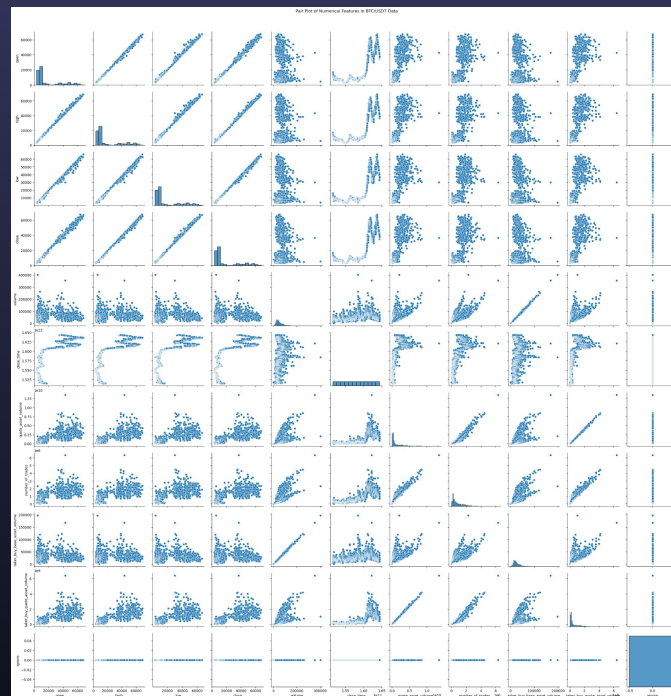


MACD

# EXPLORATORY DATA ANALYSIS

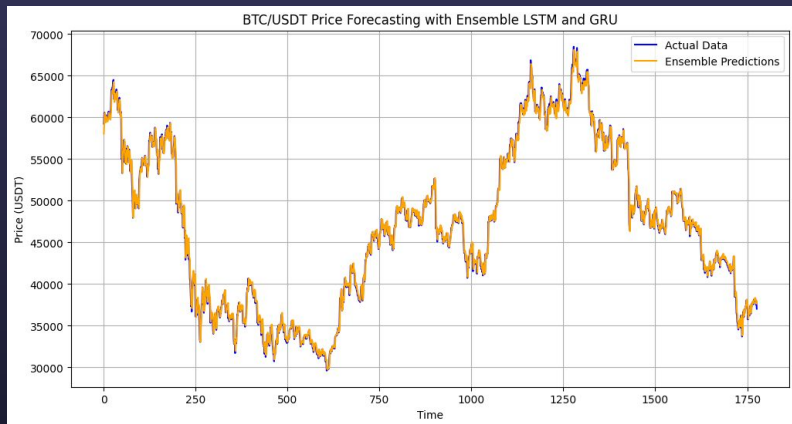


Correlation Heat Map



Pair Plot

# Developing Predictive Model- LSTM+GRU Ensemble



## RMSE FOR DIFFERENT DATASETS

	6 hrs	4 hrs	1 hr
LSTM test score	1006.63	808.78	384.11
GRU test score	923.06	793.35	395.88
Ensemble test score	942.91	779.07	389.19

# Indicators Used In Our Model



## MACD

Helps gain confidence about trends and gain insights of the market momentum

01

02

## SMA

Provides dynamic support of resistance based on trend identified

## RSI

Helps in navigating the volatile market and identifies reversals around psychological levels

03

04

## ADX

It identifies the strength of a trend allowing us to adapt to the changing market

# Buy vs Sell Signals



**BUY**

- If the closing price is above both short and long SMAs.
- RSI is below 45 (indicating potential oversold condition).
- MACD is positive
- ADX is above (indicating a strong trend).
- No open position exists

**V/S**

**SELL**



- If the closing price is below both short and long SMAs.
- RSI is above 55 (indicating potential overbought condition).
- MACD is negative.
- ADX is above (indicating a strong trend)
- An open position exists.



# Risk Management– Stop Loss and Take Profit

	Stop Loss	Take Profit
Definition	A stop-loss order is set at a predetermined price level, below the current market price for a long position or above for a short position	A take-profit order is set at a predetermined price level, above the current market price for a long position or below for a short position.
Purpose	It serves as a safety net to limit potential losses. If the market moves against the trader, the stop-loss order automatically triggers, closing the position and preventing further losses.	It allows traders to secure profits by automatically closing a position when the market reaches a favourable price level. This helps prevent potential reversal or retracement that could erode profits.
Implementation	2% of the trade price	2% of the trade price
Performance	Gross Profit- \$36,680.39 ; Net Profit- \$30,891.02 ; Sharpe Ratio- 0.8228	

# BACKTESTING RESULTS

## Actuating trade on BTC-USDT market

```
In [122]: # Print the starting conditions
print(f'Starting Portfolio Value: {cerebro.broker.getvalue():.2f} USDT')

result = cerebro.run()

print(f'Ending Portfolio Value: {cerebro.broker.getvalue():.2f} USDT')
```

```
Buying at 43544.03
current situation 43.115097262981116 3.5772395896638045 36.40307957051602
Buying at 42929.96
current situation 44.94279754443065 22.242242225031077 26.487278767890725
Buying at 43445.95
current situation 43.40502957117239 25.507267175999004 33.81758000231345
Buying at 42283.89
current situation 44.62607933521448 30.68428232205042 31.90605553919334
Buying at 42247.46
current situation 42.123857784937 11.40808990955702 28.910998065869435
Buying at 35771.37
current situation 44.4344907987664 44.43985989833891 27.483643065647122
Selling at 36798.0
Buying at 36777.38
current situation 39.74725432274282 14.512201137251395 31.82495834228603
Selling at 37703.93
Buying at 38171.67
current situation 44.06124397628028 53.11944719551684 31.021035328437375
Ending Portfolio Value: 40,534.76 USDT
```

# BACKTESTING RESULTS

## Analyzing results

In [ ]:

```
In [123]: strategy1 = result[0]
print('Sharpe Ratio:', strategy1.analyzers.mysharpe.get_analysis()['sharperatio'])
analysis_drawdown = strategy1.analyzers.drawdown.get_analysis()
analysis_trades = strategy1.analyzers.tradeanalyzer.get_analysis()

gross_profit = analysis_trades['pnl']['gross']['total']
net_profit = analysis_trades['pnl']['net']['total']
total_closed_trades = analysis_trades['total']['closed']

print(f'Gross Profit: {gross_profit:.2f}')
print(f'Net Profit: {net_profit:.2f}')
print(f'Total Closed Trades: {total_closed_trades}')
```

Sharpe Ratio: 0.8227504996334666  
Gross Profit: 36680.39  
Net Profit: 30891.02  
Total Closed Trades: 195

# BACKTESTING RESULTS-WITH TAKE PROFIT AND STOP LOSS

```
Buying at 42247.46
current situation 42.123857784937 11.40808990955702 28.910998065869435
Buying at 35771.37
current situation 44.4344907987664 44.43985989833891 27.483643065647122
Selling at 36798.0
Take Profit Price: 37533.96
Stop Loss Price: 36062.04
Buying at 36777.38
current situation 39.74725432274282 14.512201137251395 31.82495834228603
Selling at 37703.93
Take Profit Price: 38458.01
Stop Loss Price: 36949.85
Buying at 38171.67
current situation 44.06124397628028 53.11944719551684 31.021035328437375
Ending Portfolio Value: 40,534.76 USDT
```

```
In [128]: strategy2 = result[0]
print('Sharpe Ratio:', strategy2.analyzers.mysharpe.get_analysis()['sharperatio'])
analysis_drawdown = strategy2.analyzers.drawdown.get_analysis()
analysis_trades = strategy2.analyzers.tradeanalyzer.get_analysis()

gross_profit = analysis_trades['pnl']['gross']['total']
net_profit = analysis_trades['pnl']['net']['total']
total_closed_trades = analysis_trades['total']['closed']

print(f'Gross Profit: {gross_profit:.2f}')
print(f'Net Profit: {net_profit:.2f}')
print(f'Total Closed Trades: {total_closed_trades}')
```

```
Sharpe Ratio: 0.8227504996334666
Gross Profit: 36680.39
Net Profit: 30891.02
Total Closed Trades: 195
```

# BACKTESTING RESULTS—WITH TAKE PROFIT AND STOP LOSS

## Other parameters

```
In [129]: max_drawdown = analysis_drawdown['drawdown']  
print("Max Drawdown", max_drawdown)
```

Max Drawdown 3.8775885107041805

```
In [130]: max_duration = analysis_trades.len.max  
print("Max duration of single trade", max_duration)
```

Max duration of single trade 3490

```
In [131]: average_winning_trade = analysis_trades.pnl['gross']['average'] # or 'net' depending on your preference  
average_losing_trade = abs(analysis_trades.pnl['net']['average']) # Take the absolute value  
  
risk_reward_ratio_model = average_winning_trade / average_losing_trade if average_losing_trade > 0 else 0  
  
# Print the calculated Risk-Reward Ratio  
print(f'Risk-Reward Ratio of the Model: {risk_reward_ratio_model:.4f}')
```

Risk-Reward Ratio of the Model: 1.1874

# EQUITY CURVE-WITH TAKE PROFIT AND STOP LOSS



# Future Scopes

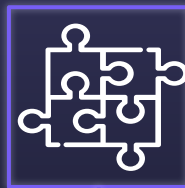
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**Dynamic Feature  
Selection**



**End-to-End  
Development**



**Ensemble  
Methods**



**Reinforcement  
Learning**