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Market price prediction based on Media and Market data

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Price prediction using Media and Market data

GOAL: To create a MLP model which use Market and Media data to predict price.

- **For Media-based predictor, we used 18 metrics for Sentiment (sen, pos, neg, con) and Cognitive Distortions per channel (catastrophizing, dichotoreasoning, disqualpositive, emotionreasoning, fortunetelling, labeling, magnification, mentalfiltering, mindreading, overgeneralizing, personalizing, shouldment, exclusivereasoning, negativereasoning)- for 77 social media channels relevant to crypto markets.**
- **For Market-based predictor we used 111 market metrics (derived from raw trades and limit order book snapshots) per 9 trading pairs (USDCUSDT,BTCUSDT, ETHUSDT, AAVEUSDT, COMPUSDT, CRVUSDT, UNIUSDT, SNXUSDT , AGIXBTC) from Binance crypto exchange.**

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Price prediction using Media and Market data

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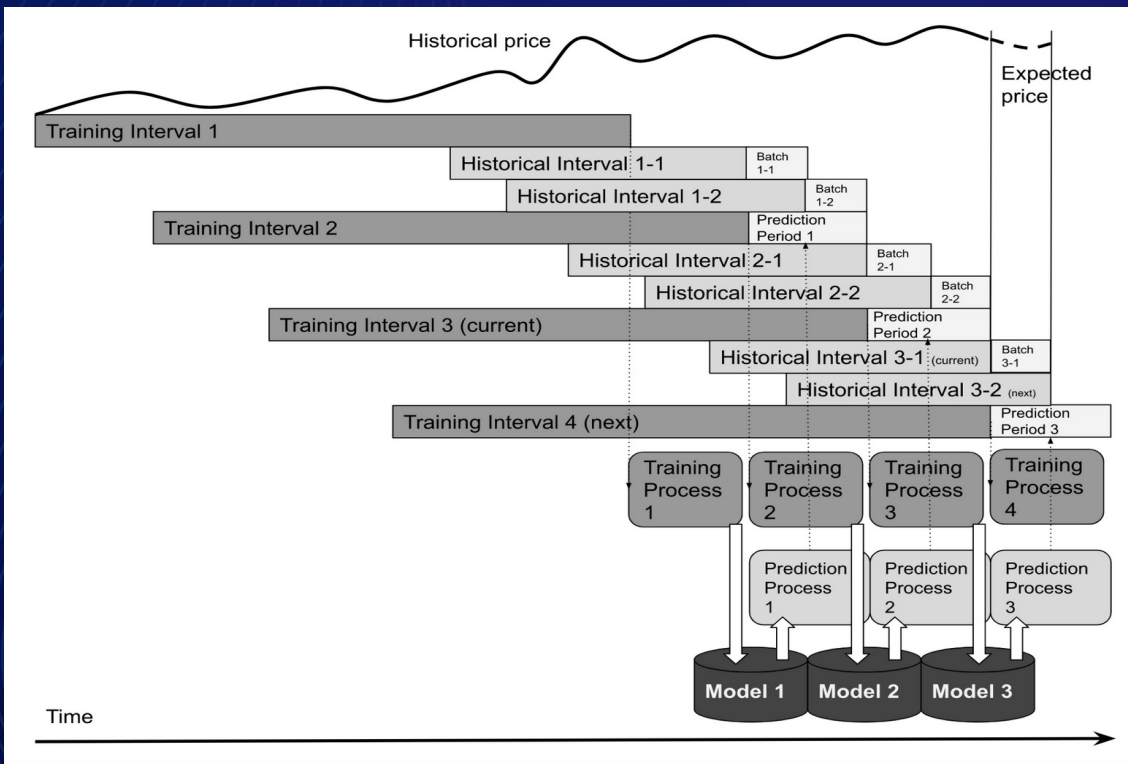
Price prediction pipeline

- **Metrics used for prediction are Sentiment, Cognitive Behavior Distortion or Market data.**
- **Four Intervals Training, Prediction, Historical and Target(Day, Hour, Minute) can be adjusted to improve prediction quality.**
- **Input metrics can be filtered based on context(filtering Social media text) and threshold correlation between price difference and metric itself.**
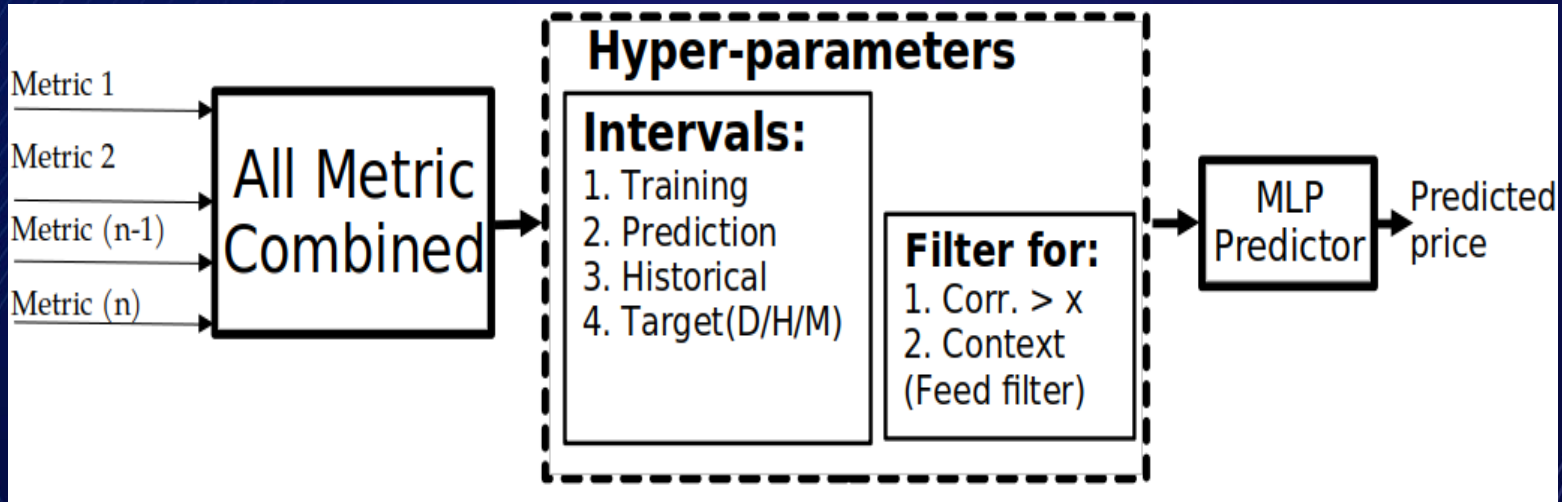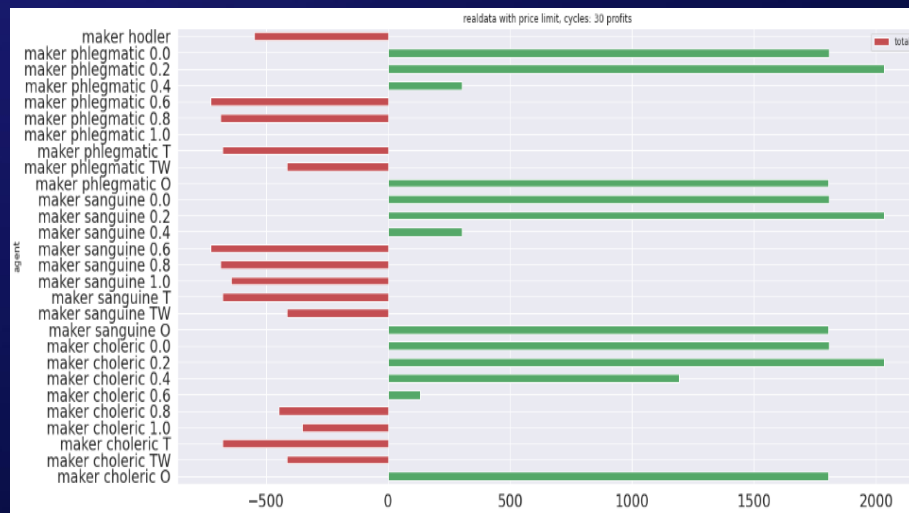
Accuracy Metrics

- **We compared 4 types of accuracy metrics for prediction and 2 types of financial metrics (based on backtesting):**
  - Weighted Directional Accuracy (WDA)
  - Directional Accuracy (DA)
  - F1 Score
  - Mean Average Percentage Error (MAPE)
  - Return of Investment, % (ROI)
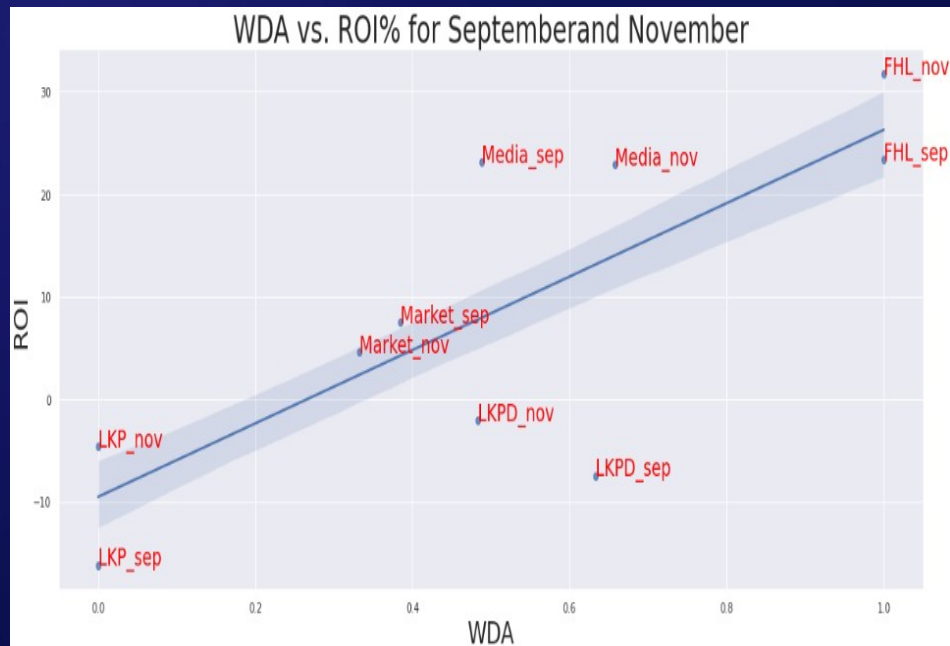 - ROI, assuming adaptive multi-strategy agency is used (ROI_AMSA)

Predictor	Month	WDA	DA	F1	MAPE	ROI	ROI_AMSA
Media	Nov	.658	.620	0.626	0.018	22.9	23.24
Media	Sep	.488	.551	0.482	0.023	23.11	23.11
Market	Nov	.332	.344	0.309	0.031	4.58	7.63
Market	Sep	.385	.517	0.423	0.028	7.55	8.40
LKP	Nov	0	0	0	0.019	-4.58	.37
LKP	Sep	0	0	0	0.021	-16.16	0
LKPD	Nov	.483	.620	.623	0.027	-2.02	.29
LKPD	Sep	.633	.517	.517	0.029	-7.44	0
FHL	Nov	1	1	1	0	31.73	31.73
FHL	Sep	1	1	1	0	23.37	23.37

realdata with price limit, cycles: 30 profits

Accuracy Metrics

- **Correlation between WDA and ROI% = 0.77**

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WDA vs. ROI% for September and November

Hyper-parameter Search

Weighted Directional Accuracy

Baselines

- **We created 3 baselines for prediction.**
  - **Upper bound:** Future history lookup (FHL) - look one point into future and get exact known price for the next data point: Prediction(T_{next}) = Actual(T_{next}).
  - **Lower bound:** Last known price (LKP) - just will use the last known price: Prediction(T_{next}) = Actual(T_{next-1}).
  - **Lower bound:** Last known price direction (LKPD) - difference between two different prices added to the LKP:
    - Prediction(T_{next}) = Actual(T_{next-1}) + (Actual(T_{next-1}) − Actual(T_{next-2})).

LKP vs price close for November

LKPD vs price close for November
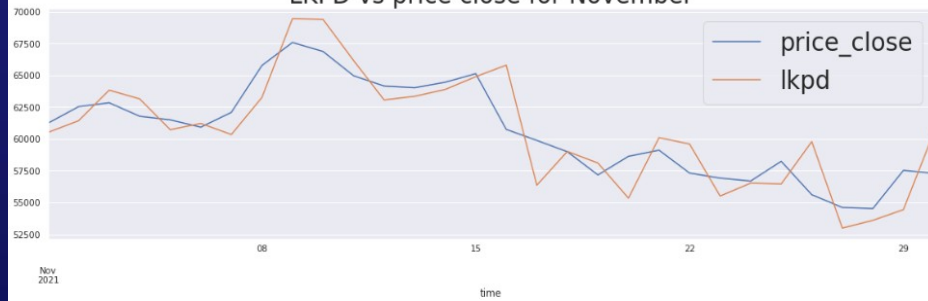
Media data based predictor vs price close for November

# WDA vs. Coefficient of Variance (CV) vs. Volume in USD

- **Max WDA BTCUSDT = 0.63**

- **Higher WDA corresponds to higher Volume_USD (Volume_USD = Trade_volume * price_close)**

- **Higher CV corresponds to lower Volume_USD**
- **Relative dispersion of data points in a data series around the mean**
- **Higher WDA corresponds to higher Liquidity???**

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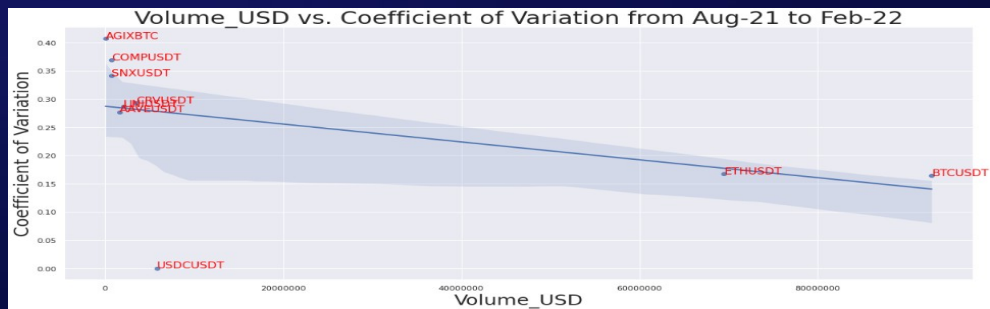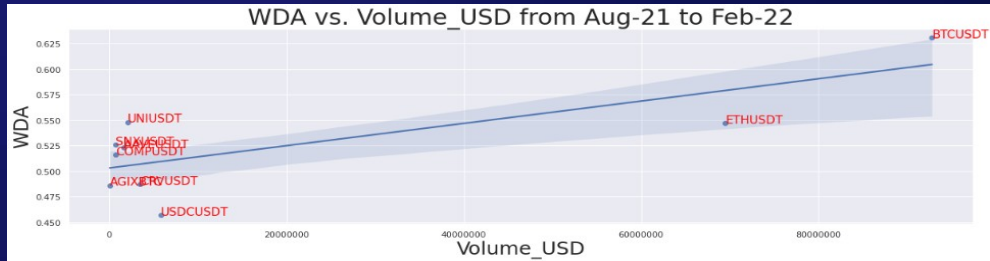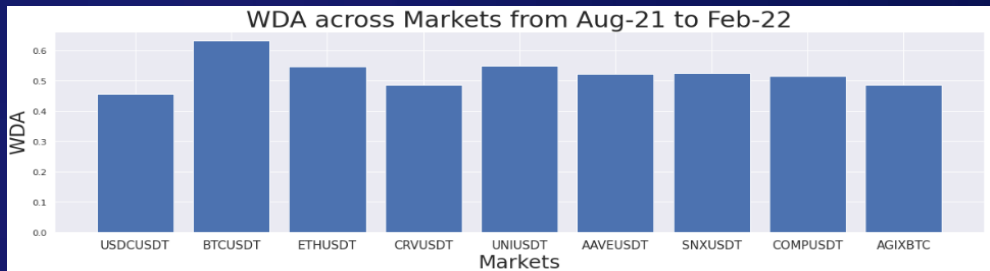
Backtesting

- **Backtesting with 5 competing price prediction setups:**
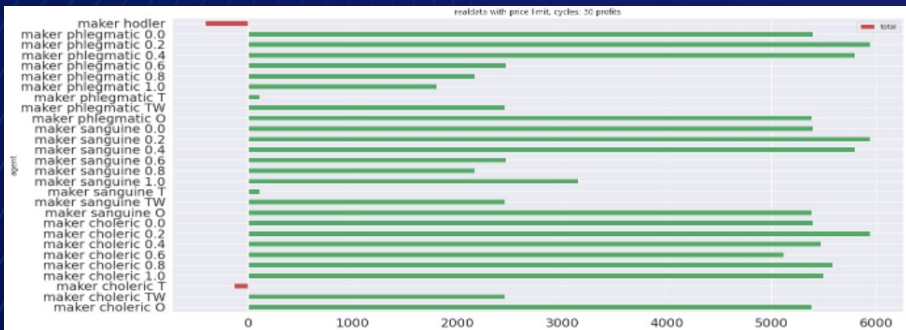 - Future history lookup (FHL)
  - No predictor
  - Last known price (LKP)
  - Last known price direction (LKPD)
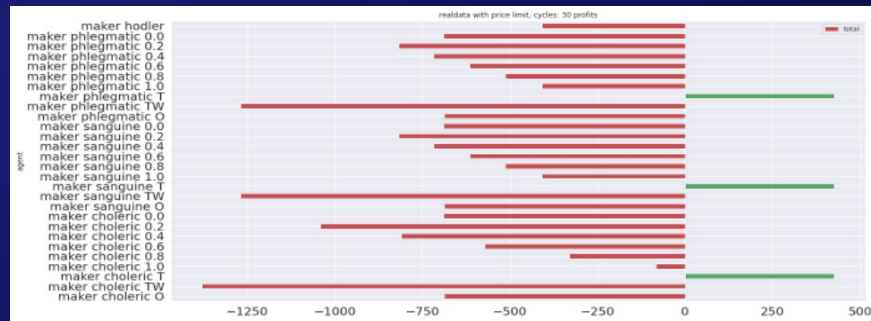 - Market-based predictor
  - Media-based predictor

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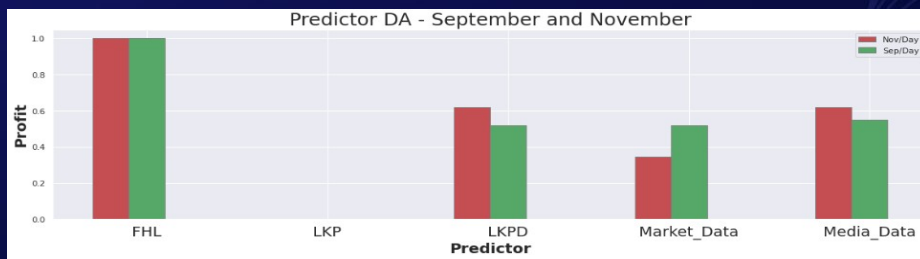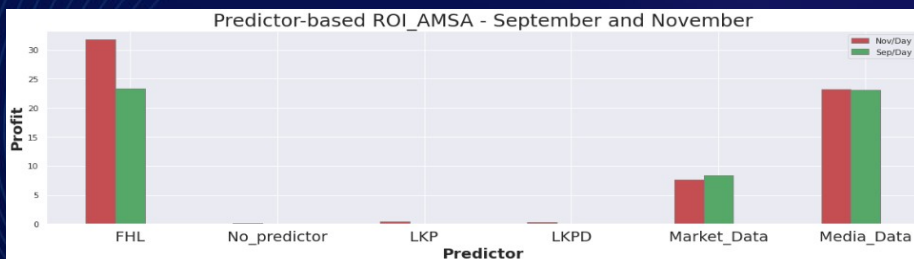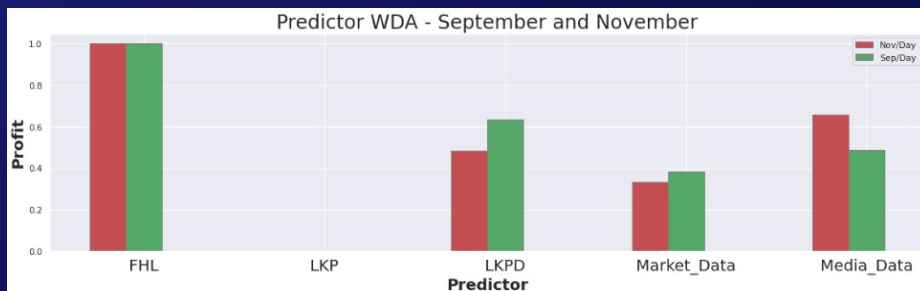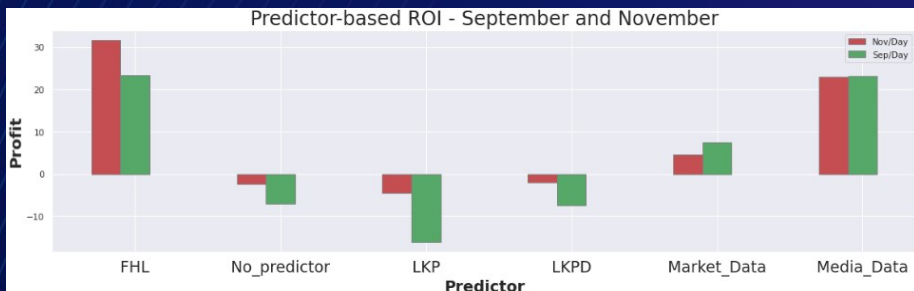
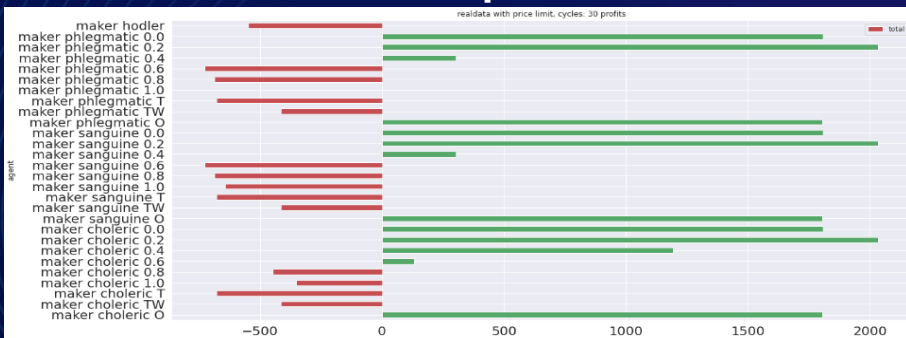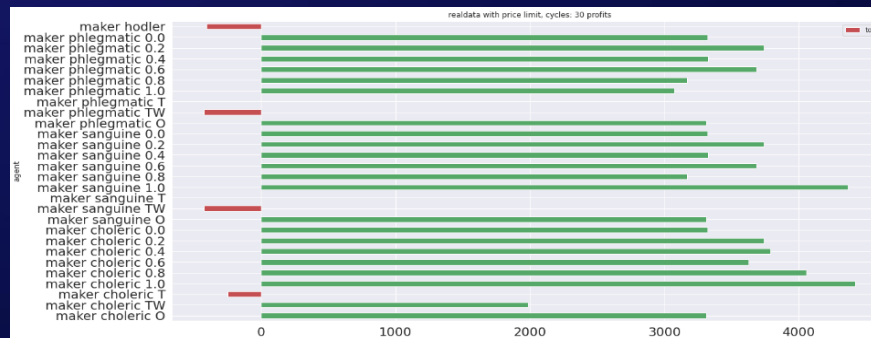# Backtesting

- **Different agent performance based on predictor**

Future history lookup

Last known price

Market data based predictor

Media data based predictor
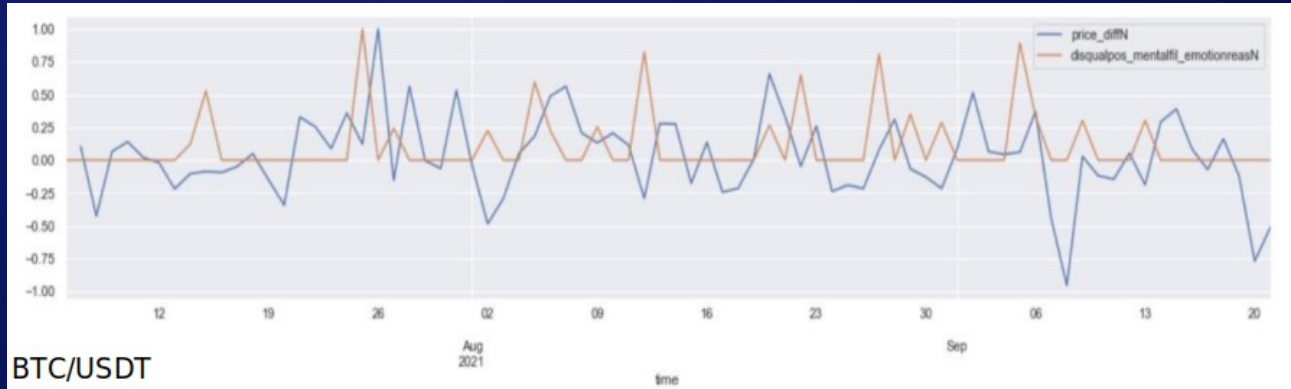

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Known issues and future work

- **Explore the reliability of hyperparameter search (DA/WDA deviations with different random seeds).**
- **Explore the reason for the disconnection between DA/WDA and trading performance (ROI).**
- **Look into the predictability of Trade Volume and Trade Count (have a better correlation with Social Media metrics than Price).**
- **Explore DA weighted by Volume for a better connection with trading performance (VWDA or Volume Weighted Directional Accuracy).**
- **Volume prediction will help in market making.**

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Causal connections between Sentiment and BTC/USD Price and Volume

- **Cognitive Distortion vs Price Move**
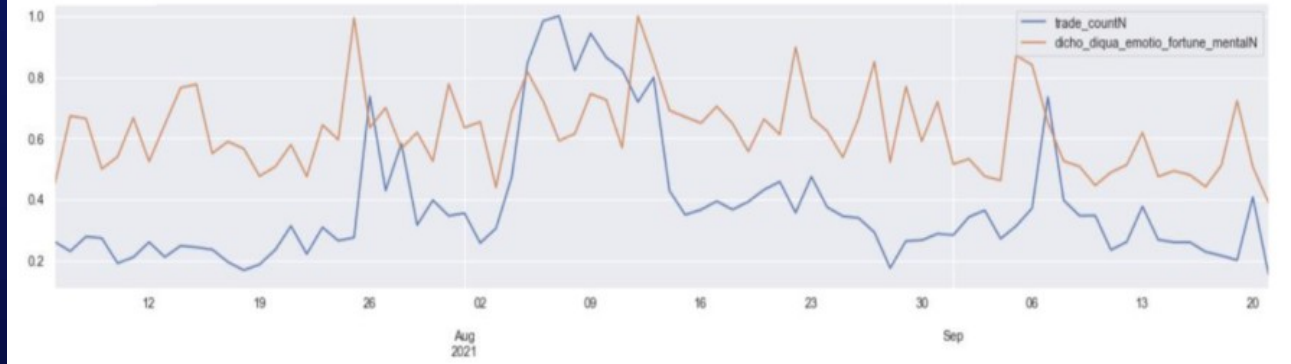
- **Cognitive Distortion vs Trade Count**

BTC/USDT

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Thank you for your attention

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