Paper Link : https://aclanthology.org/2024.finnlp-1.16/

Summary : The research paper by Luan et al. explores stock price prediction in the Chinese market by integrating sentiment analysis from social media comments. The study creates a dataset of 24 stocks from the Shanghai Stock Exchange, categorized by market value (CSI 100, 200, 500, 1000) and Book-to-Market (B/M) ratios, with 12,000 manually annotated comments. Sentiment classifiers, including SVM, CNN, CBERT, and EMB-1.3B-S, were trained, with EMB-1.3B-S achieving the best performance (F1: 0.969). These sentiment scores were integrated into LSTM and Bi-LSTM models for stock price prediction. Results show that sentiment integration generally improves prediction accuracy, with Bi-LSTM with sentiment performing best (RMSE: 41.1603, MAPE: 145.5350). However, the impact varies across stocks, with higher market value (CSI 100) and high B/M ratio stocks showing better predictive performance. The study highlights that sentiment analysis enhances predictions but is not uniformly effective, particularly for low B/M ratio stocks. The findings suggest focusing on high market value and high B/M ratio stocks for better forecasting accuracy using Bi-LSTM models.

Paper Link : https://arxiv.org/abs/2208.08300

Summary : The 2022 study by Muhammad et al. applies a transformer-based deep learning model with time2vec encoding to predict stock prices on the Dhaka Stock Exchange (DSE) for eight stocks, including 1JANATAMF, AAMRANET, and ACI. Historical daily and weekly data are preprocessed using a 10-day moving average and Min-Max normalization, incorporating five features (opening, highest, lowest, closing prices, and volume) from the prior eight days/weeks. The model, utilizing self-attention and time2vec, achieves promising results with low RMSE (0.0102–0.0669 daily, 0.0289–0.1354 weekly) and MAE (0.0125–0.0545 daily, 0.0218–0.1038 weekly). Predictions for ACI, ACIFORMULA, and DELTALIFE closely match actual prices, while 1JANATAMF and ABBANK show slight deviations. The model's versatility supports both regression and classification tasks, offering valuable insights for short- and long-term investment decisions in developing markets like Bangladesh.

Paper Link : https://www.mdpi.com/2227-7390/11/9/1985

Summary: The 2023 study by Zhang et al. proposes a CNN-BiLSTM-Attention model for stock price prediction, tested on the CSI 300 Index (2011–2021) and 11 other Chinese and international indices. The model integrates CNN for local feature extraction, BiLSTM for bidirectional temporal feature learning, and an attention mechanism to prioritize critical features. Data preprocessing involves Min-Max normalization, with features including opening, highest, lowest, closing prices, volume, turnover, and return. The model outperforms LSTM, CNN-LSTM, and CNN-LSTM-Attention models, achieving the lowest MAPE (1.023%), RMSE (64.848), and highest R^2 (0.985) for CSI 300. Robustness is confirmed across indices like SSE A-share, SSE Composite, SZSE Component, and international indices (e.g., AEX, FTSE, HSI), with RMSE reductions up to 32.8% compared to the next best model. Despite strong performance, limitations include sensitivity to spikes and exclusion of multi-source data, suggesting future enhancements.

Paper Link: https://ieeexplore.ieee.org/abstract/document/10185006

Summary: The 2023 study by Wang proposes the BiLSTM-MTRAN-TCN model for stock price prediction, combining BiLSTM, an improved Transformer (MTRAN), and TCN. The model modifies the Transformer by removing Input Embedding, adjusting Position Encoding, and replacing the decoder with TCN and fully connected layers. It uses 2700 trading days of data (2012–2023) from five Chinese index stocks (e.g., CSI 300, Shanghai Composite) and 14 Shanghai/Shenzhen stocks across seven sectors. Features include closing, opening, highest, lowest prices, volume, turnover, and moving averages, normalized via Z-score. Compared to LSTM, BiLSTM, CNN-BiLSTM, CNN-BiLSTM-AM, and BiLSTM-SA-TCN, BiLSTM-MTRAN-TCN achieves superior performance, with RMSE reduced by 24.3%–93.5% and R^2 increased by 0.3%–15.6%. It demonstrates high accuracy (R^2 up to 0.996), strong generalization (best R^2 in 85.7% of stocks), and stability across time periods, with no timeliness issues.

Paper Link: https://www.mdpi.com/2227-7390/11/5/1130

Summary: The 2023 study by Zhao et al. introduces the Time Series Relational Model (TSRM) for stock price prediction, integrating time series and stock relationship data. TSRM uses LSTM to extract temporal features from trading data (open, close, high, low, volume, turnover) and GCN to capture relationships derived via K-means clustering of closing prices, avoiding reliance on third-party platforms. Tested on 87 Shanghai and 68 Shenzhen CSI 300 stocks (2019–2020), TSRM-K-means outperforms LSTM, CNN-LSTM, KD-LSTM, and TSRM-CSRC, achieving 44% and 41% higher cumulative returns and 4.9% and 6.6% lower maximum drawdowns in Shanghai and Shenzhen, respectively. Optimal K-values (25 for Shanghai, 20 for Shenzhen) balance relationship coverage. Limitations include reliance on recent data and exclusion of external factors like macroeconomic indicators.

Paper Link: https://link.springer.com/article/10.1007/s00521-023-09369-0

Summary: The 2024 study by Billah et al. compares Simple Moving Average (SMA), Exponential Moving Average (EMA), and Long Short-Term Memory (LSTM) for stock price prediction using datasets from six companies (AAPL, AMZN, BXPH, GOOG, NFLX, TSLA) sourced from Yahoo Finance. For short-term predictions, LSTM outperforms SMA and EMA, achieving the lowest errors (RMSE: 12.312, MAPE: 2.06%) compared to EMA (RMSE: 36.683, MAPE: 10.71%) and SMA (RMSE: 43.774, MAPE: 12.53%). EMA prioritizes recent prices, while SMA averages evenly. For long-term predictions, SMA and EMA perform better, with lower errors (e.g., AAPL RMSE: 5.44 for SMA, 4.70 for EMA vs. 40.28 for LSTM). LSTM excels in short-term accuracy due to its ability to capture historical patterns. Future work suggests enhancing LSTM with cross-validation and feature engineering.

Paper Link:
https://www.sciencedirect.com/science/article/pii/S0957417423008485?ref=pdf_download&fr=RR-2&rr=94a083c7a857d05f

Summary: The research paper, published in Expert Systems With Applications (2023), introduces a deep Long Short-Term Memory (LSTM) network optimized by the Artificial Rabbits Optimization (ARO) algorithm, termed LSTM-ARO, for stock price prediction. The model leverages the ARO algorithm to fine-tune LSTM hyperparameters, enhancing prediction accuracy for the Dow Jones Industrial Average (DJIA) stock prices from 2018 to 2023. The dataset, sourced from Yahoo Finance, uses a 20-day time window to predict the next day's price, with 80% for training and 20% for testing. The LSTM-ARO model outperforms other models (ANN, LSTM1D, LSTM2D, LSTM3D, and LSTM-GA) based on evaluation metrics like Mean Squared Error (MSE), Mean Absolute Error (MAE), and R^2 score. Results indicate LSTM-ARO achieves the lowest MSE for most DJIA stocks, demonstrating superior predictive performance. Future research aims to integrate this model into dynamic trading systems for enhanced buy/sell/keep recommendations.

Paper Link:https://link.springer.com/article/10.1007/s11280-021-01003-0

Summary: The 2023 World Wide Web paper proposes a clustering-enhanced deep learning framework for stock price prediction using LSTM, RNN, and GRU models. It introduces Logistic Weighted Dynamic Time Warping (LWDTW), a novel similarity measure that leverages logistic distribution to cluster stocks effectively, outperforming Euclidean distance and standard DTW. The framework employs k-medoids clustering on daily prices of 322 US stocks (2005–2017) from Kaggle, split into training (2005–2014), validation (2015–2016), and testing (2017) sets. LWDTW-clustered LSTM achieves the best forecasting accuracy, with MAPE (0.1278), MAE (0.0536), MSE (0.0059), RMSE (0.0745), and R^2 (0.9517) for 70 S&P 500 stocks. Ablation studies on stocks like Google and Microsoft confirm LSTM's superiority with LWDTW clustering. The framework enhances prediction accuracy, offering potential for real-world investment applications.

Paper Link: https://ieeexplore.ieee.org/abstract/document/10130578

Summary: The 2023 IEEE Access paper introduces the MS-SSA-LSTM model for stock price prediction, integrating investor sentiment, Sparrow Search Algorithm (SSA), and Long Short-Term Memory (LSTM) networks. It constructs a stock-specific sentiment dictionary using East Money forum posts, calculating sentiment indices to enhance prediction accuracy. SSA optimizes LSTM hyperparameters, improving model performance. The model uses historical trading data (e.g., closing price, volume) and sentiment indices from six Chinese A-share stocks (2016–2022). Compared to MLP, CNN, and standard LSTM, MS-SSA-LSTM achieves superior results, with an average R^2 improvement of 10.74% over LSTM (e.g., PetroChina: MAPE 0.018216, R^2 0.956459). Short-term predictions (5–10 time steps) are optimal due to China's volatile market. The model is universal, applicable to global markets, but future work should refine sentiment analysis and include macroeconomic factors.

Paper Link:https://www.mdpi.com/1099-4300/25/2/219

Summary: The 2023 Entropy paper investigates deep stock market forecasting by integrating sentiment analysis with time series models. It compares 30 state-of-the-art algorithms across 16 stock datasets (2018–2020), using 67 feature setups combining closing prices and sentiment scores from Twitter, extracted via TextBlob, VADER, and FinBERT. The study evaluates performance over 1, 7, and 14-day forecast horizons using six metrics (MAE, MAPE, MSE, RMSE, RMSLE, R^2). Key findings highlight the Temporal Convolutional Network (TCN) as the top-performing method, especially for longer horizons, with TSTPlus and XCMPlus also showing strong results. Incorporating sentiment analysis generally improves predictions, particularly with smoothed time series, though no single sentiment method consistently dominates. The Blob_RM_7_Blob setup excels for short-term forecasts, while RM_7_Close_Blob performs well for 14-day predictions. The study underscores the value of multivariate inputs with sentiment data for enhancing forecast accuracy.

Paper Link:https://dl.acm.org/doi/full/10.1145/3694860.3694870

Summary: The 2024 ICCBOC paper, "Predicting Stock Prices with FinBERT-LSTM: Integrating News Sentiment Analysis," proposes a hybrid FinBERT-LSTM model to forecast stock prices by combining sentiment analysis of financial news articles with historical stock data. Using a dataset of 843,062 Benzinga news articles and NASDAQ-100 stock prices from 2009–2020, the model leverages FinBERT to extract sentiment scores (positive, neutral, negative) and LSTM to process time-series data. The FinBERT-LSTM model outperformed standalone LSTM and DNN models, achieving a testing loss of 0.00083, MAE of 173.67, MAPE of 0.045, and accuracy of 0.955 over 77 epochs. The study highlights the value of integrating news sentiment for improved short-term stock price forecasting. Future work includes expanding datasets, enhancing sentiment analysis, incorporating fake news detection, and exploring other markets like gold and real estate.

Paper Link:https://peerj.com/articles/cs-1293/#

Summary: The research paper by Xiao and Ihnaini explores stock trend prediction using sentiment analysis of tweets and news for Service (Amazon, Netflix) and Technology (Apple, Microsoft) stocks in 2021. It introduces a novel weighted sentiment index, combining VADER for tweets and FinBERT for news, and tests two time divisions: natural hours (0:00–0:00) and opening hours (9:30–9:30). The study accounts for the holiday effect, adjusting sentiment scores for non-trading days. Six machine learning algorithms (KNN, Tree, SVM, Random Forest, Naïve Bayes, Logistic Regression) were evaluated with 10-fold cross-validation to predict two goals: next-day open-to-open and open-to-close price trends. Naïve Bayes performed best, with opening hours division (CO) outperforming natural hours (CN) for open-to-close predictions, achieving up to 62.4% accuracy. The results highlight the effectiveness of time-specific sentiment analysis and the holiday effect in improving stock trend predictions.

Paper Link:https://www.neliti.com/publications/589860/harmonizing-macro-financial-factors-and-twitter-sentiment-analysis-in-forecastin

Summary: The research paper by Amin et al. investigates whether Twitter sentiment about ChatGPT, from December 2022 to March 2023, can predict daily stock price movements for tech companies like Microsoft, Google, Meta, NVIDIA, and Amazon. Using a dataset of 500,000 ChatGPT-related tweets and historical stock prices, the study employs natural language processing to extract sentiment scores and integrates macroeconomic indicators (e.g., Consumer Price Index, unemployment rates) and stock market data. Machine learning models, including Random Forest, Gradient Boosting, Decision Tree, Naïve Bayes, and Extra Trees, were used to forecast bullish or bearish trends. Random Forest excelled for Microsoft stock (100% bullish accuracy, 82% bearish) and performed strongly for Google, while Gradient Boosting led in Google's bearish predictions (98% accuracy). The study highlights the synergy of Twitter sentiment, macroeconomic factors, and company-specific data in enhancing stock market trend predictions.

Paper Link:https://www.sciencedirect.com/science/article/pii/S0957417423003639

Summary: The research paper, published in Expert Systems With Applications (2023), provides a comprehensive review of sentiment analysis on social media, focusing on platforms like Twitter. It highlights sentiment analysis applications in financial market prediction, health, customer analytics, politics, and more. The study emphasizes Twitter's role due to its diverse user base and frequent opinion expression. Key points include the evolution of sentiment analysis techniques (machine learning, lexicon-based, hybrid, and deep learning), temporal sentiment analysis for tracking sentiment changes over time, and causality analysis using Granger's causality to explore variable relationships, particularly in stock market predictions. The paper notes a gap between academic research and commercial applications, with industry uses in social media management, monitoring, and content analysis. Challenges include reproducibility issues, the complexity of large language models, and domain-specific variations. Over 2,000 academic publications and 8,000 patents indicate significant research and commercial interest, suggesting room for further advancements.

Paper Link:https://arxiv.org/abs/2303.09397

Summary: The research paper, published in Computer Science & Information Technology (2023), presents a model for predicting Bitcoin prices using Twitter sentiment analysis and historical price data. The study employs a FinBERT-based neural network to predict tweet sentiment, achieving a Mean Absolute Percentage Error (MAPE) of 9.45%. A Gated Recurrent Unit (GRU) model forecasts Bitcoin prices with a MAPE of 3.6%, using features like historical prices, tweet volume, user followers, and verification status. The dataset, sourced from Yahoo Finance and Kaggle, covers July 2021 to August 2022, with sentiment labeled using VADER. Data preprocessing addressed neutral tweet imbalance through undersampling and Gaussian

noise addition. The model outperforms other methods like Bi-LSTM, demonstrating the efficacy of combining contextual sentiment analysis with GRU for price prediction. Future work aims to incorporate sentiments from multiple media sources for enhanced accuracy.
Paper Link:https://www.cell.com/heliyon/fulltext/S2405-8440(23)10992-3

Summary: The research paper, published in Heliyon (2024), explores sentiment analysis of Turkish financial tweets to predict BIST30 stock market behavior. It combines lexicon-based and machine learning (ML) approaches, analyzing 17,189 tweets collected via MAXQDA 2020 from November 7–15, 2022, and unlabeled tweets from November 21–25, 2022. The Orange Data Mining tool labeled sentiments as positive (34.81%), neutral (47.20%), or negative (17.99%) using a multilingual lexicon. Six ML classifiers—Naive Bayes, Logistic Regression, Support Vector Machine (SVM), K-Nearest Neighbor, Decision Trees, and Multilayer Perceptron (MLP)—were applied, with SVM and MLP achieving the highest accuracies (89% and 88%) and AUC values (0.8729 and 0.8647). The study found that frequently mentioned stocks (e.g., SASA, HEKTS) had less price fluctuation, suggesting public attention stabilizes perceptions. Limitations include the complexity of market dynamics and reliance on Twitter data. Future work aims to incorporate multimodal data and deep learning.

Paper Link:https://www.mdpi.com/2075-1680/12/9/835

Summary: The research paper investigates S&P 500 index forecasting using sentiment analysis and deep learning, specifically employing FinBERT and LSTM models. It analyzes summarized news data from The New York Times (2018–2022) to extract sentiment scores with FinBERT, a finance-specific transformer model. These scores, combined with S&P 500 metrics (Open, High, Low, Close, Adj Close, Volume), are used in an LSTM model optimized via random search. The study compares LSTM models with and without sentiment scores, finding that incorporating sentiment reduces error measures (MSE, RMSE, MAE) and increases R^2, indicating improved prediction accuracy. This holds true during high-volatility periods like COVID-19 and the Russia-Ukraine War. The use of concise news summaries proves effective, reducing data volume without sacrificing predictive power. The findings highlight sentiment's role in stock price prediction, suggesting future research into diverse media sources and additional factors influencing market dynamics.

Paper Link:https://ietresearch.onlinelibrary.wiley.com/doi/full/10.1049/cit2.12059

Summary: The research paper by Mukherjee et al. (2021) explores stock market prediction using deep learning, focusing on the National Stock Exchange (NSE) NIFTY dataset (2008–2018, extended to 2020). Two models are proposed: a backpropagation-based Artificial Neural Network (ANN) and a Convolutional Neural Network (CNN) using 2-D histograms. The ANN predicts 'Open,' 'Close,' 'High,' and 'Low' prices with 97.66% accuracy, while the CNN achieves 98.92% by transforming time-series data into 2-D histograms for efficient feature extraction. The CNN requires less training data and time, outperforming ANN, especially during volatile periods like COVID-19 (91%–98% accuracy). Regularization prevents overfitting, and the models' robustness is validated across 15 dataset segments. The study highlights CNN's

superior context retention and suggests its potential for economic forecasting, with applications for stock analysts.

Paper Link:https://ieeexplore.ieee.org/abstract/document/10528270

Summary: The research paper by Peivandizadeh et al. (2024) introduces a novel approach for stock market prediction by integrating social media sentiment analysis with historical stock data from the National Stock Exchange (NSE) of India (2015–2020). The model addresses class imbalance in sentiment classification using an Off-policy Proximal Policy Optimization (PPO) algorithm, which adjusts rewards to prioritize minority class accuracy. A Transductive Long Short-Term Memory (TLSTM) model captures temporal dynamics, emphasizing recent data for enhanced prediction accuracy. The dataset includes 12,000 daily news articles and over 1.1 million stock entries. The proposed model achieves an RMSE of 2.147, an accuracy of 82.19%, and an F-measure of 89% for sentiment analysis, outperforming models like BiLSTM and PSAN. Ablation studies confirm the effectiveness of Off-policy PPO and TLSTM. Limitations include data quality dependence, market volatility sensitivity, computational complexity, and overfitting risks. Future work suggests exploring diverse data sources and adaptive mechanisms.

Paper Link:https://academianexusjournal.com/index.php/anj/article/view/11/12

Summary: The research paper by Zheng et al. (2024) explores detecting abnormal stock market volatility using sentiment analysis of 2.5 million social media posts over 24 months, integrated with market data. A hybrid model combining bidirectional LSTM with self-attention mechanisms and traditional NLP achieves a 95.7% detection rate during high-volatility periods, with a 2.8% false positive rate. The model reduces false positives by 23.5% and improves response time by 31.2% compared to traditional methods, showing a 0.789 correlation with volatility patterns. Innovations include multi-dimensional sentiment indicators, adaptive weighting, and noise reduction techniques. Robustness tests confirm stability across market conditions. Limitations involve linguistic complexity, data quality, and computational demands. The study recommends real-time sentiment monitoring for market participants and regulators, enhancing risk management and market stability.

Paper Link:https://www.mdpi.com/2504-2289/8/6/63

Summary:anguage models (LLMs) and NLP models—GPT-4, BERT, and FinBERT—in cryptocurrency sentiment analysis using a dataset of 31,037 news articles. Fine-tuning with few-shot learning on 5,000 articles improved sentiment classification accuracy. The fine-tuned GPT-4 achieved the highest accuracy at 86.7%, followed by FinBERT (84.3%) and BERT (83.3%), with the Adam optimizer outperforming AdamW. The base GPT-4 model scored 82.9% without fine-tuning, highlighting LLMs' robustness. The study underscores fine-tuning's role in enhancing model precision for crypto-specific contexts, with GPT-4 excelling in positive sentiment prediction and BERT/FinBERT in neutral labels. Cost and usability analyses suggest GPT-4's API is user-friendly but costly, while BERT offers a cost-effective, open-source

alternative. Results support sentiment analysis for investment decisions and risk management in volatile cryptocurrency markets.
Paper Link:https://www.mdpi.com/2076-3417/14/2/588

Summary: The research paper by Memiş et al. (2024) investigates sentiment analysis of Turkish financial tweets related to the BIST100 index, collected between January 2019 and March 2020. A dataset of 2,313 tweets was manually tagged as positive, negative, or neutral, forming binary and multi-class datasets. Pre-processing involved normalization using the ITU Turkish NLP Web Service API. Word embedding and fastText pre-trained embeddings were used for feature extraction. Five deep learning models—Neural Network, CNN, LSTM, GRU, and GRU-CNN—were evaluated. The CNN model with pre-trained embeddings achieved the highest accuracies: 83.02% for binary and 72.73% for multi-class classification. Binary classification outperformed multi-class due to complexity in capturing nuanced sentiments. Limitations include small dataset size and potential biases in data collection and labeling. The study highlights the efficacy of pre-trained embeddings and proposes CNN models for financial sentiment analysis to aid stock market decision-making.

Paper Link:https://www.sciencedirect.com/science/article/pii/S1544612324002575

Summary: The research paper by Kirtac and Germano (2024) evaluates sentiment analysis of 965,375 U.S. financial news articles (2010–2023) using large language models (LLMs)—OPT, BERT, FinBERT—and the Loughran-McDonald dictionary. The OPT model, leveraging GPT-3 architecture, achieved the highest accuracy (74.4%) in predicting stock return directions over three days, outperforming BERT (72.5%), FinBERT (72.2%), and the dictionary (50.1%). Regression analysis showed OPT's strong correlation with next-day returns, followed by FinBERT and BERT, with the dictionary showing minimal predictive power. A long-short trading strategy based on OPT's sentiment scores yielded a 355% return from August 2021 to July 2023, with a Sharpe ratio of 3.05, compared to the dictionary's 0.91% return and 1.23 Sharpe ratio. The study underscores LLMs' superiority over traditional methods, offering significant implications for investment strategies and AI-driven financial research.

Paper Link:https://www.nature.com/articles/s41598-024-61106-2

Summary: The research paper by Lee, Kim, and Jung (2024) introduces a deep learning approach to predict the S&P 500 index by integrating ESG sentiment from 14,049 news articles (2016–2023) with technical indicators. Using FinBERT for sentiment analysis and Bi-LSTM/Bi-RNN models, the study evaluates performance via MAPE across window sizes (3, 4, 5). The Bi-LSTM model with a window size of 3, combining ESG sentiment, price, and technical indicators, achieved the lowest MAPE (3.05%), outperforming models using only price (4.87%) or price with technical indicators (3.48%). Ablation tests confirmed ESG sentiment's causal impact on prediction accuracy. The methodology highlights ESG's long-term influence and technical indicators' short-term effects, offering insights for investors and validating ESG's role in financial strategies.

Paper Link:https://dl.acm.org/doi/abs/10.1145/3652037.3652076

Summary: The research paper by Rithesh Harish Bhat and Bhanu Jain (PETRA '24) presents a novel approach to predict stock price trends using emotion analysis of financial news headlines, bypassing traditional financial data. A distilled LLM model, fine-tuned with 76 labeled headlines, classifies emotions (anger, disgust, fear, joy, neutral, sadness, surprise) from news for 32 U.S. mega-cap companies. Data is sourced via APIs from NewsAPI and Alpha Vantage, overcoming web scraping restrictions. Two experiments compare predictions using emotion-based attributes versus financial attributes (open, close, high, low, volume). Logistic Regression achieved 87% accuracy for both, while Random Forest scored 83% (financial) and 79% (emotion). The study demonstrates that emotion analysis alone is nearly as effective as financial data for predicting next-day stock price direction, suggesting potential for broader applications with enhanced datasets.