iJRASET
International Journal For Research in
Applied Science and Engineering Technology

INTERNATIONAL JOURNAL
FOR RESEARCH
IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 11 Issue: XII Month of publication: December 2023

DOI: https://doi.org/10.22214/ijraset.2023.57184

Stock Market Price Prediction

Arman Grover[1], Debajyoti Roy Barman[2], Priyansh Kapadia[3], Neelamani Samal[4]
Dept. of Computer Science and Engineering Chandigarh University Gharuan, Mohali (Punjab)

Abstract: Investing in the stock market can be a convoluted and refined method of conducting business. Stock prediction is an extremely difficultand complex endeavor since stock values can fluctuate abruptly owing to a variety of reasons, making the stock market incredibly unpredictable.This paper explores predictive models for the stock market, aiming to forecast stock prices using machinelearning algorithms. By analyzing historical market data and employing various predictive techniques, thestudy aims to enhance accuracy in predicting future stock movements. this paper contributes understanding into the potential of LSTM models for enhancing stock market prediction accuracy and reliability.
Keywords: Machine learning, LSTM (Long short-termmemory), stock market

I. INTRODUCTION

Stock Market Price Prediction Project aims to leverage advanced machine learning techniques to forecast the future prices of financial instruments, providing valuable insights for investors and traders. In the dynamic and complex world of financial markets, accurate predictions play apivotal role in making informed decisions and optimizing investment strategies.

Background

Stock market is well-known for its inherent dynamic nature, which are impacted by a variety of variables including market mood, geopolitical developments, and economic data..Conventional analytical techniques frequently fail to capture the complex patterns and trends that propel price changes. In the recent years, ML algorithms have surfaced as very powerful tools for predicting stock prices, offering a data-driven approach to complement traditional financial analysis.

1) *Forecasting Accuracy:* The creation of models that can precisely forecast future stock prices is the main objective of this project. This involves analyzing historical data, identifying relevant features, and training models to recognize patterns that contribute to price movements.
2) *Risk Management:* Effective risk management isvery important in the financial markets. The projectaims to help traders and retail investors make informed decisions to minimize risks and maximizereturns by offering trustworthyforecasts.Algorithmic
3) *Trading:* The integration of machine learning models into algorithmic trading strategies is another objective. By automating the decision-making process, the project seeks toenhance trading efficiency and responsiveness to market changes.

II. FEATURES AND FUNCTIONALITY

An Artificial Neural Network (ANN) that uses LSTM to predict stock market prices is a type of network that can learn from sequential data andforecast future values. LSTM models have several features and functionalities that make them suitablefor this task, such as:

1) Long-term dependencies in the data, which are crucial for identifying patterns and trends in stock price movements over time, can be stored and accessed by them.
2) They are able to avoid the issue of vanishing or exploding gradients, which can impede learning and frequently arises in conventional recurrent neural networks.
3) They can handle variable-length inputs and outputs, which are common in stock market data due to different trading days and hours.
4) They can be combined with other techniques, such as attention mechanisms, dropout, or regularization, to improve their performance and generalization.

Using LSTM models, one can build a stock market price prediction system that can take historical data as input and output the predicted prices for a given time horizon. The system can also provide confidence intervals or error bounds for the predictions, which can help investors assess the riskand uncertainty of their decisions.

III. LITERATURE REVIEW

1) "Stock price prediction using LSTM, RNN and CNN-sliding window model" (2018) by Chen et al.: In order to predict stock prices, this study evaluates the effectiveness of recurrent neural networks (RNN), The authors implement a sliding window model for feature extraction from historical stock data.
2) "A deep learning model for stock price prediction and trend trading strategy" (2017) by Zhang et al.: Zhang et al.suggest an LSTM-based stock price prediction through deep learning. The paper also incorporates a trend trading strategy,showcasing the integration of deep learning into practical trading applications.
3) "Deep learning for stock prediction using numerical and textual information" (2017) by Hu et al.: This research combines numerical stock data with textual information from financial news, using a model of hybrid deep learning that involves LSTM. The study emphasizes the importance of incorporating multiple data sources for enhanced prediction.
4) "A deep learning approach for stock price prediction based on recurrent neural networks"(2018) by Xiong et al.: Xiong and associates investigate a deep learning strategy for stock price prediction using LSTM. The paper discusses the advantages of leveraging deep learning to capture complex patterns in financial time series data.
5) "Stock price prediction using attention-based multi-input LSTM" (2019) by Li et al.: Li et al. present a multi-input, attention-based LSTM model for stock price prediction.. The attention mechanism is employed to assign different weights to various input features, enhancing the model's focus on relevant information.
6) "Predicting stock prices with a feature fusion LSTM-CNN model using hybrid information" (2020) by Wang et al.:This study offers a hybrid stock price prediction model that combines CNN and LSTM.. The model leverages both historical stock data and external factors, emphasizingthe importance of feature fusion for improved accuracy.
7) "Forecasting stock prices with a hybrid deep learning model incorporating long-term and short-term memory networks" (2021) by Qiu et al.: Qiu et al. suggest a hybrid deep learning model for stock price forecasting that combines short- and long-term memory networks. The model attempts to represent both short-term swings instock prices as well as long-term trends.

IV. RESEARCH METHODOLOGY

The stock data is subjected to the LSTM algorithm method. Additionally, provided and discussed below are models for mathematical computations and visualization.

LSTM (Long Short-Term Memory):

The recurrent neural network (RNN) architecture known as LSTM, It was created to solve the vanishing and exploding gradient issues that are frequently encountered in conventional RNNs. LSTMs are widely used in many domains, including speech recognition, time series forecasting, natural language processing, and more.They are particularly well-suited for learning patterns in sequential data.

The primary characteristic of Long Short-Term Memory (LSTM) networks is their capacity to selectively remember or forget information over extended sequences, which enables them to handle long-distance dependencies and connections in data. A sophisticated architecture including input, output, forget gates, and memory cells enables this. Three gates that control the information flow are part of the LSTM unit.

Because they can maintain and update information over time, these gates allow LSTMs to be especially useful for tasks involving long-term dependencies. They do this by controlling the flow of information through the cell state.

Long Short-Term Memory (LSTM) models is popularized in machine learning due to their ability to handle vanishing gradients and maintain long- term dependencies. This has made LSTMs a valuable tool for sequential data analysis and has greatly increased the effectiveness of deep learning models.

V. MATHEMATICAL CALCULATIONS ANDVISUALIZATIONS MODELS

ReLU activation function

$f(x)=\max(0,x)$

Corrected linear activation unit, or ReLU, isregarded as a turning point in the deep learning revolution. Compared to its predecessor activation functions, like sigmoid or tanh, it is both better and simpler.

Its derivative, the ReLU function, is monotonic.For any negative input, it returns 0, but for any positive input, it returns the value that was entered.

Adaptive Moment Estimation optimizer, or Adam optimizer, is a popular deep learning optimization algorithm.

The term "adaptive moment estimation" aptly captures its capacity to adaptively modify the learning rate for every network weight separately. In contrast to stochastic gradient descent (SGD), which keeps a constant learning rate during training, the Adam optimizer dynamically determines each learner's rate based on previous gradients and their second moments.

$$m_t = \beta_1 m_{t-1} + (1-\beta_1)\left[\frac{\delta L}{\delta w_t}\right] v_t = \beta_2 v_{t-1} + (1-\beta_2)\left[\frac{\delta L}{\delta w_t}\right]^2$$

The formula given above is used to represent the working of Adam optimizer.

Mean Squared Error, or MSE

It is the mean/average of the differences squared of theactual and estimated values. It is a statistical model's measure of error. If the model is error free than the MSE is 0. MSE is also known as MSD(Mean Squared Deviation).

$$MSE = \frac{\sum(y_i - \hat{y}_i)^2}{n}$$

Root mean squared error, or RMSE

$$\mathrm{RMSE} = \sqrt{\frac{1}{n}\sum_{i=1}^{n}(S_i - O_i)^2}$$

Visualization Graph

Visualizations help in understanding patterns, trends, and model performance, aiding traders, analysts, and investors in making informed decisions in the stock market. Choose visualization techniques based on the specific data, predictions, and the insights you aim to derive.

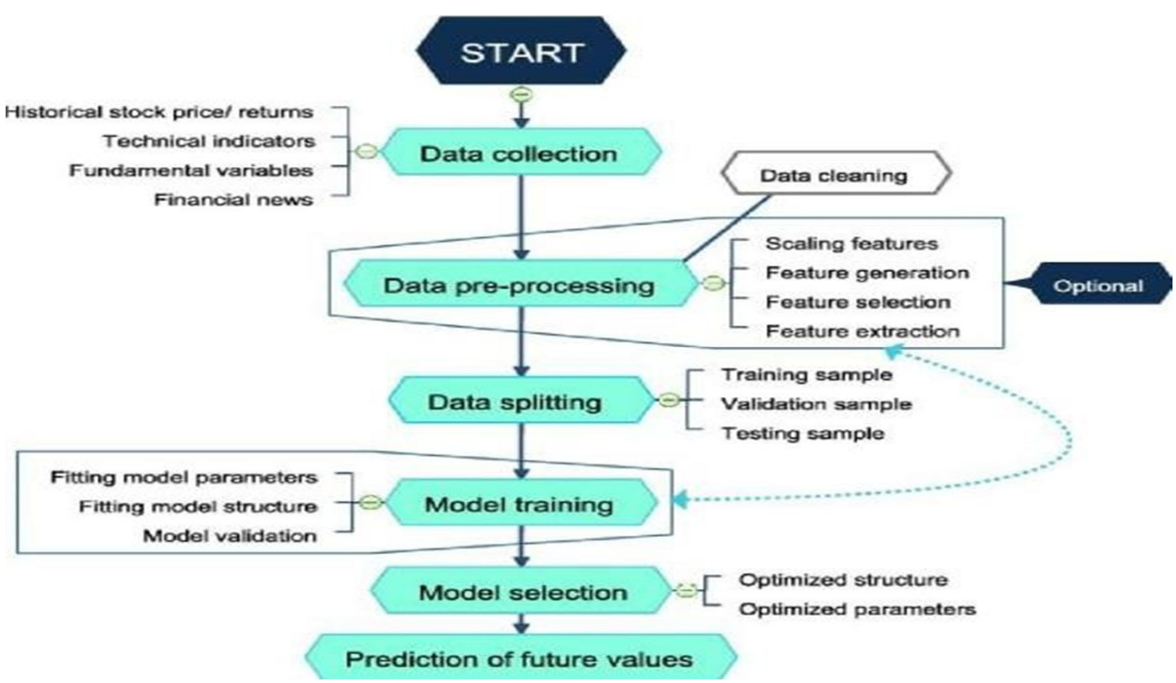
Time Series Plot:

Actual vs. Predicted: Plot the actual stock prices against the predicted prices over time. This helps visualize how well your model performs.

Visualization tool:

Python Library: Matplotlib

VI. DESIGN FLOW



International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 11 Issue XII Dec 2023- Available at www.ijraset.com

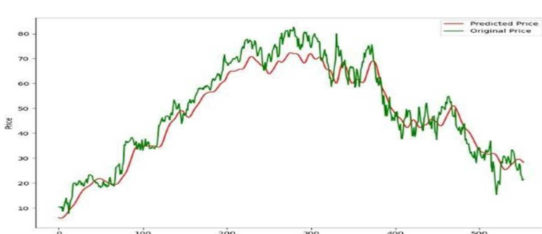
1) *Problem Definition:* Clearly define the problem you want to solve. Determine whether you're predicting short-term or long-term stock prices, price movements, or some other financial metric.
2) *Data Collection:* Gather past data of stock market, which contains stock prices, volumes, and any additional data you plan to use (e.g., technical indicators, fundamental metrics, sentiment scores).
3) *Data Preprocessing:* This includes cleaning and preprocessing the data, handling missing values, outliers, and scaling/normalization. This is done so to ensurethat the data is in a suitable format for modeling.
4) *Data Splitting:* It splits the data into two sets (training and testing sets). Cross-validation is crucial to assess model performance.
5) *Model Selection:* Choosing an appropriate ML or deep learning algorithm is very essential. Some of the choices include, decision trees, linear regression, random forests, and neural networks. Consider ensembling multiple models for better accuracy.
6) *Model Training:* Through the training dataset the model is trained.. Utilizing methods like random or grid search, the hyperparameters are optimized.
7) *Model Evaluation:* We evaluate the performance of the model on the testing dataset using appropriate measures (e.g., MAE, MSE or classification metrics if predicting price movements).
8) *Regular Model Evaluation and Updating:* Keep an eye on the model's performance, assess it frequently, and update it as needed to reflect shifting market dynamics.
9) *Deployment:* Deploy the model for real-world use. Ensure it integrates with trading platforms or investment systems if required.

VII. OTHER METHODS

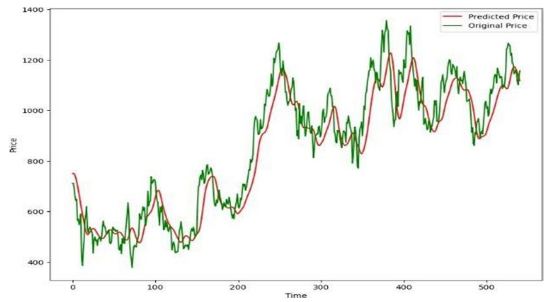
1) *Random Forest:* Several decision trees are constructed using thisensemble learning technique, and their individual predictions are then combined. It can mitigate overfitting and handle non-linear relationships in data.
2) *Support Vector Machines (SVM):* A popular machine learning algorithm for tasks involving regression and classification is SVM. It works well in high-dimensional spaces and is effective for capturing complex patterns in data.
   In the context of stock price prediction, SVM aims to find a hyperplane that separates the data points in feature space the best. In regression, it predicts the target variable's value based on the input features.
3) *Reinforcement Learning Models:* Reinforcement learning models, like use trial, Deep Q-Learning and error to learn optimal strategies for trading by interacting with the marketenvironment.
   In the context of stock market prediction, reinforcement learning models aim to maximize rewards by making buy or sell decisions. These models learn from the consequences of their actions and adapt their strategies over time
4) *K-Nearest Neighbours (KNN):* It is an easy-to-understand supervised machine learning algorithm which is applicable to both classification and regression problems. This predicts a data point's value based on of its closest neighbors in the feature space is a fundamental ideaunderlying K-Nearest Neighbors.
5) *Bayesian Models:* Bayesian models are based on Bayesian statistics, aframework that incorporates probability theory to update beliefs about parameters as more data becomes available. Bayesian models are particularly useful when dealing with uncertainty and making predictions depending on known information and empirical data.

VIII. RESULT

Using historical data, we have developed a Long Short-Term Memory (LSTM) model in Python to forecast the price of Google shares in the future. The visualization below illustrates the predicted price of Google shares in red, generated by our algorithm, alongside the actual price represented in green. Our algorithm utilizes 96 LSTM units to achieve high accuracy in predicting stock prices over a specified period. The graph showcases the outcomes of our algorithm, highlighting the effectiveness of the approach in forecasting Googleshare prices.



The below graph shows the visualization of Reliance Industries Limited stock prediction for a given period of time



IX. CONCLUSION

To sum up, the stock market price prediction study has shed light on the difficulties and nuances involved in financial market forecasting. Over the course of the project, several machine learning models and techniques were looked into in order to forecast stock values using historical data. But it's important to recognise that financial markets are very inconsistent and volatile, which makes making precise predictions difficult.

The experiment demonstrated the value of feature engineering, preparing data, and evaluating models to improve prediction accuracy. Even while certain models may perform well in backtesting, unanticipated events, market mood, and macroeconomic variables might have an impact on how well they function in the real world.

The research also demonstrated how models must be continuously adjusted and improved in order to stay up with changing market conditions.

X. FUTURE TRENDS

Integration of Advanced Machine Learning Techniques: As technology develops further, the integration of deep learning and reinforcement learning, two examples of advanced machine learning techniques, may prove advantageous for future stock market price prediction projects. These techniques are able to draw more complex relationships and patterns from the provided financial data.

The predictive power of models may be improved by incorporating alternative data sources, such as satellite imagery, sentiment analysis and economic indicators. Combining various datasets could lead to a more thorough understanding of marketdynamics and increase forecast accuracy.

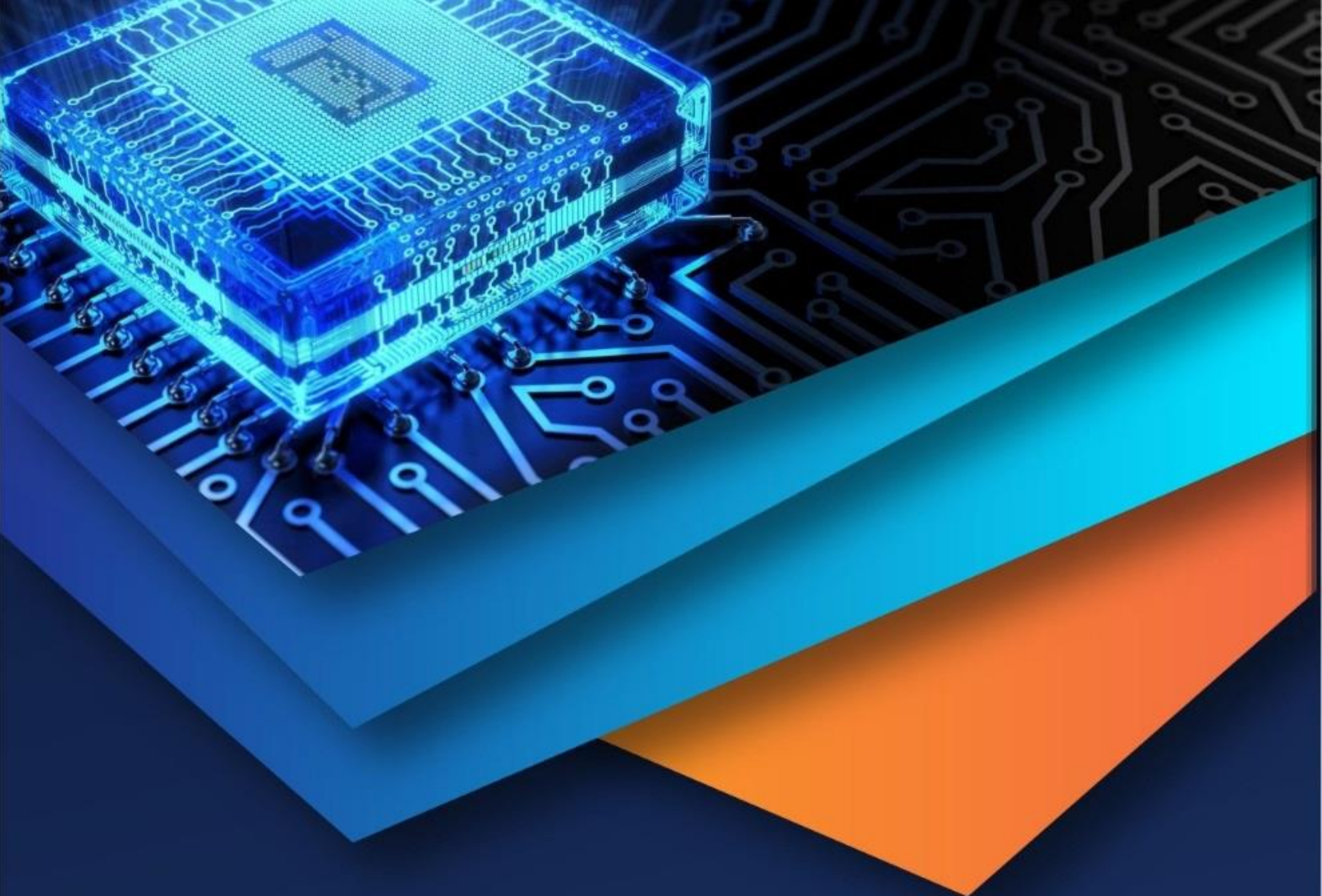
Explainability and Interpretability: Upcoming initiatives ought to concentrate on creating models that are both interpretable and accurate. Gaining the confidence of regulators and investors requires explainability. Techniques like Local Interpretable Model-agnostic Explanations (LIME) or SHapley

Additive exPlanations (SHAP) could be used toprovide insight into how complex models make decisions.

Real-time Data Processing: Future projects might focus increasingly on complex real-time processing systems as a result of the growing availability of real-time data. This can help models generate accurate predictions and swiftly adjust to shifting market conditions.

REFERENCES

[1] Lucas Nunno. Stock Market Price Prediction Using Linear and Polynomial Regression Models.
[2] Subba Rao Polamuri, K. Srinivas, A. Krishna Mohan. Stock Market Prices Prediction using Random Forest and Extra Tree Regression.
[3] Mruga Gurjar1, Parth Naik2, Gururaj Mujumdar3, Prof. Tejaswita Vaidya4. STOCK MARKET PREDICTION USING ANN.
[4] Mayankkumar B Patel 1, Sunil R Yalamalle 2. Stock Price Prediction Using Artificial Neural Network.
[5] Khalid Alkhatib1, Hassan Najadat2, Ismail Hmeidi 3, Mohammed K. Ali Shatnawi 4. Stock Price Prediction Using K-Nearest Neighbor (kNN) Algorithm.
[6] Shri Bharathi1* Angelina Geetha2. Sentiment Analysis for Effective Stock Market Prediction
[7] Pramod B S, Mallikarjuna Shastry P. M. Stock Price Prediction Using LSTM
[8] Shri Bharathi, Angelina Geetha. Sentiment Analysis for Effective Stock Market Prediction.
[9] Prof. Pritam Ahire, Hanikumar Lad, Smit Parekh, Saurabh Kabrawala. LSTM BASED STOCK PRICE PREDICTION.
[10] Kim, S., Ku, S., Chang, W., & Song, J. W. (2020). Predicting the Direction of US Stock Prices Using Effective Transfer Entropy and Machine Learning Techniques.
[11] Rajput, Vivek, and Sarika Bobde. Stock market forecasting techniques: literature survey.
[12] Nayak, Aparna, MM Manohara Pai, and Radhika M. Pai. Prediction models for Indian stock market.
[13] Achyut Ghosh, Soumik Bose, Giridhar Maji, Narayan C. Debnath, Soumya Sen. Stock Price Prediction Using LSTM on Indian Share Market
[14] R. S. Sutton and A. G. Barto, Reinforcement learning: An introduction.
[15] S. Hochreiter and J. Schmidhuber, "Long short-term memory," Neural computation.



10.22214/IJRASET

45.98

IMPACT FACTOR: 7.129

IMPACT FACTOR: 7.429

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY