



SATHYABAMA
INSTITUTE OF SCIENCE AND TECHNOLOGY
(DEEMED TO BE UNIVERSITY)
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**DEPARTMENT OF ELECTRICAL AND ELECTRONICS
ENGINEERING**

BONAFIDE CERTIFICATE

This is to certify that this Project Report is the bonafide work of
GUBBALA AISHWARYA (Reg. No: 41140027) who carried out
the internship training program At The university of texas at
Dallas Internship on artificial intelligence, machine learning &
deep learning from **05.06.2023 to 28.07.2023**

INTERNAL GUIDE

HEAD OF THE DEPARTMENT

SUBMITTED ON : _____

INTERNAL EXAMINER

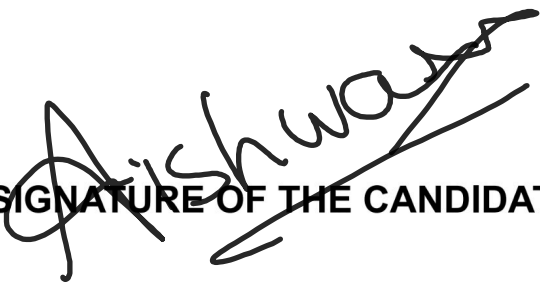
EXTERNAL EXAMINER

DECLARATION

I, **GUBBALA AISHWARYA** hereby declare that the internship report entitled **The university of texas at Dallas Internship on artificial intelligence, machine learning & deep learning** done by me is submitted on behalf of Internship completion in 60 days, gained knowledge and experience.

DATE:

PLACE: CHENNAI


SIGNATURE OF THE CANDIDATE

ACKNOWLEDGEMENT

I have made efforts in this training. However, it would not have been possible without the kind support and help of many individuals and organizations. I would like to extend my sincere thanks to all of them.

I am highly indebted to APTRANSCO for their guidance and constant supervision as well as for providing necessary information regarding the training & also for their support in completing the internship.

I would like to express my gratitude towards my parents for their kind cooperation and encouragement which helped me in the completion of this training. I would like to express my special gratitude and thanks to the substation people for giving me such attention and time.

My thanks and appreciation also go to my colleagues in developing the training and the people who have willingly helped me out with their abilities.

TABLE OF CONTENTS

CHAPTER No.	TITLE	PAGE No.
1	INTRODUCTION ABOUT THE COMPANY	1
2	NATURE OF WORK DONE	1
	2.2.1 ARTIFICIAL INTELLIGENCE	2
	2.2.2 DEEP LEARNING	2
	2.2.3 MACHINE LEARNING	2
3	METHODS AND PROCESSES	17
	3.1 Graph Search Algorithms	17
	3.2 Decision Trees	
	3.3 Activation Functions	
	3.4. Neural Networks	
	3.5. Recurrent Neural Networks (RNNs)	
	3.6. Convolutional Neural Networks (CNNs)	
	3.7 Long Short-Term Memory (LSTM):	
	3.8 Reinforcement Learning	
	3.9. Attention Transformers	
	3.10 Autoencoders	
		17
4	KNOWLEDGE AND EXPERIENCE	18
5	Work done	29
	5.1 Technical analysis	29
	5.2 Fundamental Analysis	29
	5.3. sentiment analysis	
	5.4. Machine learning	
	5.4.1. Data Preparation	
	5.4.2. Machine Learning Models	
	5.4.3.Evaluation Metrics	
	5.4.4.Challenges	
	5.4.5. Cautions and Considerations	

CHAPTER No.	TITLE	PAGE No.
	5.4.6. Output of stock prediction	
	5.4.7. Conclusion	
	5.4.8. FUTURE SCOPE	
6	PHOTOGRAPHS	
7	CERTIFICATE PHOTO GRAPH	

CHAPTER 1

INTRODUCTION ABOUT THE UNIVERSITY

The university's main campus is located in Richardson, a suburb of Dallas. UT Dallas also has satellite campuses in Dallas and Plano, Texas. The campus is known for its modern architecture and state-of-the-art facilities. UT Dallas offers a wide range of undergraduate, graduate, and doctoral programs across various fields of study. Some of the prominent schools and colleges at UT Dallas include the Naveen Jindal School of Management, the Erik Jonsson School of Engineering and Computer Science, the School of Natural Sciences and Mathematics, and the School of Arts, Technology, and Emerging Communication. UT Dallas is known for its research activities and has several research centers and institutes dedicated to various disciplines, including engineering, computer science, neuroscience, and the arts. The university has a strong focus on stem.

CHAPTER 2

NATURE OF WORK DONE IN UNIVERSITY

- In the phase we will familiarise with the university of texas at Dallas, get introduced to other interns, all the instructors and resources of computer science department and ready for the internship.
- In the internship we will be exposed to diverse program conducted by various organisations at university of texas at Dallas . Additionally, inter will be taken on weekend trips to various areas.
- We will experience and observe various activities first-hand ,take note and will be asked to summarize daily activities. The supervisor will be present at all times during this phase to monitor our progress. At the end of the phase , the supervisor will review our understanding and skill level to ensure that we are prepared for the next phase .

2.1. COURSE DONE

- Artificial Intelligence
- Deep learning
- Machine learning

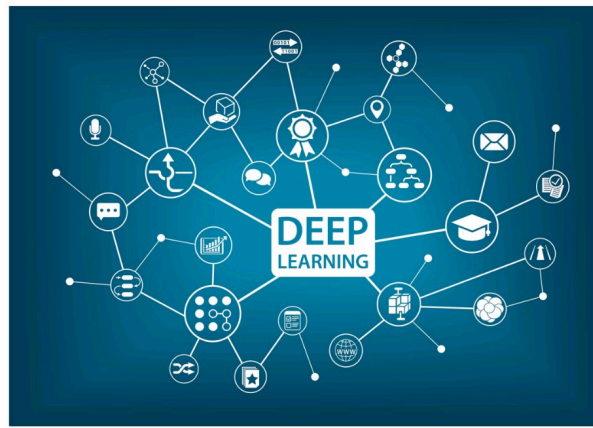
2.2.1 Artificial intelligence

Artificial Intelligence (AI) refers to the development of computer systems and machines that can perform tasks that typically require human intelligence. These tasks include reasoning, problem-solving, learning, perception, understanding natural language, and interacting with the environment. AI aims to create systems that can simulate human cognitive abilities and adapt to new situations.



2.2.2 Deep learning

Deep Learning (DL) is a subfield of machine learning (ML) that focuses on the use of artificial neural networks to model and solve complex problems. It has gained significant attention and popularity in recent years, primarily due to its remarkable success in a wide range of applications, including computer, natural language processing, and speech recognition.



2.2.3 MACHINE LEARNING

Machine Learning (ML) is a subset of artificial intelligence (AI) that focuses on the development of algorithms and statistical models that enable computer systems to improve their performance on a specific task through learning from data, without being explicitly programmed.



CHAPTER 3

METHODS & PROCESSES

The Methods I have learned and used are in following

- Graph Search Algorithms
- Decision Trees
- Activation Functions
- Neural Networks
- Recurrent Neural Networks (RNNs)
- Convolutional Neural Networks (CNNs)

- Long Short-Term Memory (LSTM)
- Reinforcement Learning
- Attention Transformers
- Auto-encoders

3.1. Graph Search Algorithms;

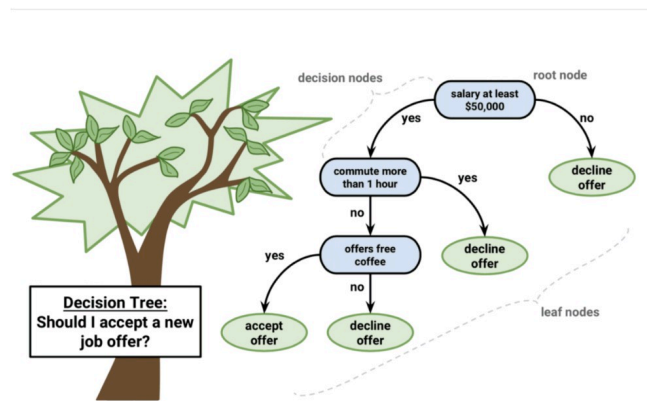
Graph search algorithms are a fundamental part of computer science and artificial intelligence. They are used to traverse and explore graphs, such as those representing networks, social connections, or decision-making processes. Popular graph search algorithms include depth-first search (DFS) and breadth-first search (BFS), which are crucial in solving problems like pathfinding and network analysis.

3.2. Decision Trees:

Decision trees are a type of machine learning model used for classification and regression tasks. They represent decisions and their possible consequences in a tree-like structure. Each node in the tree represents a decision or test on a specific feature, leading to branches that eventually reach leaves with predicted outcomes.

Decision

widely
data
analysis.



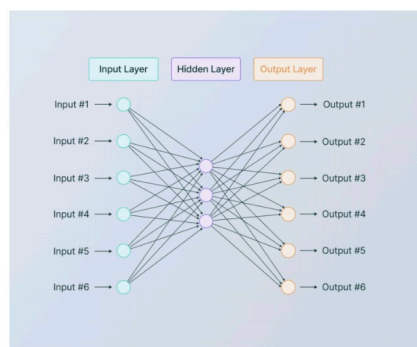
trees are
interpretable and
used in fields like
mining and decision

3.3. Activation Functions:

Activation functions are essential components in artificial neural networks. They introduce non-linearity into the model, enabling it to learn complex patterns. Popular activation functions include sigmoid, ReLU (Rectified Linear Unit), and tanh. The choice of activation function impacts the network's learning ability and convergence speed.

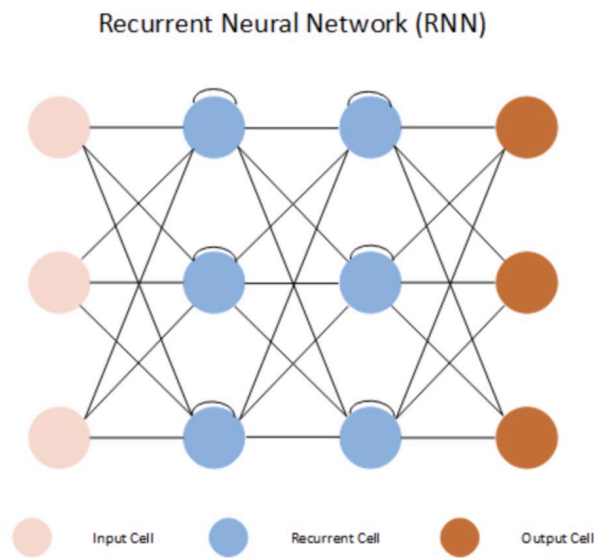
3.4. Neural Networks:

Neural networks are a class of machine learning models inspired by the human brain's structure and function. They consist of interconnected nodes (neurons) organized into layers. Neural networks can perform tasks like image recognition, natural language processing, and reinforcement learning. Deep neural networks, with many hidden layers, have revolutionized the field of deep learning.



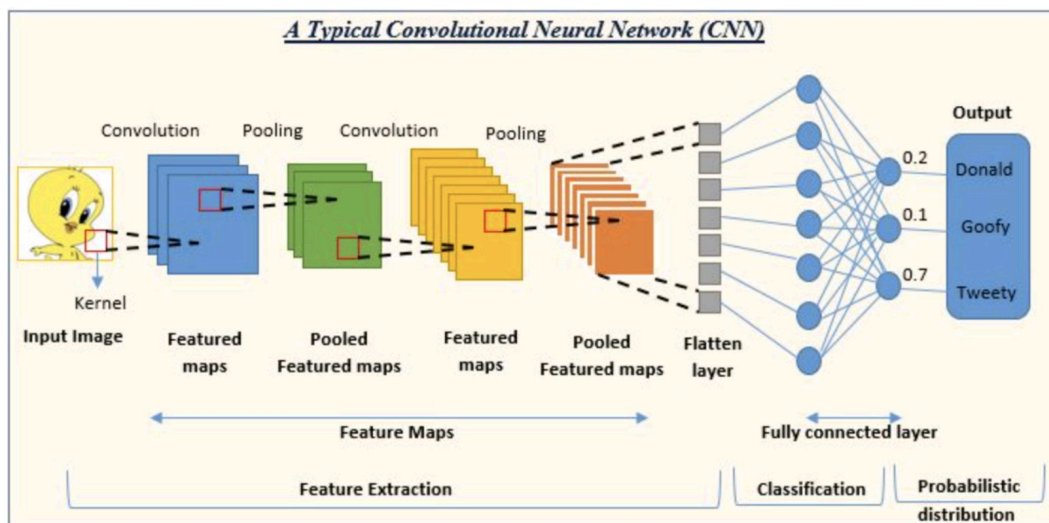
3.5. Recurrent Neural Networks (RNNs):

RNNs are a type of neural network architecture designed to handle sequences and time-series data. They have feedback connections that allow information to flow in loops, making them suitable for tasks like natural language processing, speech recognition, and video analysis. However, they suffer from vanishing and exploding gradient problems.



3.6.Convolutional Neural Networks (CNNs)

CNNs are specialized neural networks for processing grid-like data, such as images and videos. They employ convolutional layers to automatically learn hierarchical features, making them highly effective for tasks like image classification, object detection, and image segmentation

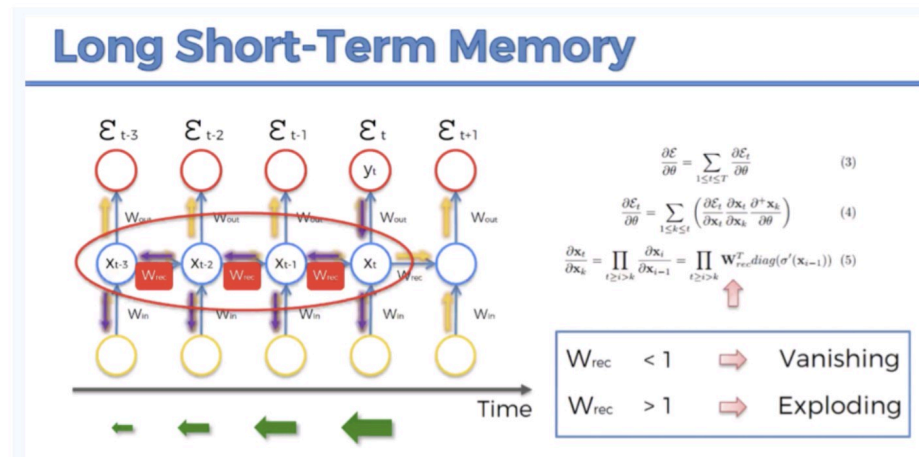


Caption

3.7.Long Short-Term Memory (LSTM)

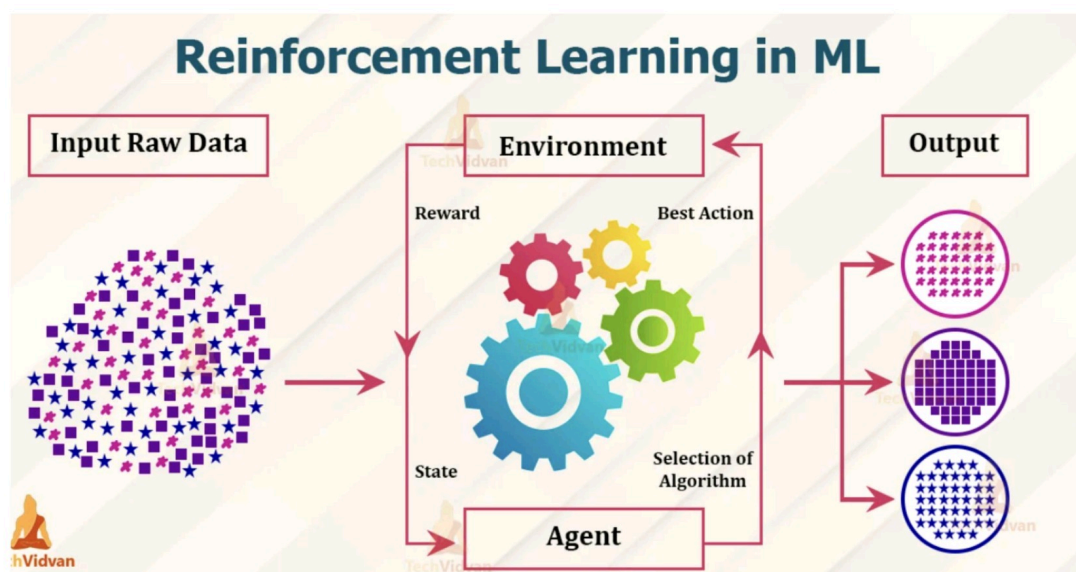
LSTMs are a type of RNN architecture designed to mitigate the vanishing gradient problem. They are well-suited for modeling long sequences and have memory cells that can capture and remember relevant information over extended

periods. LSTMs are widely used in speech recognition, language translation, and time-series forecasting.



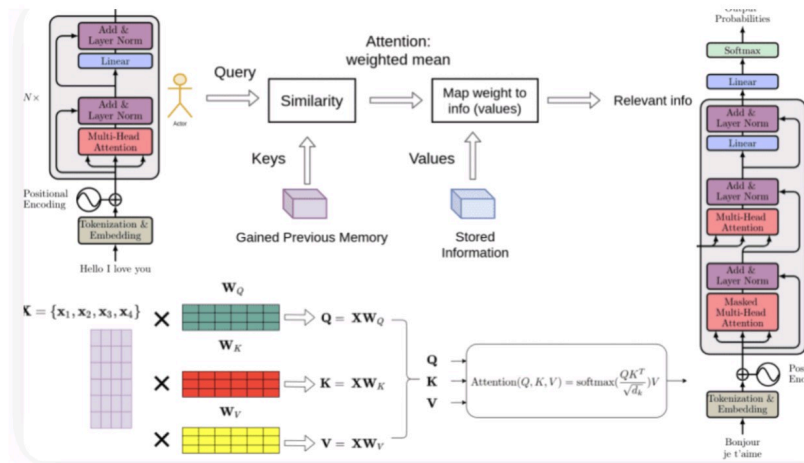
3.8.Reinforcement Learning:

Reinforcement learning is a machine learning paradigm where an agent learns to make decisions by interacting with an environment. The agent receives rewards or penalties based on its actions, and its goal is to maximize the cumulative reward. Reinforcement learning has applications in autonomous robotics, game playing, and optimization.



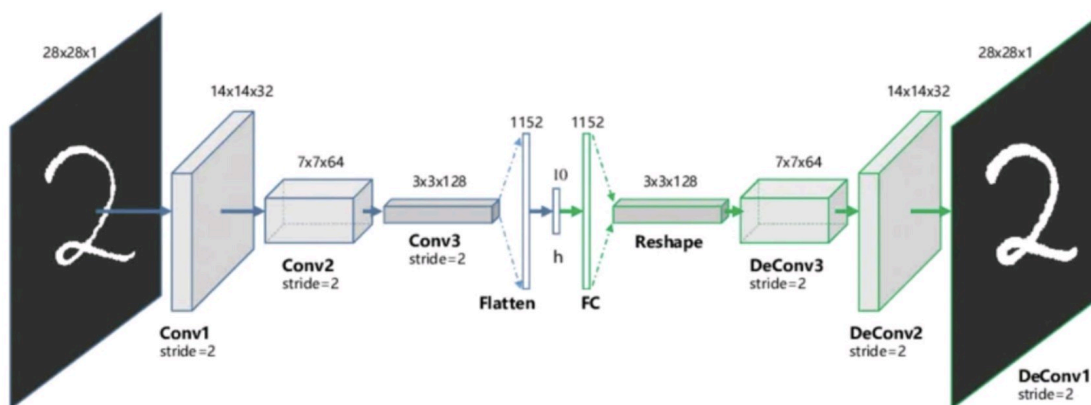
3.9.Attention Transformers:

Attention transformers are a class of deep learning models that excel in tasks requiring understanding of context and relationships in data. They use attention mechanisms to focus on relevant parts of the input, making them effective in natural language processing, machine translation, and image generation.



3.10.Autoencoders:

Autoencoders are neural network architectures used for unsupervised learning and dimensionality reduction. They consist of an encoder that compresses input data into a latent representation and a decoder that reconstructs the input from this representation. Autoencoders find applications in data compression, anomaly detection, and feature learning.



CHAPTER 4

KNOWLEDGE AND EXPERIENCE

- **Data Preprocessing:** I learned how to clean and prepare data for machine learning models by handling missing values, encoding categorical variables, and scaling features appropriately.
- **Model Selection:** I gained expertise in selecting the right Machine learning algorithms for various tasks, considering factors like the problem type (classification, regression, clustering), dataset size, and complexity.
- **Model Training:** I acquired hands-on experience in training machine learning models using popular libraries like scikit-learn or TensorFlow. This involved parameter tuning, cross-validation, and understanding model performance metrics.
- **Feature Engineering:** I learned the importance of feature engineering in improving model performance, including techniques such as feature selection, extraction, and transformation.
- **Deep Learning:** I delved into deep learning techniques, including neural network architecture design, optimization algorithms, and working with frameworks like TensorFlow and PyTorch.
- **Evaluation and Validation:** I gained proficiency in assessing model performance through metrics like accuracy, precision, recall, F1-score, and understanding the trade-offs between them.
- **Deployment:** I got hands-on experience in deploying machine learning models into production environments, including considerations for scalability, latency, and model versioning.
- **Ethical Considerations:** I became aware of the ethical aspects of machine learning, such as bias and fairness, and learned how to address these issues responsibly.
- **Overall,** my internship provided me with a strong foundation in machine learning concepts and practical skills, enabling me to apply this knowledge to real-world problems and contribute to the field effectively.

CHAPTER 5

WORK DONE

PROJECT ON MACHINE LEARNING

- STOCK PREDICTION : A COMPEHENSIVE GUIDE

Types of Stock Predictions

Technical Analysis Analysis of historical market data to identify trends and patterns.	Fundamental Analysis Assessment of a company's financial health, management and competitive position.
Sentiment Analysis Analysis of social media, news articles and other sources to gauge public opinion and predict trends.	Machine Learning Using algorithms to automatically learn and improve from experience without being explicitly programmed.

- TYPES OF STOCK PREDICTION

5.1 Technical analysis:

Technical analysis is a methodology used in financial markets, primarily in trading and investing, to forecast future price movements of assets such as stocks, currencies, commodities, and cryptocurrencies. It relies on the examination of historical price and volume data, as well as various chart patterns and technical indicators, to make trading decisions.

5.2.Fundamental Analysis:

Fundamental analysis is a comprehensive method for assessing the value of financial assets by examining financial statements, economic indicators, and other relevant factors. It is widely used by investors and analysts to make informed decisions about investments, but it should be used in conjunction with other forms of analysis and risk management strategies for a well-rounded investment approach.

5.3.sentiment analysis:

sentiment analysis is a valuable NLP technique used to extract and quantify sentiment from text data. Its applications span various industries, providing insights into customer opinions, market trends, and brand reputation. As NLP technology advances, sentiment analysis continues to play a crucial role in understanding human sentiment and opinion in the digital age.

5.4. Machine learning:

Machine learning has been widely used in stock price prediction and financial forecasting. However, it's essential to understand that predicting stock prices is a challenging task due to the inherent complexity and randomness of financial markets. Here are some key points to consider when applying machine learning to stock price prediction.

5.4.1. Data Preparation :

Data Sources: Gather historical stock price data, financial indicators, news sentiment, and any other relevant data sources.

Feature Engineering: Create meaningful features that capture market dynamics, such as moving averages, volatility, trading volume, and technical indicators.

Data Cleaning: Clean and preprocess the data by handling missing values, outliers, and data scaling. Ensure the data is suitable for modeling.

5.4.2. Machine Learning Models:

- **Supervised Learning:** Stock price prediction is often framed as a regression problem. Common supervised learning algorithms used include linear regression, support vector machines (SVM), decision trees, and ensemble methods like random forests.
- **Time Series Analysis:** Time series forecasting models like autoregressive integrated moving average (ARIMA), seasonal decomposition, or Prophet can be used for short-term predictions.

- **Deep Learning:** Recurrent Neural Networks (RNNs) and Long Short-Term Memory networks (LSTMs) are popular for capturing sequential dependencies in time series data.

5.4.3. Evaluation Metrics:

- **Metrics:** Common evaluation metrics for stock price prediction include Mean Absolute Error (MAE), Mean Squared Error (MSE), Root Mean Squared Error (RMSE), and Mean Absolute Percentage Error (MAPE).
- **Backtesting:** Use backtesting to assess the model's performance on historical data, simulating trading strategies, and measuring the returns.

5.4.4. Challenges:

- **Market Noise:** Stock prices are influenced by numerous factors, including news events, investor sentiment, and macroeconomic conditions, making it challenging to predict.
- **Non-Stationarity:** Financial time series data is often non-stationary, meaning statistical properties change over time, requiring advanced modeling techniques.
- **Data Quality:** Financial data may contain errors, and not all relevant information is readily available, leading to potential biases.

5.4.5. Cautions and Considerations:

- **Overfitting:** Be cautious of overfitting, where the model performs well on training data but poorly on unseen data. Regularization techniques can help mitigate overfitting.
- **Legal and Ethical Considerations:** Be aware of legal and ethical considerations when using ML for stock prediction, such as market manipulation regulations.
- **Diversification:** Avoid putting all your investments based solely on model predictions. Diversify your portfolio to spread risk.

- **Long-Term vs. Short-Term:** Decide whether your ML model will focus on short-term trading (day trading)
- Long-Term Memory (LTM):
- Long-term memory is responsible for capturing more extended and complex patterns in stock data, such as seasonal trends, market sentiment, and macroeconomic factors. LTM can be implemented using more sophisticated architectures like LSTM or Gated Recurrent Units (GRUs). These models can remember information over longer sequences of data and are better suited for capturing dependencies in stock prices over extended periods. or swing trading) or longer-term investment strategies.

It's important to recognize that no ML model can consistently predict stock prices with complete accuracy. Market dynamics are influenced by both rational and irrational factors, and stock prices can be subject to sudden and unexpected changes. While ML can be a valuable tool for analyzing historical data and identifying patterns, it should be used in conjunction with other forms of analysis and a disciplined approach to risk management. Moreover, the use of ML for stock prediction should align with your investment goals and risk tolerance.

5.4.6. code for stock prediction:

```
+ Code + Text

import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
from sklearn.model_selection import train_test_split
from sklearn.preprocessing import MinMaxScaler
from keras.models import Sequential
from keras.layers import LSTM, Dense
from keras.callbacks import EarlyStopping
from sklearn.metrics import mean_squared_error

# Step 1: Acquire the required data of stock prices
# Load your stock price data into a pandas DataFrame
# Replace 'data.csv' with the path to your stock price data file
data = pd.read_csv('AAPL.csv')

# Step 2: Visualize the stock price history
# Optionally, plot the historical stock prices to understand the data
plt.figure(figsize=(12, 6))
plt.plot(data['Date'], data['Close'], label='Stock Price')
plt.xlabel('Date')
plt.ylabel('Closing Price')
plt.title('Stock Price History')
plt.legend()
plt.show()

# Step 3: Divide the data into training and test sets
train_data, test_data = train_test_split(data['Close'].values, test_size=0.2, shuffle=False)

# Step 4: Prepare the data for LSTM
# Scale the data to the range [0, 1] for better convergence
```

```

# Scale the data to the range [0, 1] for better convergence
scaler = MinMaxScaler()
train_data_scaled = scaler.fit_transform(train_data.reshape(-1, 1))
test_data_scaled = scaler.transform(test_data.reshape(-1, 1))

# Create sequences for LSTM
def create_sequences(data, sequence_length):
    sequences = []
    for i in range(len(data) - sequence_length):
        sequences.append(data[i:i+sequence_length])
    return np.array(sequences)

sequence_length = 10 # You can adjust this value based on the problem and data size

X_train = create_sequences(train_data_scaled, sequence_length)
X_test = create_sequences(test_data_scaled, sequence_length)

# Prepare target variables (next day's closing price)
y_train = train_data_scaled[sequence_length:]
y_test = test_data_scaled[sequence_length:]

# Step 5: Construct the LSTM model architecture
model = Sequential()
model.add(LSTM(units=50, input_shape=(X_train.shape[1], X_train.shape[2])))
model.add(Dense(units=1))

# Step 6: Train the LSTM model
model.compile(optimizer='adam', loss='mean_squared_error')
early_stopping = EarlyStopping(patience=5, verbose=1, restore_best_weights=True)
history = model.fit(X_train, y_train, epochs=50, batch_size=32, validation_split=0.1, callbacks=[early_stopping])

```

```

y_train = train_data_scaled[sequence_length:]
y_test = test_data_scaled[sequence_length:]

# Step 5: Construct the LSTM model architecture
model = Sequential()
model.add(LSTM(units=50, input_shape=(X_train.shape[1], X_train.shape[2])))
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# Step 6: Train the LSTM model
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early_stopping = EarlyStopping(patience=5, verbose=1, restore_best_weights=True)
history = model.fit(X_train, y_train, epochs=50, batch_size=32, validation_split=0.1, callbacks=[early_stopping])

# Step 7: Evaluate the LSTM model
y_pred = model.predict(X_test)
y_pred_actual = scaler.inverse_transform(y_pred)
y_test_actual = scaler.inverse_transform(y_test.reshape(-1, 1))

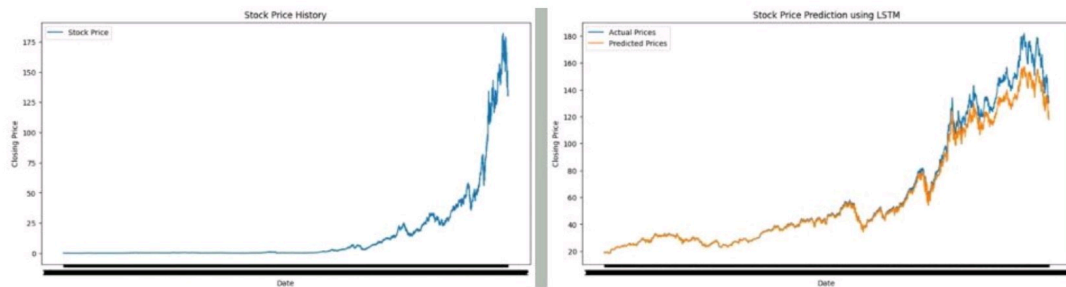
rmse = np.sqrt(mean_squared_error(y_test_actual, y_pred_actual))
print("Root Mean Square Error (RMSE):", rmse)

# Step 8: Visualize the predicted stock prices
plt.figure(figsize=(12, 6))
plt.plot(data['Date'].values[-len(y_test_actual):], y_test_actual, label='Actual Prices')
plt.plot(data['Date'].values[-len(y_test_actual):], y_pred_actual, label='Predicted Prices')
plt.xlabel('Date')
plt.ylabel('Closing Price')
plt.title('Stock Price Prediction using LSTM')
plt.legend()
plt.show()

# Step 9: Draw conclusions from the predicted values
# Analyze the performance of the model and draw conclusions based on the visualized results and RMSE value.

```

5.4.6. Output of stock prediction:



The estimation stock prediction and actual stock prediction can be seen above.

5.4.7. Conclusion:

ML can be a valuable tool in the stock market, providing quantitative insights and automating aspects of trading and investment. However, it should be used cautiously, recognizing its limitations and the inherent unpredictability of financial markets. Combining ML with other forms of analysis, risk management strategies, and a well-defined investment approach can help mitigate risks and enhance the potential benefits of using ML for stock prediction. Successful stock trading and investment require a holistic approach that considers multiple factors, including fundamental analysis, technical analysis, and market sentiment, in addition to ML-based predictions.

5.4.8. FUTURE SCOPE :

- The future scope in machine learning is vast and continues to expand as AI technology becomes more integrated into our daily lives. However, staying up-to-date with the latest developments and continuously learning is essential to remain competitive in this rapidly evolving field

CHAPTER 6

PHOTOGRAPHS

THE UNIVERSITY OF TEXAS AT DALLAS



I have completed My internship on Artificial intelligence, Machine learning And deep learning . the importance of AI, ML, and DL in the future lies in their transformative potential across diverse sectors, enhancing productivity, decision-making, and innovation while addressing complex challenges and improving the quality of life. These technologies are poised to shape the future of work, healthcare, transportation, and society as a whole.



CHAPTER 7
CERTIFICATE



Department of
**COMPUTER
SCIENCE**
THE UNIVERSITY OF TEXAS AT DALLAS



GUBBALA AISHWARYA

is recognized for completing Internship

**ARTIFICIAL INTELLIGENCE, MACHINE LEARNING
& DEEP LEARNING**

June 5 – July 28, 2023

A handwritten signature in black ink, reading 'John Cole'.

Prof. John Cole
Assoc. Director,
CS Outreach

A handwritten signature in black ink, reading 'Jey Veerasamy'.

Dr. Jey Veerasamy
Director, CS Outreach

A handwritten signature in black ink, reading 'Ovidiu Daescu'.

Dr. Ovidiu Daescu
CS Dept. head