**Slide 1: Title Slide**

* **Title**: AI-Driven Stock Price Prediction Using LSTM and RNN
* **Subtitle**: A Deep Learning Approach to Forecasting Stock Market Prices
* **Your Name & Date**

**Slide 2: Introduction to Stock Price Prediction**

* Overview of stock market prediction and its importance.
* **Why stock price prediction matters**:
  + Investment strategies
  + Risk management
  + Financial forecasting
* Challenges:
  + High volatility
  + Unpredictable trends
  + Complex interdependencies

**Slide 3: Traditional Methods vs AI Methods**

* **Traditional Methods**:
  + Linear regression
  + ARIMA models
  + Moving averages
* **AI Methods**:
  + Machine learning algorithms (Random Forest, SVM)
  + Deep learning (LSTM, RNN)

**Slide 4: Introduction to RNN (Recurrent Neural Networks)**

* **What is RNN?**:
  + Neural networks designed for sequential data.
  + Uses feedback loops to maintain information over time.
* **Key feature**:
  + Memory of previous inputs helps to predict future stock prices.
* **Applications**:
  + Time series forecasting
  + Natural Language Processing

**Slide 5: Limitations of Vanilla RNN**

* **Vanilla RNN Issues**:
  + **Vanishing Gradient Problem**: Difficulty in learning long-term dependencies.
  + **Exploding Gradient Problem**: Unstable gradients during training.
* Why RNN is not always ideal for stock price prediction without modifications.

**Slide 6: Introduction to LSTM (Long Short-Term Memory)**

* **What is LSTM?**
  + A special type of RNN designed to overcome the limitations of vanilla RNN.
  + Uses gates (input, forget, output) to control the flow of information.
* **Why LSTM for stock price prediction?**
  + Can capture long-term dependencies better than RNN.
  + More accurate for time series prediction tasks.

**Slide 7: How LSTM Works**

* **Memory Cell**: Stores information for long durations.
* **Forget Gate**: Decides what information should be discarded.
* **Input Gate**: Decides which new information to store.
* **Output Gate**: Determines the output of the LSTM.
* Diagram of LSTM architecture.

**Slide 8: Data Preprocessing for Stock Prediction**

* **Data Collection**:
  + Historical stock prices (Open, Close, High, Low, Volume).
  + Other external factors (e.g., news sentiment, economic indicators).
* **Data Scaling**:
  + Use of MinMax or Standard Scaler to normalize stock data.
* **Time Series Formatting**:
  + Sequence data format: creating a rolling window to predict future stock prices.

**Slide 9: Model Architecture**

* **LSTM Model for Stock Price Prediction**:
  + Layers: Input Layer → LSTM Layer → Dense Layer → Output Layer
  + Hyperparameters: number of units, dropout rate, learning rate
* **RNN vs LSTM**: Why LSTM outperforms RNN in time series prediction.
* **Training the Model**:
  + Loss function: Mean Squared Error (MSE)
  + Optimizer: Adam optimizer
  + Evaluation: RMSE, MAE

**Slide 10: Model Evaluation and Metrics**

* **Performance Metrics**:
  + RMSE (Root Mean Squared Error)
  + MAE (Mean Absolute Error)
  + MAPE (Mean Absolute Percentage Error)
* **Backtesting**: Comparing predicted vs. actual stock prices over test data.

**Slide 11: Case Study: Predicting Stock Prices**

* Example of a stock price prediction (e.g., Apple, Tesla, etc.).
* **Preprocessing Data**:
  + Date range, price types (Open, Close, etc.), and feature engineering.
* **Model Training**:
  + Model architecture and performance evaluation results.
* Graph of stock predictions vs. actual prices.

**Slide 12: Challenges in Stock Price Prediction**

* **High volatility**: Financial markets are unpredictable.
* **Market Sentiment**: Incorporating external factors like news, social media.
* **Data Quality**: Missing values and outliers can impact prediction accuracy.

**Slide 13: Future Work & Improvements**

* **Hybrid Models**:
  + Combine LSTM with other models (e.g., ARIMA, XGBoost) for better accuracy.
* **Incorporate News Sentiment**: Use NLP models to analyze social media/news for prediction.
* **Transfer Learning**: Apply knowledge from one stock to another.

**Slide 14: Conclusion**

* AI, especially LSTM and RNN, can significantly improve stock price prediction accuracy.
* Future potential to enhance models with external data and hybrid approaches.
* **Key Takeaways**:
  + Deep learning models like LSTM offer promising solutions for stock market forecasting.
  + Further improvements and research are needed for better accuracy and risk prediction.