



**SCHOOL OF
ENGINEERING**



DAYANANDA SAGAR UNIVERSITY

Devarakaggalahalli, Harohalli, Kanakapura Road, Ramanagara Dt, Bengaluru-562112, Karnataka, India

An Internship Report on

(Sales Prediction)

Submitted in Partial fulfillment for award of degree in

**Bachelor of Technology
in
COMPUTER SCIENCE AND ENGINEERING
(ARTIFICIAL INTELLIGENCE & MACHINE LEARNING)**

Submitted by

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ENG21AM0115**

Internship carried out at
Titan Company Limited

INTERNAL GUIDE

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**DAYANANDA SAGAR
UNIVERSITY**

**DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING (AI&ML)
SCHOOL OF ENGINEERING
DAYANANDA SAGAR UNIVERSITY
BENGALURU, KARNATAKA
(2024- 2025)**



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Department of Computer Science & Engineering
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CERTIFICATE

This is to certify that the Internship report, entitled “**Sales Prediction**”, a bonafide student of Bachelor of Technology in Computer Science and Engineering (Artificial Intelligence & Machine Learning) at the School of Engineering, Dayananda Sagar University, Bengaluru in partial fulfillment of the requirement for the VIII semester during the academic year 2024-2025. It is certified that all the corrections/suggestions indicated for Internal Assessment have been incorporated in the report. The Internship report has been approved as it satisfies the academic requirements in respect of Internship prescribed for the VIII Semester.

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DECLARATION

I, Shree Aarthe, hereby declare that the Internship titled “**Sales Prediction**” embodied in this report has been carried out by me during VIII Semester B. Tech in **Computer Science and Engineering (Artificial Intelligence & Machine Learning)**, at School of Engineering, **Dayananda Sagar University**, submitted in partial fulfilment for the award of degree in **Bachelor of Technology in Computer Science and Engineering (Artificial Intelligence & Machine Learning)** during the academic year **2024-2025**. The work embodied in this report is original & it has not been submitted in part or full for any other degree in any University.

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Place : Bengaluru
Date :10.04.2025

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1. About the Organization

1.1 Introduction

Titan Company Limited, a part of the Tata Group, is one of India's most respected and trusted lifestyle companies. Headquartered in Bengaluru, Karnataka, Titan is known for revolutionizing the Indian watch and jewelry market through its pioneering brands like Titan, Tanishq, Fastrack, Sonata, and EyePlus. Over the years, the company has diversified into multiple retail segments, including fashion accessories, fragrances, and eyewear.

1.2 Vision

To be the most admired and responsible lifestyle company, creating enriching experiences for people and making a difference in their lives through innovation, quality, and excellence.

1.3 Mission

To create elevating experiences for the people we touch and significantly impact the world we work in. Titan aims to drive growth through customer-centric products and sustainable practices, while maintaining strong values and ethics.

1.4 Team

Titan's success is driven by a dynamic team of professionals from diverse backgrounds, working collaboratively to achieve common goals. The organization promotes a culture of innovation, inclusivity, and continuous learning. The company also fosters talent development through training programs, mentorship, and project-based learning opportunities like internships.

1.5 Services

Titan offers a wide range of services and products across various verticals:

- **Watches and Wearables** – Titan, Fastrack, Sonata, and smartwatches
- **Jewelry** – Tanishq, Mia, Zoya
- **Eyewear** – Titan Eye+, with a focus on precision and style
- **Fragrances and Accessories** – Skinn by Titan, belts, wallets, and bags
- **Technology and Analytics** – Data-driven solutions to enhance customer experience, supply chain, and business operations

2. About the Department

2.1 Introduction

During my internship at Titan Company Limited, I was part of the **Employee Experience Department**, which plays a crucial role in enhancing internal operations and ensuring employee satisfaction through the integration of digital tools, data analytics, and process optimization. This department focuses on creating a smooth and engaging work environment by leveraging technology and innovative solutions.

2.2 Systems Department

The Employee Experience Department at Titan aims to improve the day-to-day experience of employees by automating repetitive tasks, enhancing decision-making through data-driven insights, and implementing digital tools to streamline internal workflows. It acts as a bridge between various business units and technology teams to ensure seamless integration of solutions that benefit employees at every level.

The department emphasizes:

- Data analytics for internal business processes
- Automation and forecasting tools
- Internal reporting dashboards
- Smart decision-support systems

2.3 Sales Prediction Model Development

As part of my internship, I worked on the **Sales Prediction Project**, which involved developing a deep learning model to forecast future sales using historical data. This tool can assist teams in planning inventory, optimizing resources, and making informed decisions based on predicted trends. The model was developed using time series data and implemented with machine learning techniques such as **Conv1D and LSTM**. It contributes to improving business efficiency and supports proactive planning across departments.

3. Internship Domain

3.1 Introduction

The internship was focused on the domain of **Data Science and Business Analytics**, with a specific application in **Sales Forecasting**. The project aimed to develop a predictive model capable of forecasting future sales using historical sales data. This domain lies at the intersection of machine learning, time series analysis, and business decision-making, where data-driven insights help in improving operational efficiency and strategic planning.

By working on this project, I gained hands-on experience in handling real-world business data, applying deep learning techniques, and interpreting prediction outcomes that support business goals.

3.2 Technologies Used

The following tools and technologies were used throughout the project:

- **Python**: Programming language used for data processing and model building.
- **Google Colab**: Interactive coding environment for writing, testing, and documenting code.
- **NumPy & Pandas**: Libraries used for data manipulation and preprocessing.
- **Matplotlib & Plotly**: Visualization libraries for plotting sales trends and predictions.
- **TensorFlow & Keras**: Deep learning frameworks used to build and train the Conv1D and LSTM models.
- **Scikit-learn**: For scaling data and evaluating model performance with metrics like MAE and RMSE.

3.2.1 Sales Prediction Using Deep Learning

This project involved building a hybrid deep learning model combining **Conv1D (1-Dimensional Convolutional Layer)** and **LSTM (Long Short-Term Memory)** to analyze and forecast sales. The objective of the project was to predict future sales based on historical data in order to support inventory management and resource planning. The dataset consisted of daily sales figures in a time series format. The data was first cleaned, scaled, and transformed into sequences suitable for supervised learning. A hybrid deep learning model was then developed, starting with Conv1D layers to capture local patterns within short-term windows of the time series. These were followed by LSTM layers, which effectively learned long-term temporal dependencies in the sales trends. Finally, a Dense layer was added to produce the output

prediction. The resulting trained model was able to forecast next-day sales with high accuracy and can be integrated into dashboards or business systems for real-time decision-making.

3.3 Project Overview

The Sales Prediction project aimed to leverage historical sales data to forecast future sales, enabling data-driven planning and improved operational efficiency at Titan Company Limited. The project was executed under the guidance of the Employee Experience Department and involved end-to-end model development—from data preprocessing to model evaluation. This initiative was essential for creating a foundation for automating sales forecasts and supporting inventory management through machine learning solutions.

4. Tasks Performed

4.1 Data Preprocessing and Analysis

The initial stage of the project involved in-depth exploration and preparation of the raw sales dataset. I began by cleaning the data, which included handling missing values, converting date fields into proper datetime formats, and ensuring the dataset was sorted chronologically. Using libraries such as **Pandas**, **NumPy**, and **Matplotlib**, I conducted **exploratory data analysis (EDA)** to detect trends, outliers, and seasonal patterns. Feature engineering was performed where necessary, and the sales values were normalized using **MinMaxScaler** to prepare the data for neural network training. The time series data was then transformed into supervised learning format by creating input-output sequences, where each input window consisted of 30 consecutive days and the corresponding output was the next day's sales.

4.2 Model Building and Evaluation

Once the data was prepared, I built a deep learning model using **TensorFlow** and **Keras**, combining **Conv1D** and **LSTM** layers to take advantage of both short-term and long-term patterns in the time series data. The model was compiled using the **Mean Squared Error (MSE)** loss function and optimized using the **Adam optimizer**. It was trained using the training dataset and validated on unseen test data. The model's performance was evaluated using **Mean Absolute Error (MAE)** and **Root Mean Squared Error (RMSE)**. Visualizations were plotted to compare predicted and actual sales values, which demonstrated the model's reliability and trend-following capabilities.

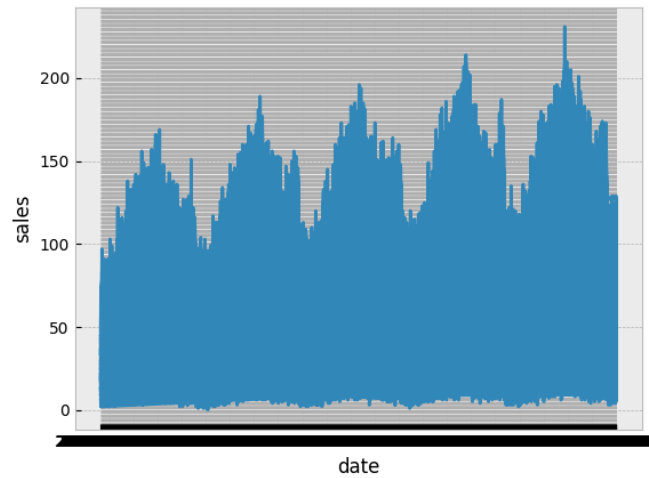
4.3 Hyperparameter Tuning and Optimization

To improve the model's accuracy and generalization, I performed several rounds of hyperparameter tuning. This included experimenting with different values for the number of LSTM units, filter sizes in the Conv1D layer, learning rates, batch sizes, and sequence lengths. Additionally, techniques such as **EarlyStopping** and **Dropout** were used to prevent overfitting. I compared results from various configurations using validation error metrics and chose the best-performing model based on minimal validation loss and low RMSE.

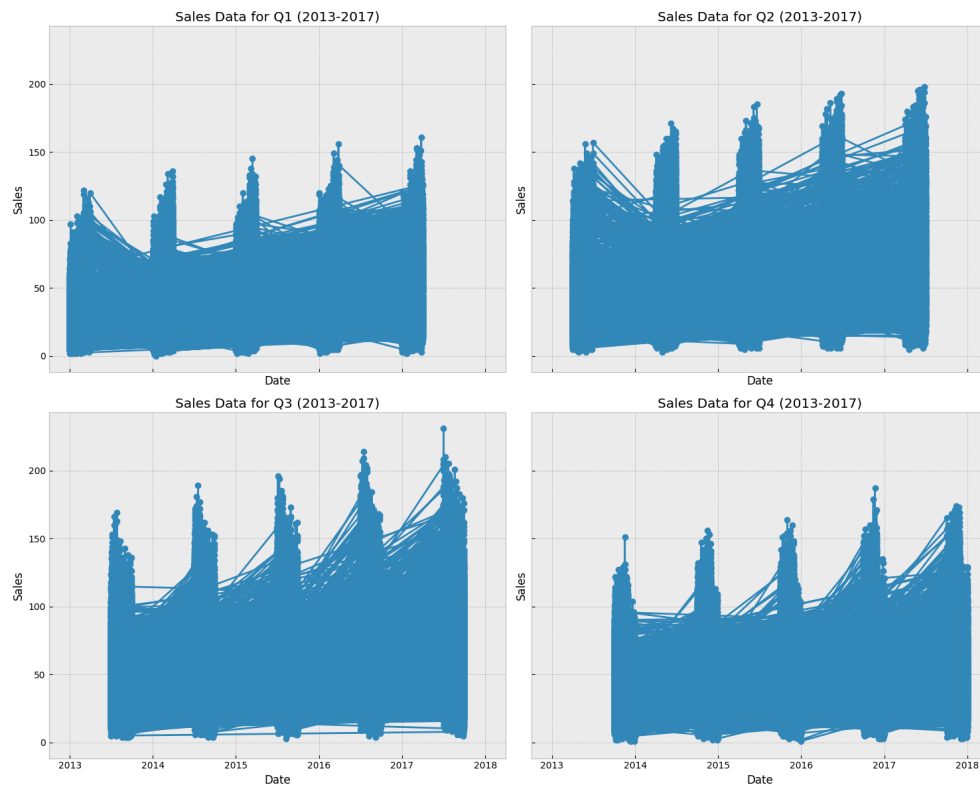
4.4 Model Deployment Readiness

Although deployment was out of scope for the internship, I ensured the model was scalable and exportable. The trained model was saved in **.h5** format using Keras for future integration. The preprocessing pipeline was also modularized so it could be reused during deployment. I documented the prediction pipeline, which included loading the model, performing data scaling, formatting sequences, and generating sales forecasts. This prepares the model for future use in internal dashboards or enterprise systems to enable real-time or batch-wise sales prediction.

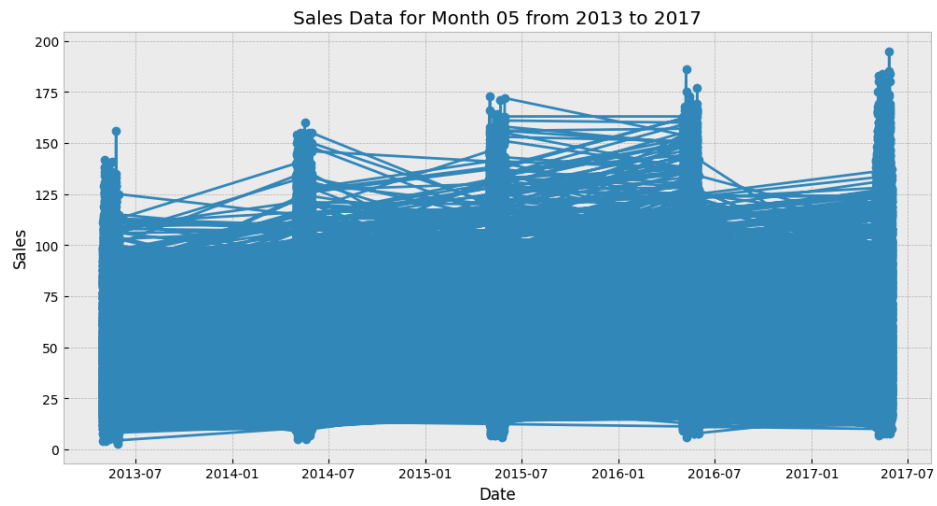
"SALES GRAPH OF EVERY YEAR"



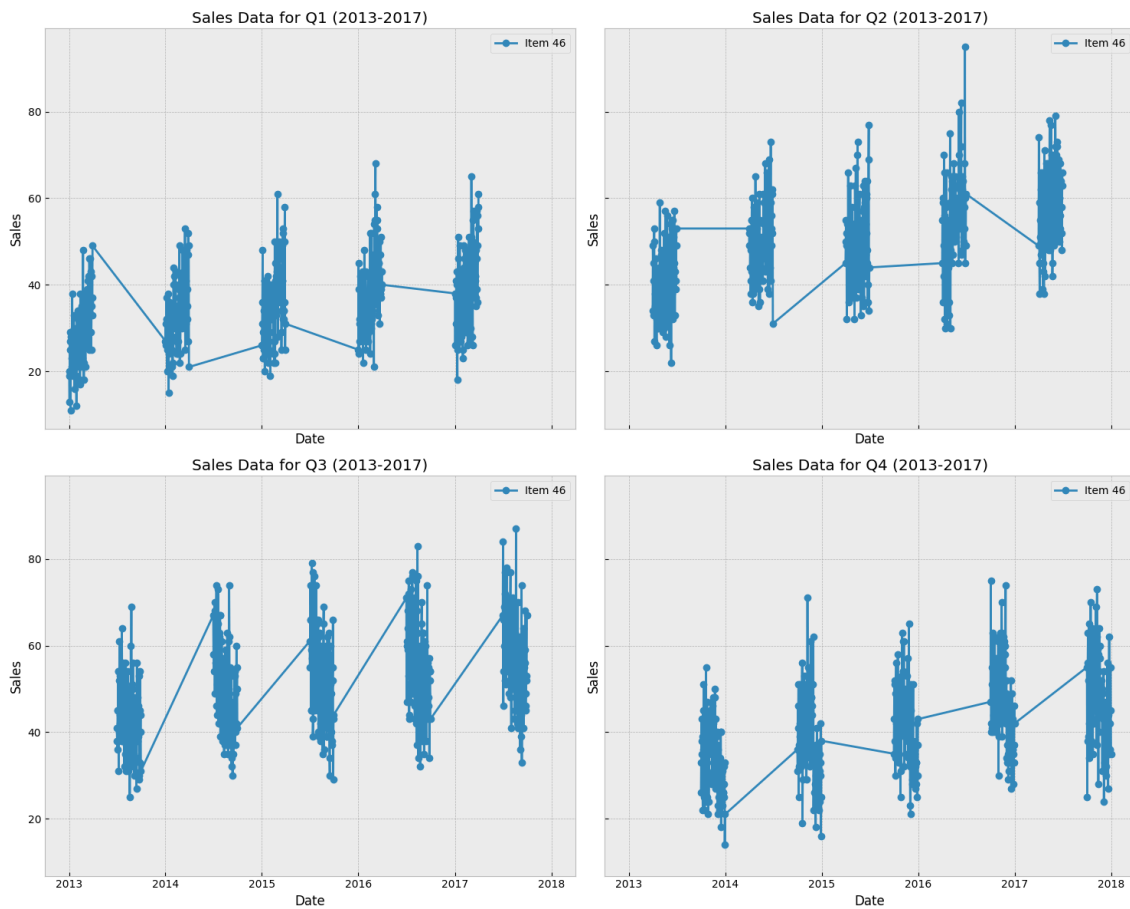
"SALES GRAPH FOR EACH QUARTER FROM 2013 TO 2017"



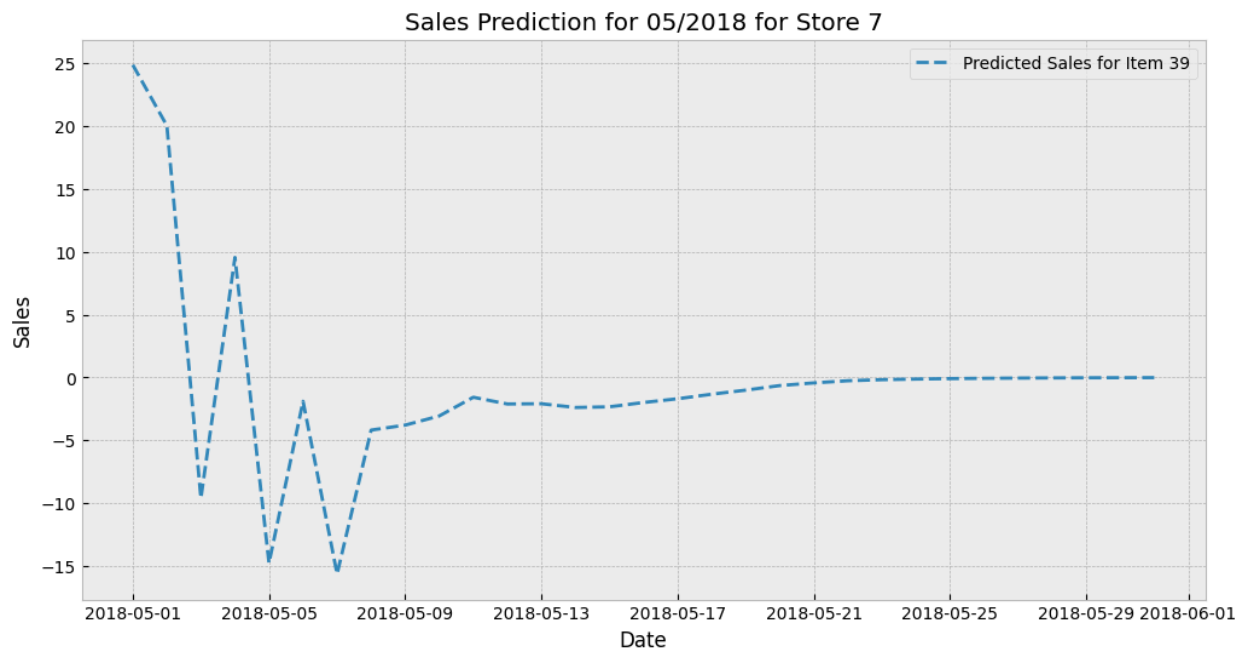
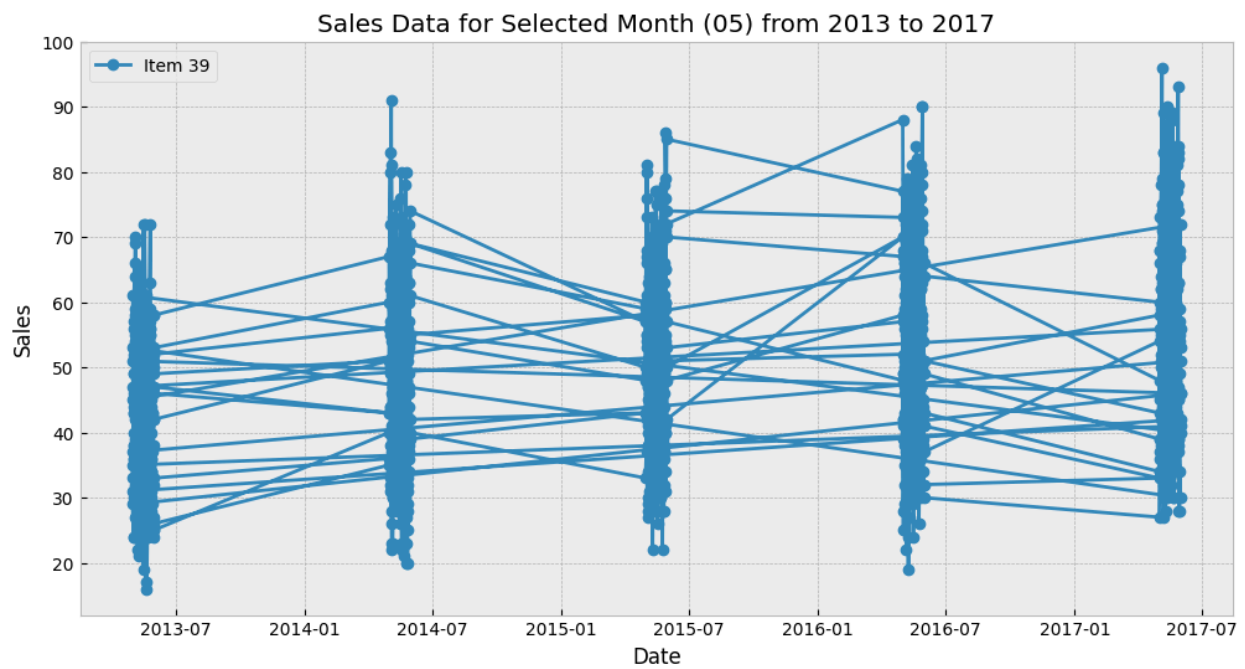
"SALES GRAPH FOR PARTICULAR MONTH FOR EACH YEAR"



"SALES GRAPH FOR PARTICULAR ITEM FOR EACH QUARTER"



"SALES PREDICTION GRAPH FOR A PARTICULAR ITEM FROM A PARTICULAR STORE FOR NEXT YEAR"



5. Internship Outcomes

5.1 Technical Skill Development

During the course of the internship, I significantly enhanced my technical proficiency across several domains. I gained practical experience working with **Python**, particularly in handling **time series data**, which is a crucial skill in data science and forecasting applications. I deepened my understanding of **data preprocessing techniques** such as normalization, missing value handling, and sequence generation for supervised learning. I also became proficient in using powerful libraries such as **Pandas** and **NumPy** for data manipulation, and **Matplotlib** and **Seaborn** for generating insightful visualizations during exploratory data analysis (EDA). On the modeling front, I applied **deep learning techniques** using **TensorFlow** and **Keras**, successfully building a hybrid architecture combining **Conv1D** and **LSTM** layers. Additionally, I explored **model evaluation metrics** like MAE and RMSE, implemented **hyperparameter tuning**, and learned how to optimize training using **dropout layers** and **early stopping** to avoid overfitting. These hands-on skills not only improved my confidence in developing machine learning models but also strengthened my ability to handle real-world data challenges end-to-end.

5.2 Business Understanding and Application

Beyond technical learning, one of the most valuable outcomes of the internship was the exposure to how data science is used in actual business settings. I learned to interpret and translate **raw data into meaningful insights** that could influence decision-making in areas such as **inventory planning**, **sales forecasting**, and **resource allocation**. By working on the Sales Prediction project, I understood the **importance of accurate forecasts** in helping a company like Titan maintain product availability without overstocking, thus reducing costs and improving efficiency. I also gained insight into how predictive analytics fits into broader business systems—such as dashboards or ERP tools—and how predictive models can assist business leaders in **strategic planning**. The experience taught me how to align my technical deliverables with **organizational goals** and effectively communicate insights with both technical and non-technical stakeholders. This bridging of technical output with business application has been a key milestone in my learning journey.

6. Conclusion

The internship at **Titan Company Limited** was a highly enriching and transformative experience. It provided me with a platform to not only apply theoretical knowledge gained during my academic journey but also to understand the practical significance of data science in a corporate environment. The **Sales Prediction project** was both challenging and rewarding, as it involved handling real-world time series data, preparing it for machine learning, and building a deep learning model that could make meaningful predictions. Through this project, I got the opportunity to delve deep into the areas of **data preprocessing, exploratory data analysis (EDA), feature engineering, and model development using Conv1D and LSTM architectures**. I gained practical experience working with essential Python libraries like Pandas, NumPy, Matplotlib, TensorFlow, and Keras, which helped sharpen my technical skills. Additionally, I learned how to evaluate models using performance metrics like MAE and RMSE, and how to improve them using optimization techniques. Beyond the technical accomplishments, the internship helped me understand the importance of aligning data science solutions with **business goals and outcomes**. I saw firsthand how accurate sales forecasting can support critical decisions in **inventory management, demand planning, and resource allocation**, and how machine learning models can be integrated into broader decision-support systems. Overall, the internship not only enhanced my confidence in solving real-world problems but also gave me a clear perspective on how **AI/ML technologies** are transforming industries. It has motivated me to continue learning, exploring, and growing as a machine learning professional, and I look forward to applying these learnings in my future roles and projects.

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