**Executive Summary: Customer Sentiment Analysis**

**Project Overview**

This project focuses on conducting an in-depth **Customer Sentiment Analysis** using **Natural Language Processing (NLP)** techniques and **Power BI** for data visualization. The goal is to extract actionable insights from customer reviews to understand sentiment distribution and improve business decision-making.

**Methodology**

1. **Data Collection & Preparation:**
   * The dataset consists of customer reviews, ratings, and other relevant attributes.
   * Performed **data cleaning** by removing duplicates, handling missing values, and applying text preprocessing techniques such as **lowercasing, removing special characters, and stopwords elimination**.
2. **Sentiment Analysis & NLP Implementation:**
   * Implemented **TextBlob** for **basic sentiment scoring** (positive, neutral, and negative sentiment classification).
   * Used **TF-IDF Vectorization** to transform text data into numerical format for machine learning models.
   * Applied **Multinomial Naïve Bayes** to improve sentiment classification accuracy.
   * Explored **Deep Learning (LSTM)** for advanced sentiment prediction.
3. **Data Export & Power BI Dashboard:**
   * Processed sentiment results were exported to a CSV file for **Power BI integration**.
   * Developed an **interactive dashboard** in **Power BI**, including:
     + **Sentiment Distribution Bar Chart** (to visualize overall sentiment counts).
     + **Sentiment Proportion Pie Chart** (to highlight sentiment percentages).
     + **Stacked Bar Chart** (to compare sentiment trends across different ratings).
     + **Slicer for Sentiment Filtering** (allowing dynamic analysis of specific sentiment categories).

**Key Insights & Findings**

* A **significant majority (90%+) of customer reviews are positive**, indicating strong customer satisfaction.
* A **small proportion (6.6%) of reviews are negative**, which can be further analyzed to identify common issues.
* Sentiment scores align closely with star ratings, confirming the effectiveness of the sentiment classification model.
* The dashboard provides a **user-friendly and data-driven approach** for decision-makers to analyze customer feedback dynamically.

**Business Implications & Recommendations**

* **Monitor negative sentiment trends** and address common pain points to enhance customer experience.
* Utilize sentiment analysis insights to **improve product offerings and customer service strategies**.
* Implement **real-time sentiment monitoring** in Power BI for proactive decision-making.
* Extend this analysis by incorporating **topic modeling (LDA)** to extract key themes from negative reviews.

**Conclusion**

This **Customer Sentiment Analysis project** successfully leveraged **Python NLP libraries** and **Power BI** to extract meaningful insights from customer reviews. By combining **machine learning models and visual analytics**, the project provides a **comprehensive sentiment overview** that can drive **strategic business improvements**. Future enhancements may include **real-time sentiment tracking, AI-based chatbot integration, and deep sentiment modeling using transformer-based NLP models (BERT).**