

CUSTOMER SENTIMENT AND TREND ANALYSIS

Members:

1-Yassin amr abdelaziz morsy

2-Mohamed ahmed Mohamed ali Shehata

3-shrouk mohamed abdelsadik

4-saad tarek saad

5-Abdallah mohy saad ali




AGENDA

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 - Technology Behind the project
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- Exploratory Data Analysis (EDA)
- Data Collection and Preprocessing
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- Model Evaluation
- Real-World Impact and Business Use Case
- Deployment

INTRODUCTION

An abstract graphic on the left side of the slide featuring a complex network of glowing blue lines and dots, resembling a digital or neural network, set against a dark blue background.

WHAT IS CUSTOMER SENTIMENT AND TREND ANALYSIS

- **Customer Sentiment Analysis:** The process of analyzing text to determine whether the customer's feedback is positive, negative, or neutral.
 - **Trend Analysis:** A method of understanding changes in customer behavior, preferences, and opinions over time, based on patterns in feedback or interaction data.
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- A horizontal bar at the bottom of the slide with a gradient from orange on the left to dark purple on the right.



WHY THIS PROJECT IS IMPORTANT

- The ability to automatically analyze customer feedback provides businesses with actionable insights, enabling them to respond quickly to concerns, capitalize on positive feedback, and adapt to trends in the market.
 - Trend analysis helps detect patterns and evolving preferences in customer behavior, making it easier to predict future needs and shape strategies.
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TECHNOLOGY BEHIND THE PROJECT



NATURAL LANGUAGE PROCESSING (NLP)

- **Language Processing (NLP)** is a field in technology that helps computers understand and process human language.
- In this case, we use NLP to analyze customer reviews or feedback and determine whether people feel positive, negative, or neutral about a product or service.



TRANSFORMER MODELS

BERT AND ROBERT & SELF-ATTENTION.

Transformer Models:

transformer architecture, the backbone of modern NLP models.

self-attention Mechanism transformers replaced traditional methods (RNNs and LSTMs) by capturing long-range dependencies and context more effectively **self-attention**.

- **BERT:** “BERT is a transformer model that stands for Bidirectional Encoder Representations from Transformers. It reads sentences from both directions at once (left-to-right and right-to-left), helping it understand the full context of words. BERT is great at tasks like understanding customer feedback and answering questions.”

WORKFLOW OF THE PROJECT



Data Collection



Exploratory Data Analysis (EDA)



Data Preprocessing



Model Training



Model Evaluation



Deployment

EXPLORATORY DATA ANALYSIS (EDA)

Exploratory Data Analysis (EDA) is the process of analyzing and visualizing the dataset to understand its structure, distribution, and key characteristics before applying machine learning models.

Key Goals of EDA

- **Understand Data:** Find patterns and any unusual data points.
- **Explore Features:** Look at how different parts of the data relate to each other (like word frequency).
- **Check Sentiment Balance:** See how many reviews are positive, negative, or neutral.



TECHNIQUES USED IN EDA

- **Class Distribution:** Use a bar chart to show how many reviews are positive, negative, and neutral.
- **Word Frequency Analysis:** Create a word cloud to show common words in positive and negative reviews.
- **Review Length Distribution:** Make a histogram to see if certain types of reviews are longer or shorter.
- **N-gram Analysis:** Look for common pairs or triplets of words to find common themes.





Data Collection and Preprocessing

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Data Sources

The project gathers customer feedback from various sources, including online reviews, social media posts, and customer surveys.

2

Data Cleaning

Collected data is cleaned and preprocessed to remove irrelevant information, errors, and inconsistencies, ensuring data quality.

3

Data Transformation

The data is transformed into a format suitable for the sentiment analysis model, using techniques like tokenization and stemming.

MODEL SELECTION

a. Choosing the Right Model

Sentiment analysis models need to understand language context. **Transformer models** like **BERT** and **RoBERTa** are ideal for this task.

b. Why Use Transformers?

Transformers understand word context in long sentences and handle ambiguities effectively (e.g., sarcasm, negations).

c. Pre-trained Models

BERT (Bidirectional Encoder Representations from Transformers) and **RoBERTa** (Robustly optimized BERT) were used, as they are highly effective for sentiment classification.



MODEL TRAINING

a. Fine-tuning the Model

- Pre-trained models were fine-tuned on your specific dataset.
- **Training Data:** A portion of the dataset is used to teach the model how to classify sentiment.
- **Validation Data:** Used to monitor the model's performance and tune hyperparameters.



MODEL TRAINING

b. Training Parameters

- **Batch Size:** Number of examples processed in each step.
- **Learning Rate:** Controls how much the model adjusts its weights after each batch.
- **Epochs:** Number of complete passes through the training dataset.

c. Preventing Overfitting

- Regularization techniques, like **dropout**, were used to prevent the model from memorizing the training data.



A futuristic robotic hand, rendered in a light blue and white color scheme, is shown from the wrist up. The hand is holding a large, glowing circular interface that emits a bright cyan and magenta light. The background is dark blue with a pattern of small, glowing white dots and lines, resembling a circuit board or a digital network. The overall aesthetic is high-tech and futuristic.

MODEL EVALUATION

■ a. Metrics Used

- **Accuracy:** Percentage of correct predictions.
- **Precision:** How many of the positive/negative predictions were actually correct.
- **Recall:** The ability to find all relevant positive/negative cases.
- **F1 Score:** Balances precision and recall for an overall performance measure.




MODEL EVALUATION

■ b. Confusion Matrix

- Shows how many reviews were classified correctly vs. incorrectly (true positives, false positives, etc.).

■ c. Model Performance

- Highlight the model's success rate in predicting sentiment.
 - Discuss any common errors, such as difficulty detecting sarcasm or distinguishing between neutral and slightly positive feedback.
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Real-World Impact and Business Use Case



Customer Service Enhancement

Sentiment analysis can help identify dissatisfied customers, understand their concerns, and provide timely support.



Targeted Marketing Campaigns

By understanding customer sentiment, businesses can tailor marketing messages and campaigns to resonate with specific audiences.



Product Development

Sentiment analysis can provide valuable insights into customer preferences and help companies develop products that meet market demands.



Deploying the Solution

The sentiment analysis solution can be deployed as a web application, API, or integrated into existing business systems. The deployment process involves configuring the model, setting up infrastructure, and ensuring data security.

Explore the model

THANK YOU