

# CAPSTONE PROJECT

## SENTIMENT ANALYSIS OF RESTAURANT REVIEW

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# OUTLINE

- **Problem Statement** (Should not include solution)
- **Proposed System/Solution**
- **System Development Approach** (Technology Used)
- **Algorithm & Deployment**
- **Result**
- **Conclusion**
- **Future Scope**
- **References**

# PROBLEM STATEMENT

The objective of this project is to analyze customer reviews and feedback on restaurant services, including food quality, taste, and ambiance etc, to gauge customer sentiment, understand satisfaction levels, and identify areas for improvement. Customer reviews are a rich source of information that can reveal both the strengths and weaknesses of the restaurant. By systematically analyzing this feedback, we aim to provide actionable insights that can help restaurant owners and workers to enhance the quality of their services, improve customer outcomes, and increase overall satisfaction. This analysis will involve collecting customer reviews from various platforms, preprocessing the data for sentiment analysis, and using advanced natural language processing techniques to derive meaningful insights.

# PROPOSED SOLUTION

The proposed system aims to address the challenge of analyzing sentiment on restaurant review, we propose a comprehensive approach leveraging natural language processing (NLP) techniques and machine learning models:

## **Data Collection:**

**Web Scrapping:** Collect review data from popular review sites like Yelp, Google, and TripAdvisor using web scrapping techniques.

**Data Formats:** Extract review text, ratings, and other relevant metadata in a structured format like CSV or JSON.

## **Data Preprocessing: Cleaning and Tokenization**

**Cleaning:** Remove html tags, URLs , special characters, and other noise from the raw review text.

**Tokenization:** Break down the cleaned text into individual words or tokens using natural language processing techniques.

**Normalization:** Convert all text to lowercase and perform lemmatization or stemming to reduce words to their base forms.

**Machine Learning Algorithm:** Implement models like Naïve Bayes, Support Vector Machines, or Deep Learning models to predict sentiment based on review text.

Utilize deep learning models like LSTMs and Transformers that can capture complex linguistic pattern

## **Feature Extraction:**

### **Bag-of-Words:**

Create a vocabulary of unique words from the review corpus and encode reviews as vectors of word counts.

### **Sentiment Lexicons:**

Use pre-build dictionaries of negative and positive words to compute sentiment scores for each review.

### **Deep learning embedding:**

Learn dense vector representations of words using neural networks to compute semantic and sentiment information.

## **Model Training:**

After selecting the right machine learning model split the dataset into training and testing sets. Train the training data and then evaluate the testing data using appropriate metrics like F1 score, recall, accuracy, precision.

## **Model Evaluation:**

Use k-fold cross validation to ensure the model's robustness.

Using techniques like grid search or model search optimize the model's parameters which is called as hyperparameter tuning.

## **Deployment:**

Save the trained model using serialization libraries like pickle or joblib.

Deploy the model in a production environment to classify new reviews.

# SYSTEM APPROACH

In restaurant review, understanding customer sentiment is crucial for improving restaurant's feedback. A tech-powered approach unlocks valuable insights from various sources. Online reviews, and social media discussions within peoples or friends offer a wealth of data.

Natural Language Processing (NLP) plays a key role. This technology breaks down text, removes irrelevant information like typos, and identifies key phrases. Machine learning then takes center stage. By analyzing vast amounts of processed text, trained algorithms can classify sentiment – positive, negative, or neutral.

This analysis provides restaurant owners with a deeper understanding of customer satisfaction with care. It reveals areas for improvement, allowing them to address specific concerns and prioritize resources effectively. Ultimately, by harnessing technology to understand customer needs can foster better engagement between restaurant's staff and customer and deliver a more positive experience.

However, restaurant review sentiment analysis presents unique challenges. They require specialized techniques. NLP algorithms must be trained on feedback-specific datasets to accurately understand the context and nuances of customer language. Additionally, ethical considerations are paramount. Ensure compliance with website terms of service and user privacy when scrapping data.

Despite these challenges, the potential benefits of restaurant review sentiment analysis are undeniable. By leveraging technology to understand customer voices, restaurant owners or staff can build stronger relationships with their customers, improve the quality of food, and ultimately contribute to a more positive experience for everyone involved.

# ALGORITHM & DEPLOYMENT

In this section, the machine learning algorithm chosen for predicting sentiment labels is described:

## **Algorithm Selection:**

Choosing appropriate sentiment analysis techniques such as Logistic Regression, Naïve Bayes that is Good for text data, SVMs and Deep Learning Models like RNN, CNN, Transformers like BERT for state-of-the-art performance.

## **Data Input:**

For restaurant review sentiment analysis, the data input involves gathering customer reviews and feedback from various sources, including official websites, Google Reviews, Yelp, specific review platforms, and social media channels. This process utilizes web scraping tools and APIs to extract structured data while adhering strictly to data privacy regulations such as HIPAA. By collecting these diverse sources of feedback, restaurants can obtain comprehensive insights into customer sentiment, enabling them to identify areas for improvement and enhance overall service quality effectively.

## **Training Process:**

Preprocessing customer reviews by cleaning, tokenizing, and normalizing text data extracted from restaurant's websites, Google Reviews, Yelp, specific review platforms, and social media channels.

## **Prediction Process:**

Applying trained sentiment analysis models to predict sentiment labels (positive, negative, neutral) for incoming customer reviews from official websites, Google Reviews, Yelp, specific review platforms, and social media channels. Providing actionable insights based on the predicted sentiments to improve restaurant services, operational efficiencies, and customer satisfaction levels.

# RESULT

## Insights from Customer Sentiments:

Identify positive sentiments highlighting strengths in restaurant services such as taste presentation, variety of menu items , and timely responses.

## Key Findings:

Positive sentiments often highlight specific restaurants quality.

Negative sentiments frequently point to common challenges that impact customer experience across multiple facilities or services.

## Actionable Recommendations:

Introduce initiatives to reduce wait times and improve scheduling efficiency.

Implement training programs to enhance communication skills among restaurants staff.

## Impact:

Improved customer satisfaction leading to increased customer retention and positive word-of-mouth recommendations.

# CONCLUSION

Sentiment analysis can provide valuable insights into customer opinions and drive data-driven decision making for restaurants

Sentiment analysis is a powerful tool for understanding customer perceptions and experiences in the restaurant industry. By analyzing the language and emotions expressed in online reviews, businesses can gain valuable insights to improve their operations, menu, and overall customer satisfaction.

Insights from sentiment analysis empower restaurants to make data-driven decisions about their menu, service, and operations.

In conclusion, restaurant review sentiment analysis helps restaurants stay ahead of the competition by identifying strengths, weaknesses, and areas for improvement. By addressing customer pain points and implementing feedback, restaurants can enhance the overall dining experience. Advancements in natural language processing, deep learning, and multimodal analysis will further improve the accuracy and applicability of sentiment analysis in the restaurant industry.

# FUTURE SCOPE

**Enhanced Personalization:** Utilize sentiment analysis to personalize customer interactions and service plans based on individual preferences and feedback.

**Real-Time Feedback Mechanisms:** Implement real-time feedback systems to capture and analyze customer sentiments instantly, enabling immediate service improvements.

**Integration with AI and IoT:** Integrate sentiment analysis with AI and IoT devices to monitor customer emotions in real-time, enhancing proactive food delivery.

**Predictive Analytics:** Develop predictive models using historical sentiment data to anticipate customer needs and optimize resource allocation and service planning.

**Cross-Institutional Benchmarking:** Establish benchmarks for sentiment analysis across restaurants to compare performance and identify best practices for continuous improvement.

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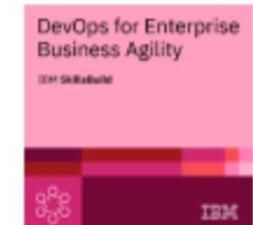
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