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Review of AI-Based Approaches for Sentiment and Opinion Mining of Online Restaurant Reviews

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ABSTRACT: Online consumer reviews play a crucial role in shaping customer perceptions and business performance in the restaurant industry. With the rapid growth of user-generated content on platforms such as Zomato and Google Maps, Artificial Intelligence (AI) techniques have become essential for extracting meaningful insights from large volumes of unstructured textual data. The paper synthesizes existing research by categorizing studies into key thematic areas such as sentiment analysis, deep learning-based review modeling, fake review detection, rating prediction, recommendation systems, and decision-support dashboards. The strengths, limitations, and challenges of these approaches are critically analyzed. The review highlights how AI-driven sentiment analysis and opinion mining can support improved decision-making, enhance customer satisfaction, and optimize restaurant operations, while also identifying research gaps and future directions.

KEYWORDS: Online Consumer Reviews, Artificial Intelligence, Sentiment Analysis, Restaurant Industry, Machine Learning

I. INTRODUCTION

In the digital era, online consumer reviews have become a dominant factor influencing customer decision-making in the restaurant industry. Potential diners frequently rely on textual reviews and ratings to evaluate food quality, service standards, pricing, and ambiance before choosing a restaurant [1]. Consequently, these reviews significantly impact a restaurant's reputation, revenue, and long-term sustainability. Given the massive volume and unstructured nature of review data, manual analysis is impractical, creating a strong need for automated analytical techniques[2].

Artificial Intelligence (AI), particularly Natural Language Processing (NLP) and Machine Learning (ML), offers powerful tools for analyzing online consumer reviews. Techniques such as sentiment analysis, topic modeling, and aspect-based opinion mining enable the extraction of customer emotions, preferences, and recurring concerns from textual data. These insights help restaurant owners and managers improve service quality, redesign menus, and enhance overall customer experience[3].

This paper delves into the exciting world of AI applications for analyzing online restaurant reviews. We will explore the various AI techniques employed, such as sentiment analysis, topic modeling, and aspect-based opinion mining. Sentiment analysis, a cornerstone of AI-powered review analysis, unlocks the emotional undercurrents of reviews, pinpointing positive, negative, and neutral opinions[4]. By sifting through vast amounts of text data, AI can identify recurring themes and topics within reviews, a process known as topic modeling. This allows restaurants to understand what aspects of their business resonate most with customers, or conversely, which areas require improvement[5]. Aspect-based opinion mining takes the analysis a step further, dissecting reviews to identify specific aspects of the dining experience, such as food quality, service attentiveness, or ambiance. By pinpointing these granular details, restaurants can gain invaluable insights into customer satisfaction across various touchpoints[6].

The impact of AI on online review analysis extends far beyond simply understanding customer sentiment. AI can be harnessed to identify fake reviews, a growing concern in the online review landscape[7]. These deceptive reviews can skew a restaurant's perception and mislead potential customers. AI algorithms, armed with the ability to analyze writing style, language patterns, and reviewer behavior, can flag potentially fraudulent reviews, allowing restaurants to maintain the integrity of their online reputation[8].

Another emerging concern in online review platforms is the presence of fake or fraudulent reviews, which can mislead customers and distort business evaluations. AI-based models have shown promising results in detecting deceptive reviews by analyzing linguistic patterns and reviewer behavior[9]. Despite these advancements, challenges such as data dependency, language ambiguity, and model interpretability remain significant. This paper reviews recent AI-based approaches applied specifically to online restaurant reviews and discusses their effectiveness and limitations[10].

II. LITERATURE SURVEY

2.1 Deep Learning-Based Sentiment Analysis of Restaurant Reviews (2023)

Several studies published in 2023 focus on applying deep learning models for sentiment analysis of restaurant reviews. Chen et al. (2023) proposed an integrated sentiment analysis framework combining BERT, TextRNN, and TextCNN to capture both global semantic information and local contextual features from restaurant review texts. Their approach demonstrated improved classification accuracy compared to traditional methods. Similarly, Begum et al. (2023) analyzed Zomato restaurant reviews using a Random Forest classifier with TF-IDF features, achieving reliable sentiment classification into positive, negative, and neutral categories. Sunarko et al. (2023) extended sentiment analysis to aspect-level classification by categorizing Google Maps restaurant reviews into aspects such as menu, taste, and ambiance using BERT-based models.

2.2 Topic Modeling and Aspect-Based Opinion Mining (2023)

Topic modeling and aspect-based opinion mining provide deeper insights into specific attributes of restaurant services. Suryadi et al. (2023) applied Latent Dirichlet Allocation (LDA) to restaurant reviews collected from major tourism destinations, identifying key topics such as service quality, food taste, ambiance, and overall experience. Sentiment analysis was then performed for each identified topic, enabling a fine-grained evaluation of restaurant performance across different dimensions.

2.3 Business Performance, Rating Prediction, and Recommendations (2023)

Beyond sentiment classification, AI techniques have been applied to predict business performance and customer ratings. Tao and Zhou (2023) investigated restaurant closure prediction using online consumer reviews by integrating deep learning with time-series analysis, demonstrating that review sentiment trends can serve as early indicators of business failure. Bhatia et al. (2023) focused on predicting restaurant ratings using machine learning algorithms such as Linear Regression, Random Forest, and KNN on Zomato datasets. Kalaivani et al. (2023) developed a restaurant recommendation system that combines sentiment analysis with similarity measures to suggest restaurants aligned with customer preferences.

2.4 Fake Review Detection and Review Authenticity (2023)

Fake review detection is a critical challenge in online review analysis. Chakravarty et al. (2023) analyzed fraudulent reviews using deep learning models such as CNN-LSTM, LSTM, and BiLSTM. Although their study was conducted on IMDB movie reviews, the methodologies and findings are relevant to restaurant review platforms, as both domains face similar issues related to review manipulation and rating fraud. Their results indicate that hybrid deep learning models can effectively distinguish between genuine and fake reviews, offering valuable insights for future restaurant-specific fraud detection research.

2.5 Decision-Support and Dashboard Systems (2023)

AI-driven analytics have also been used to support managerial decision-making. Medeiros et al. (2023) developed a dashboard-based decision-support system for monitoring performance indicators in the restaurant and hospitality sector. While not limited to sentiment analysis, such systems demonstrate how insights derived from data analytics can support strategic planning and policy evaluation.

III. CHALLENGES

Despite the significant advantages of AI-based analysis of online restaurant reviews, several challenges persist. The performance of AI models heavily depends on the availability of large, high-quality datasets, which may not be accessible for small or newly established restaurants. Language complexity, including sarcasm, slang, and cultural context, often leads to misclassification of sentiments. Bias in training data can further affect fairness and generalizability of results. Fake review detection remains an ongoing challenge as deceptive techniques continuously evolve. Additionally, the lack of explainability in complex deep learning models reduces trust and transparency for end-users. High implementation costs also limit adoption among small-scale restaurant businesses.

IV. SCOPE AND EXPECTED OUTCOMES

The scope of this review is limited to AI-based techniques applied to online restaurant reviews, with a focus on studies published in 2023. The expected outcomes include a clear thematic understanding of current research trends, identification of effective AI models for sentiment and aspect analysis, and recognition of gaps such as the need for restaurant-specific fake review detection datasets and explainable AI models.

Studies outside the restaurant domain and methods that do not involve AI-based learning models are excluded. From a methodological perspective, sentiment classification in restaurant reviews is commonly modeled as a mapping function:

$$f: R \rightarrow S$$

where $R = \{r_1, r_2, \dots, r_n\}$ represents the set of restaurant reviews and $S = \{\text{Positive, Negative, Neutral}\}$ denotes the sentiment polarity classes.

For aspect-based sentiment analysis, the overall sentiment score of a review can be represented as a weighted aggregation of individual aspect sentiments:

$$\text{Sentiment}_{\text{review}} = \sum_{i=1}^k w_i \cdot s_i$$

where s_i is the sentiment score of the i^{th} aspect (e.g., food quality, service, price), w_i is the corresponding importance weight, and k is the total number of detected aspects.

The expected outcomes of this review include a clear thematic understanding of current research trends, identification of effective AI models such as deep learning and transformer-based architectures for sentiment and aspect extraction, and recognition of research gaps. These gaps include the lack of restaurant-specific fake review detection datasets, challenges in multilingual and code-mixed review analysis, and the need for explainable AI models that can justify predictions through attention weights or feature attribution mechanisms.

To compare model performance across studies, commonly used evaluation metrics are summarized using standard equations. Accuracy is defined as:

$$\text{Accuracy} = \frac{TP + TN}{TP + TN + FP + FN}$$

Precision, Recall, and F1-score are computed as:

$$\text{Precision} = \frac{TP}{TP + FP}$$

$$\text{Recall} = \frac{TP}{TP + FN}$$

$$F1\text{-score} = \frac{2 \times \text{Precision} \times \text{Recall}}{\text{Precision} + \text{Recall}}$$

where TP , TN , FP , and FN denote true positives, true negatives, false positives, and false negatives, respectively. These performance parameters enable a quantitative comparison of AI models across different restaurant review datasets and provide a standardized basis for evaluating sentiment classification and aspect-level prediction effectiveness.

V. CONCLUSION

This review paper provides a structured synthesis of recent AI-based approaches for analyzing online consumer reviews in the restaurant industry. By categorizing existing studies into sentiment analysis, topic modeling, performance prediction, fake review detection, and decision-support systems, the paper highlights the growing importance of AI in understanding customer feedback. While current techniques demonstrate strong potential for improving customer satisfaction and operational efficiency, challenges related to data quality, interpretability, and scalability remain. Future research should focus on developing domain-specific, transparent, and cost-effective AI models to further enhance the reliability and practical applicability of online restaurant review analysis.

REFERENCES

1. J. Tao and L. Zhou, "Can Online Consumer Reviews Signal Restaurant Closure: A Deep Learning-Based Time-Series Analysis," in *IEEE Transactions on Engineering Management*, vol. 70, no. 3, pp. 834-848, March 2023, doi: 10.1109/TEM.2020.3016329.
2. R. Chen, M. Liu, L. Pan and Y. Niu, "Chinese Restaurant Industry Review Sentiment Analysis Method Based on Integration Model," 2023 International Conference on Advances in Electrical Engineering and Computer Applications (AEECA), Dalian, China, 2023, pp. 614-618, doi: 10.1109/AEECA59734.2023.00115.
3. P. S. Raju, A. Hemalata, A. Vanathi and V. Ravikishore, "Sentiment Analysis on Restaurant Review using Machine Learning Algorithms," 2023 3rd International Conference on Innovative Mechanisms for Industry Applications (ICIMIA), Bengaluru, India, 2023, pp. 1003-1010, doi: 10.1109/ICIMIA60377.2023.10425809.
4. N. Begum, M. Ruthika, N. L. Deepika, M. S. Sucharitha and V. P. Rao, "Sentiment analysis on Zomato customer reviews using Random Forest Classifier," 2023 6th International Conference on Recent Trends in Advance Computing (ICRTAC), Chennai, India, 2023, pp. 225-230, doi: 10.1109/ICRTAC59277.2023.10480757.
5. B. Sunarko, U. Hasanah and S. Hidayat, "Enhancing Restaurant Customer Review Analysis: Multi-Class Text Classification with BERT," 2023 6th International Seminar on Research of Information Technology and Intelligent Systems (ISRITI), Batam, Indonesia, 2023, pp. 501-506, doi: 10.1109/ISRITI60336.2023.10467438.
6. A. Chakravarty and A. Rengarajan, "Analysis of Deep Learning Models to Identify Uniqueness in User Reviews and Ratings," 2023 3rd International Conference on Advancement in Electronics & Communication Engineering (AECE), GHAZIABAD, India, 2023, pp. 698-702, doi: 10.1109/AECE59614.2023.10428195.
7. D. Suryadi and J. T. Sabarman, "Analyzing Restaurants in Tourism Destinations Through Online Reviews Using Topic Modeling and Sentiment Analysis," 2023 IEEE 9th Information Technology International Seminar (ITIS), Batu Malang, Indonesia, 2023, pp. 1-6, doi: 10.1109/ITIS59651.2023.10419923.
8. S. Bhatia, C. Arya, S. Verma, D. Gautam, B. B. Naib and A. Kumar, "Predict Success of a Zomato Restaurant using Machine Learning," 2023 World Conference on Communication & Computing (WCONF), RAIPUR, India, 2023, pp. 1-7, doi: 10.1109/WCONF58270.2023.10235064.
9. K. S. Kalaivani, C. S. Kanimozhiselvi, B. R. Narmatha and Z. H. M. Bilal, "Improving the Restaurant Recommendation Performance using Sentiment Analysis," 2023 5th International Conference on Inventive Research in Computing Applications (ICIRCA), Coimbatore, India, 2023, pp. 296-300, doi: 10.1109/ICIRCA57980.2023.10220869.
10. F. A. Medeiros, R. M. S. Laureano and L. M. S. Laureano, "Dashboard to monitor the Restaurant and Hospitality Financial Support Program," 2023 18th Iberian Conference on Information Systems and Technologies (CISTI), Aveiro, Portugal, 2023, pp. 1-6, doi: 10.23919/CISTI58278.2023.10211877.



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