ZOMATO RESTAURANT RATING PREDICTION

An Internship Project Report

Submitted to

DLITHE CONSULTANCY SERVICES PRIVATE LIMITED

By

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1. ACKNOWLEDGEMENT

I would like to extend my heartfelt gratitude to DLithe Consultancy Services Private Limited for providing me with the invaluable opportunity to undertake my internship at their esteemed institution. Their support and guidance were instrumental in shaping my project, and I am truly grateful for the experience.

I would also like to express my deepest thanks to Ms. Medini, who served as an exceptional guide throughout this internship journey. Her expertise, encouragement, and mentorship were pivotal in making this experience rewarding and enriching.

Additionally, I am grateful to Mangalore Institute of Technology & Engineering for giving me the chance to pursue this internship at DLithe Consultancy Services Private Limited. The college's support and encouragement have been crucial in enabling me to gain practical industry experience and further my learning.

Finally, I want to acknowledge all the individuals who assisted me in various ways, providing valuable insights and contributing to my growth and knowledge during the internship period. Thank you all for your unwavering support.

2. ORGANIZATIONAL INFORMATION

DLithe is a technology-based product company that has been serving IT companies and academic institutions since the year 2018. The company is led by industry professionals with two decades of experience. For IT companies, DLithe offers services such as technology consultancy, project development, IT recruitment, staffing, competency development, and content development. On the other hand, the company serves academic institutions by providing competency development services in niche technologies like artificial intelligence, internet of things, robotics, cybersecurity, augmented reality, and more. DLithe has also developed the arm-based Cortex M3 series microcontroller and the ioCube product in the embedded and IoT domain.

During my rewarding internship in the field of Artificial Intelligence and Machine Learning, I had the privilege of being a part of an exceptional program under the guidance of this renowned organization. Throughout the internship, I gained comprehensive insights into diverse industry verticals, spanning from understanding project requirements to the final deployment phase.

DLithe's internship program provided me with a valuable opportunity to immerse myself in real-world scenarios, gaining exposure to industry best practices and learning how to implement AI and ML solutions within an agile project life cycle. The supportive environment and dedicated mentors at the organization ensured that I could explore practical use cases for AI and ML implementation, enabling me to grow and learn during insightful post-mentoring sessions.

One notable aspect of the internship was the opportunity to work on real-world project, including a diabetes prediction using aiml. DLithe provided guidance and mentoring throughout the project, allowing me to gain hands-on experience with different machine learning models and their application in solving practical problems like crop price prediction.

This internship experience has equipped me with a strong foundation in artificial intelligence and machine learning, positioning me well for a career in this dynamic and rapidly evolving field.

2. CONTENTS

4 . ABSTRACT

The restaurant industry is highly competitive, with customers relying on various factors to make informed dining choices. Restaurant ratings and reviews are essential for both consumers and restaurant owners, as they can significantly impact business success. In this project, we propose a novel approach to predict restaurant ratings using Artificial Intelligence and Machine Learning (AI/ML) techniques.

Restaurant Rating Predictor stands as a tool for getting a good restaurant for the food enthusiasts. Leveraging the dataset from Zomato, our application, developed with Streamlit, lets users to select a city, cuisine, and price range, and predicts the rating of the best restaurant fitting their preferences. By employing a Multi-Linear Regression model, we offer accurate and customized restaurant recommendations, fostering informed dining choices.

Our objective is to develop a predictive model that can accurately estimate a restaurant's rating based on a variety of features, such as location, cuisine, price range, ambiance, and customer reviews. To achieve this goal, we collect and preprocess a comprehensive dataset that includes information from a wide range of restaurants.

5. INTERNSHIP OBJECTIVES

The primary objectives of the AI and ML internship was designed to equip us with comprehensive skill set and practical knowledge in various areas of Artificial Intelligence and Machine Learning. The key objectives included:

- **Learning Python Basics:** The internship aimed to provide a strong foundation in Python programming, as it is one of the most widely used languages in AI and ML. Participants were introduced to Python syntax, data structures, and essential libraries used in AI and ML development.
- **Gain Practical Experience:** The primary goal of this internship was to gain practical, hands- on experience in the field of artificial intelligence and machine learning. This involved working on real-world projects and applying AI and ML concepts to solve practical problems.
- **Understanding ML Algorithms:** The internship focused on making us understand fundamental ML algorithms such as Linear Regression, Binary Classification, and Decision Trees. These algorithms form the building blocks for more advanced techniques and are crucial for understanding the basics of supervised learning.
- **Exploring Neural Networks:** We delved into the world of Neural Networks, understanding their architecture and how they mimic the human brain's functioning. Topics covered included Activation Functions and Forward Propagation, which are essential concepts for building and training neural networks.
- **Mentorship and Feedback:** Receive guidance and mentorship from industry experts to enhance skills and knowledge in AI and ML. Use feedback to continuously improve and refine project work.
- **Emphasizing GitHub and LinkedIn Profile Maintenance:** The internship recognized the importance of a strong online presence for aspiring AI and ML professionals. We were encouraged to maintain an active GitHub repository showcasing our projects and contributions, as well as a well-curated LinkedIn profile to showcase our skills and accomplishments.
- **Master AI/ML Tools and Platforms:** To become proficient in using AI and ML tools and platforms widely used in the industry. This includes working with frameworks like TensorFlow, scikit-learn, and exploring cloud-based AI services.

6. WEEKLY OVERVIEW OF INTERNSHIP ACTIVITY

Week 1:

- Objective: Understanding Python Fundamentals for AI & ML
- Activities:
- Covered Python syntax and data structures
- Explored essential libraries used in AI and ML
- Worked on basic Python programming exercises and projects

Week 2:

- Objective: Learning Various Machine Learning Algorithms and Implementation in Python
- Activities:
- Hands-on implementation of Binary Classification algorithms
- Explored Decision Trees and their practical applications
- Worked on Linear Regression and its use cases
- Applied CNN on MNIST dataset for image classification
- Understood concepts of Forward Propagation and Neural Networks

Week 3:

- Objective: Use Case Selection, Data Collection, Preprocessing, and Algorithm Exploration
- Activities: Gathered relevant data for the Chatbot such as query and response.
- Explored various Web scraping tools to further improve data gathering.
- Pre-processed the data to remove null values, extra queries or responses and further found ways to annotate data.
- Discussed potential challenges and approaches with the mentor during weekly sessions

Week 4:

- Objective: Model Training, Testing, and Sentiment Analysis - Activities:
- Trained the bot and checked similarity score for queries asked and quires previously existing.
- Studied various similarity testers for similarity detection.
- Incorporated feedback from mentor sessions to make further improvements
- Determined issue with normalizing data and testing various techniques to overcome issue.
- Conducted user testing to ensure the Chatbot functionality and usability.

Key Learnings:

- Gained proficiency in Python Programming language.
- Acquired knowledge and experience in applying diverse ML Algorithms using Python.
- Understood criticality of data preparation and data refactoring for use in Natural Language Processing techniques.
- Gained knowledge and hands-on experience with logistic regression, SVM, Naive Bayes, decision trees, and neural networks in Python.
- Understood the strengths and weaknesses of each algorithm for various use case.

7. CHALLENGES AND LEARNING OUTCOMES

CHALLENGES

Developing a Restaurant rating prediction application using machine learning can be a promising endeavour, but it also comes with various challenges. Predicting restaurant ratings can be a challenging task with several factors influencing the accuracy of such predictions. Below are some of the challenges and potential learning outcomes associated with restaurant rating prediction:

1.Data Quality and Quantity: The quality and quantity of data is critical. Inconsistent, outdated, or biased data can lead to inaccurate predictions. User-generated content, such as reviews and ratings, may also be subjective and noisy.

2.Feature Selection: Deciding which features to consider in the prediction model can be challenging. Relevant features like location, cuisine, price range, and reviews need to be selected, but it's not always clear which factors are most influential.

3.Temporal Dynamics: Restaurant ratings can change over time due to factors like seasonal trends, menu changes, and management adjustments. Models need to account for this temporal aspect.

4.User Behaviour: Understanding user behaviour is complex. User preferences and rating patterns can be influenced by personal biases, mood, or even the weather on a given day.

5.Sparsity of Data: In some cases, there may be a limited number of ratings and reviews for a particular restaurant, making it challenging to build accurate models, especially in the case of new or lesser-known establishments**.**

6.Fake Reviews: Some reviews may be fake or manipulated, which can mislead the prediction model. Detecting and handling such reviews is crucial.

7.Geographic Variability: Restaurants in different regions or cities can have different standards and expectations. Models need to consider these geographic variations.

LEARNING OUTCOMES

1.Machine Learning and Data Science Skills: Developers and data scientists working on the project can acquire a deep understanding of various machine learning algorithms, data preprocessing, feature engineering, and model training.

Skills related to data analysis, data visualization, and statistical analysis are honed during the project.

2. Data Collection and Preprocessing: Learn how to collect and preprocess data relevant to diabetes prediction. This involves cleaning, normalizing, and transforming data to make it suitable for ML algorithms.

3. Feature Engineering: Understand the process of feature selection and engineering to identify which data attributes are most informative for predicting restaurant rating.

4. Machine Learning Algorithms: Gain expertise in various ML algorithms like multi linear regression logistic regression, decision trees, random forests, support vector machines, and deep learning models. Understand when and how to use each one for predicting restaurant rating.

5. Model Training and Evaluation: Learn how to train ML models, split data into training and testing sets, and evaluate model performance using metrics like accuracy, precision, recall, F1- score, and ROC AUC.

6. Hyperparameter Tuning: Understand the importance of hyperparameter tuning to optimize model performance.

7. Cross-Validation: Learn about k-fold cross-validation to assess the model's generalization performance.

8. Feature Importance: Interpret and analyse the importance of different features in the prediction model

8. PROJECT DETAILS

CHAPTER 1

8.1 INTRODUCTION

The culinary world is vast and diverse, offering an array of dining experiences that cater to every palate. Zomato, one of the leading restaurant discovery and review platforms, has amassed a wealth of data from diners, providing a rich tapestry of restaurant reviews and ratings. The "Zomato Restaurant Rating Prediction" project embarks on a data-driven journey to unlock the secrets hidden within this treasure trove of information, with the ultimate goal of predicting restaurant ratings accurately. This project not only showcases the power of machine learning but also addresses real-world challenges and delivers tangible benefits to both diners and restaurant owners.

The foundation of this project lies in the belief that every dining experience is a unique blend of elements. These elements include the restaurant's location, cuisine, pricing, ambiance, and service, to name just a few. These components come together to form a comprehensive snapshot of a restaurant's quality, reflected in the ratings and reviews provided by Zomato users. By harnessing this data, we aim to answer a fundamental question: What makes a restaurant truly exceptional, and can we predict its rating based on these factors?

Through this project, we will encounter various challenges, from data preprocessing and feature engineering to model selection and evaluation. We will also explore advanced techniques in machine learning such as multi linear regression. The potential impact of this project is significant. For diners, it can offer invaluable guidance in selecting the perfect restaurant for their occasion and preferences, enhancing their overall dining experience. For restaurant owners, it can provide insights into areas for improvement and opportunities for success, ultimately contributing to their business growth.

Additionally, this project not only provides a compelling learning experience for aspiring data scientists and machine learning enthusiasts but also showcases the practical applications of AI in the hospitality industry. By mastering the art of restaurant rating prediction, we are not only refining our skills but also contributing to the ever-evolving landscape of AI-driven solutions

CHAPTER 2

8.2 LITERATURE SURVEY

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CHAPTER 3

8.3 PROBLEM STATEMENT

The restaurant industry is dynamic and ever-evolving, with a multitude of factors influencing the ratings and success of dining establishments. In the era of online reviews and data-driven decisions, diners often face the challenge of selecting the ideal restaurant that matches their location, food preferences, and budget constraints. This project aims to address this challenge by developing a Restaurant Rating Predictor using machine learning techniques. By leveraging a comprehensive dataset from Zomato and employing predictive modeling.

CHAPTER 4

8.4 PROJECT OBJECTIVE

Rating Prediction: The project aims to develop a predictive model that can estimate the ratings of restaurants based on various factors and features. These factors may include location, cuisine, price range, customer reviews, and more.

Customer Insights: By analysing customer reviews and feedback, the project seeks to uncover hidden patterns and sentiments that can shed light on the reasons behind a restaurant's rating. This information can help restaurant owners make informed decisions to improve their services.

Recommendation System: The project may also incorporate a recommendation system to suggest restaurants to customers based on their preferences and previous dining experiences.

Data Analysis: A critical component of the project is data analysis. It involves processing and examining large datasets of restaurant information and customer reviews to derive meaningful conclusions.

Data Collection and Integration: Gather and integrate restaurant-related data from various sources, including restaurant databases, review websites, and user-generated content.

Data Preprocessing: Clean and preprocess the data to ensure its quality and consistency. Handle missing values, standardize data formats, and perform data transformation as needed.

Machine Learning Model Development: Build, train, and evaluate machine learning models for rating prediction. Experiment with various algorithms, such as regression, decision trees, or neural networks, to find the most accurate model.

Multiple Linear Regression: It is a statistical technique used in the field of data analysis and machine learning. It extends the concept of simple linear regression, which models the relationship between two variables, to model the relationship between a dependent variable and multiple independent variables.

Real-Time Updates: Ensure that the system provides real-time or near-real-time updates to keep restaurant ratings and recommendations up to date.

Accuracy and Performance: Continuously improve the accuracy of rating predictions and the overall system's performance, minimizing errors and providing reliable recommendations.

CHAPTER 5

8.5 METHODOLOGIES

Data Collection and Preprocessing:

- Gather restaurant data, including attributes like location, cuisine, menu, price range, user reviews, and historical ratings.
- Collect data from various sources, such as websites, APIs, or scraping platforms like Yelp, TripAdvisor, Zomato, or Google Maps.
- Clean the data by handling missing values, outliers, and inconsistencies. Encode categorical features (e.g., location, cuisine type) into numerical representations (one-hot encoding or embeddings).Normalize or scale numerical features.
- Split the dataset into training and testing subsets.

Feature Engineering:

- Create new features if necessary. For example, you could generate features like the average review sentiment, the number of years in business, etc.

Model Selection:

- Choose a machine learning model for rating prediction. Common choices include: Regression models (e.g., Linear Regression, Random Forest Regressor, Gradient Boosting Regressor).Neural networks if you have a large dataset and complex patterns to capture.

Model Training:

- Train the selected model on the training dataset. Tune hyperparameters using techniques like cross-validation or grid search.

Evaluation:

- Evaluate the model's performance using appropriate metrics like Mean Absolute Error (MAE), Mean Squared Error (MSE), or Root Mean Squared Error (RMSE). Consider using custom evaluation metrics specific to the restaurant domain, such as sentiment analysis.

Scalability and Maintenance:

- Ensure that the system can handle increased load as the number of users and restaurants grows. Regularly update and retrain the model to maintain its accuracy.

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CHAPTER 6

8.6 IMPLEMENTATION

Data Collection:

1. Web Scraping: Use web scraping libraries like BeautifulSoup or Scrapy in Python to collect data from Zomato. You can scrape restaurant details, user reviews, ratings, and any other relevant information. Ensure you comply with Zomato's terms of service and robots.txt file during the scraping process.

2. Data Storage: Save the scraped data into structured files or a database. CSV files are a common choice, or you can use SQL databases like SQLite or PostgreSQL.

Data Preprocessing:

3. Data Cleaning: Clean the scraped data to remove duplicates, handle missing values, and address any inconsistencies. This is especially important when working with web-scraped data.

4. Data Exploration: Explore the data to identify patterns, distributions, and outliers. Use visualizations and summary statistics to understand the dataset.

Feature Engineering:

5. Feature Selection: Identify which features you want to include in your multiple linear regression model. Common features may include restaurant attributes (cuisine, location, price range), user-generated features (average rating, number of reviews), and sentiment scores from user reviews.

6. Feature Encoding: Convert categorical variables into numerical representations, such as one-hot encoding for cuisine types or location.

Model Building:

7. Data Splitting: Split the data into training and testing sets. A common split ratio is 70-30 or 80-20, with the larger portion for training.

8. Multiple Linear Regression Model: Build a multiple linear regression model using libraries like scikit-learn in Python. Fit the model to the training data, with the restaurant ratings as the dependent variable and the selected features as independent variables.

9. Model Evaluation: Evaluate the model on the testing dataset using regression metrics like mean squared error (MSE), root mean squared error (RMSE), and R-squared (R2). These metrics help you assess how well the model predicts restaurant ratings.

Results and Reporting:

10. Report and Visualization: Present your findings, insights, and model performance in a report. Use visualizations to help explain your results and recommendations. Highlight the relationship between features and ratings.

CHAPTER 7

8.7 RESULT AND FUTURE SCOPE

RESULT

1.Accurate Restaurant Rating Predictions: The primary result of the project should be the development of a predictive model that can accurately estimate restaurant ratings based on various factors. This model can serve as a valuable tool for Zomato users looking to make informed dining choices.

2. Insightful Feature Importance: The project can provide insights into which factors have the most significant influence on restaurant ratings. Understanding the importance of features such as cuisine, location, ambiance, and service can benefit both diners and restaurant owners.

3.User Experience Enhancement: By offering diners a reliable method to find restaurants that match their preferences, the project can enhance the overall dining experience for users of Zomato.

4.**Business Insights for Restaurants:** The project's results can also be valuable for restaurant owners. By analyzing the model's predictions, restaurant owners can identify areas for improvement and understand how specific aspects of their establishment affect customer ratings.

5.Real-time Prediction: Integrating real-time data and user interactions can make the system more dynamic. Users could receive restaurant rating predictions based on their current location and preferences.

FUTURE SCOPE

Improved Accuracy: Continuous refinement of machine learning models and algorithms can lead to increased prediction accuracy. The project can strive to better understand and incorporate more complex and nuanced factors that influence restaurant ratings, such as specific menu items, seasonal variations, and special events.

Real-Time Analysis: Real-time data processing and analysis could enable the project to provide instant rating predictions and insights. Customers and restaurant owners could access up-to-the-minute information on restaurant ratings and customer feedback.

Customized Recommendations: Enhancing the recommendation system can involve personalizing recommendations to individual preferences and dietary restrictions, enabling customers to discover restaurants that cater to their unique tastes.

Sentiment Analysis: The project can further delve into sentiment analysis by identifying and categorizing customer sentiments based on specific aspects of the dining experience, such as service quality, ambiance, or food taste. This can offer more detailed insights for restaurant owners.

Feedback Loop: Establishing a feedback loop with restaurant owners to inform them about the insights and recommendations generated by the system can promote continuous improvement in restaurant services.

Expansion to Global Markets: The project can expand its scope to include restaurants in various countries and cultures, adapting its algorithms to account for regional variations in dining preferences and rating criteria.

Integration with social media: Integration with social media platforms can help capture a broader range of customer feedback and reviews, as well as leverage social data for more comprehensive analyses.

Mobile Apps and Voice Assistants: Developing dedicated mobile applications and voice-activated assistants that provide restaurant ratings, recommendations, and insights can make the project more accessible and user-friendly.

Partnerships with Food Apps: Collaborating with existing food delivery and restaurant discovery platforms can provide opportunities for data exchange and wider adoption of the project's services.

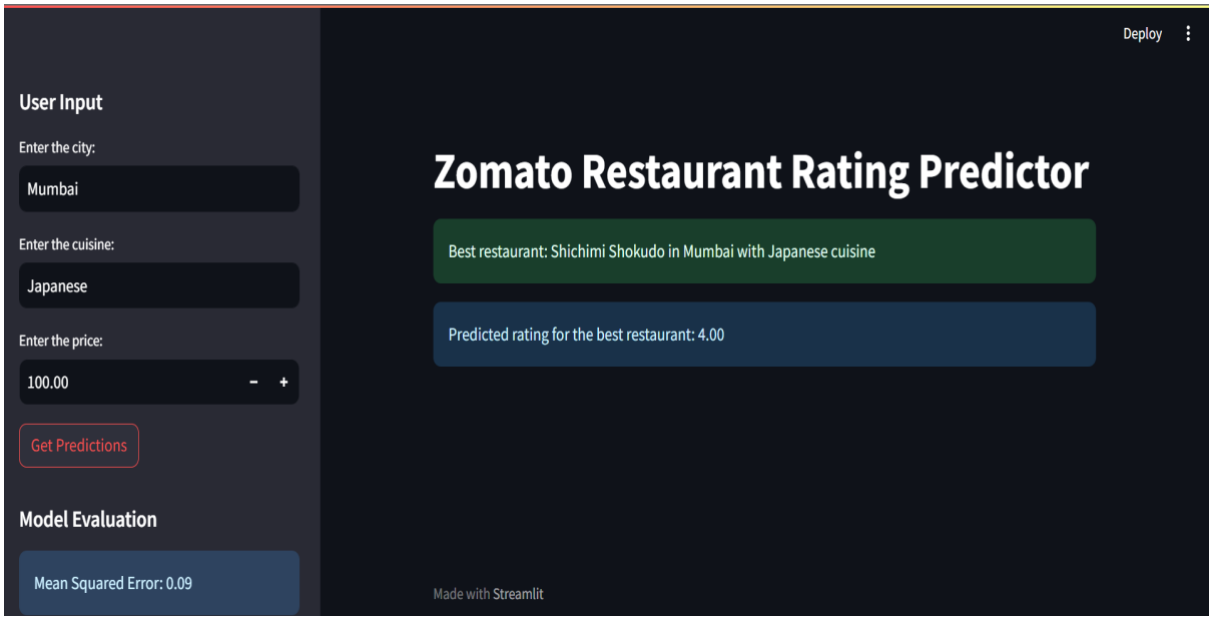
Research and Academic Applications: The project can contribute to academic research in areas such as AI, NLP (Natural Language Processing), and data analytics. It can also be used for research into consumer behavior and preferences.

Predictive Analytics for Restaurant Industry: Beyond restaurant ratings, the project can evolve to provide predictive analytics for various aspects of the restaurant industry, such as predicting customer footfall, revenue trends, and menu popularity.

Regulatory Compliance: As restaurant rating platforms often face challenges related to fake reviews and unfair ratings, the project can explore methods for ensuring data integrity and compliance with relevant regulations.

RESULT:


Deploy
User Input
Select City:
Ahmedabad
Select Cuisine:
Afghan
Enter the price:
0.00
Get Predictions
Model Evaluation
Zomato Restaurant Rating Predictor
Made with Streamlit


Deploy
User Input
Enter the city:
Mumbai
Enter the cuisine:
Japanese
Enter the price:
100.00
Get Predictions
Model Evaluation
Mean Squared Error: 0.09
Zomato Restaurant Rating Predictor
Best restaurant: Shichimi Shokudo in Mumbai with Japanese cuisine
Predicted rating for the best restaurant: 4.00
Made with Streamlit

9. APPENDIX

1. Data Sources and Sample Data: - Details about the sources of the health data used for training the model. - Examples of sample data entries, demonstrating the format and structure of the input data.

2. Data Preprocessing Details: - Step-by-step breakdown of the data preprocessing techniques applied to the dataset, including handling missing values, outlier detection, and feature scaling.

3. Machine Learning Model Parameters: - A list of the hyperparameters and settings used for the SVM classifier, along with explanations of their significance.

4. Code Snippets: - Key sections of code used in the application's development, such as interface design, model training, and explain ability techniques.

5. Privacy and Security Documentation: - An overview of the privacy and security measures implemented, including data encryption and access controls

6. Educational Content: - Samples of the educational content provided within the application, such as articles, infographics, or video links

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