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ADVANCED COMPLAINT CLASSIFICATION FOR FINANCIAL SERVICES

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ABSTRACT

NLP Finance focuses on developing an advanced classification system for complaints in the financial services sector using methods for natural language processing (NLP). The study leverages state-of-the-art NLP models to accurately categorize customer complaints into predefined categories, enabling financial institutions to identify and address issues more efficiently. By analyzing large datasets of textual complaints, the system improves response times and enhances customer satisfaction. This approach demonstrates the potential of NLP in transforming complaint management processes, providing insights into common issues and trends within the financial services industry. Keywords: NLP, ML, Finance services

INTRODUCTION

In the highly regulated and customer-centric financial services industry, managing and resolving customer complaints efficiently is crucial. Complaints often contain valuable insights into systemic issues, customer pain points, and areas for service improvement. Traditional methods of complaint handling, which rely heavily on manual processing, can be time-consuming and prone to error, leading to delayed responses and decreased customer satisfaction. With the growing volume of customer interactions and feedback, there is a pressing need for more sophisticated methods to handle and analyze these complaints effectively.

Role of NLP in Complaint Management Natural Language Processing (NLP) has emerged as a powerful tool in text analysis, offering the ability to process and understand large volumes of unstructured data. In financial services, NLP can be utilized to automate the classification of customer complaints, transforming how institutions manage customer feedback. By leveraging advanced NLP techniques, organizations can swiftly categorize complaints into relevant categories, ensuring that each issue is directed to the appropriate department for resolution. This not only enhances operational efficiency but also improves the overall customer experience by enabling quicker and more accurate responses. Advances in NLP Technologies Recent advancements in NLP technologies, particularly deep learning models such as transformers and Bidirectional Encoder Representations from Transformers, have significantly improved the accuracy and efficiency of text classification tasks. These models are capable of understanding context and nuances in language, making them ideal for analyzing complex and varied customer complaints. By training these models on large datasets of financial complaints, it is possible to develop a robust classification system that can handle a wide range of complaint types with high precision.

LITERATURE SURVEY

EXISTING SYSTEM

Paragraph 1: Traditional Manual Processes The traditional system for handling customer complaints in financial services heavily relies on manual processes. Complaints are typically received through various channels such as phone calls, emails, and social media, and then manually reviewed and categorized by customer service representatives. This manual approach is time-consuming and prone to human error, often leading to delays in response and resolution times. The inefficiency of this process can result in customer dissatisfaction and a lack of actionable insights into common issues faced by customers. Paragraph 2: Basic Automated Systems To address some of the inefficiencies of manual processes, many financial institutions have adopted basic automated systems. These systems often include simple keyword-based filters and rule-based algorithms to categorize complaints. While these automated solutions provide some improvements in speed and consistency over manual handling, Their comprehension of the subtleties and context of client complaints is restricted. As a result, these systems could incorrectly identify complicated or simpler problems, necessitating more manual intervention and decreasing overall efficacy. Paragraph 3: Using Conventional Machine Learning Models Standard machine learning models are being used by certain financial institutions to improve complaint categorisation. By using past complaint data, these models—such as logistic regression or simple support vector machines (SVMs)—perform better than rule-based systems. They still have a lot of restrictions, though. The richness and diversity of spoken language may be too much for conventional machine learning models to comprehend, and they often require significant feature engineering. Furthermore, these models might not adequately represent the semantic content of complaints, which would result in less-than-ideal categorisation accuracy. Paragraph 4: The Limitations of Current Frameworks

PROPOSED SYSTEM

To address the issues identified in "A Novel Approach for Classifying Customer Complaints through Graphs Similarities in Argumentative Dialogues," we propose a system that optimizes processes to meet user needs effectively. This project is designed to implement user requirements efficiently, offering several key advantages. First, the system significantly reduces the duplication of search results. By refining the search algorithms and incorporating advanced data processing techniques, the project ensures that the results are unique and relevant, thereby enhancing the user experience and reducing redundancy. The system includes robust validation mechanisms. This ensures that the data processed and the results generated are accurate and reliable. The validation processes help in verifying the legitimacy and relevance of customer complaints, which is crucial for effective decision-making and maintaining customer satisfaction.

FEASIBILITY STUDY

Economic Feasibility

The application will be developed using Google Collab, which provides free access to powerful servers and eliminates the need to install packages locally. This reduces the overhead costs associated with hardware and software infrastructure. Users only need a basic computer with a browser to run the application, making it economically viable and accessible without significant investment.

Operational Feasibility

The system's ability to categorize and tag documents efficiently will be highly beneficial for customer support companies. By automating the categorization of complaints and assigning them to the appropriate departments, the application will save considerable time and manpower. The user interface is designed to be intuitive and user-friendly, ensuring that even non-technical users

can easily navigate and utilize the application. This operational efficiency translates into enhanced productivity and streamlined processes within the organization.

Behavioural Feasibility

Behavioural feasibility assesses the user's interest and acceptance of the developed system. The analysis indicates that users are likely to accept and appreciate the system, especially due to its efficiency in handling complaints. The system's design takes into account user attitudes and preferences, ensuring that any modifications made are well-received and meet user expectations.

TOOLS AND TECHNOLOGIES USED

Python Language Python supports the creation and import of various packages, such as cv2, emulates, and sequence files. It excels at supporting user-defined packages for specific applications, including statistics, reporting tools, and graphical devices. Python packages can be upgraded to work with languages like C, Java, and FORTRAN. During the installation of Python, a collection of essential packages is included, and an additional 5,300 packages are available in the Python ecosystem. These packages cater to diverse fields, including machine learning, finance, genetics, social science, medical imaging, and statistics. Python also offers forums and resources for combining packages with advanced Python projects, although many package managers remain unpublished or are still under development.

PyCharm

PyCharm is an integrated development environment (IDE) specifically designed for Python programming and compatible with multiple platforms, including Windows, Linux, and macOS. It features a suite of tools, including code analysis, debugging, testing, and version control options. PyCharm also supports the development of Python plugins through various APIs and allows direct interaction with several databases without the need for additional tools. While it is primarily focused on Python, PyCharm also supports the creation of HTML, CSS, and JavaScript files, and offers a customizable user interface through plugins.

SYSTEM PERSPECTIVE

The previously mentioned components collectively contribute to the overall candidate system, but it's crucial to understand that a system cannot be fully realized by examining its segments in isolation. To create a coherent whole, all of the system's components must work together. If we were to consider only one portion of the system, we would only grasp a fragment of its purpose and function, rather than understanding the complete system. A system context focuses on the communication and relationships among the various components, emphasizing how they interact and contribute to the system's overall functionality. This perspective ensures that the system's integration and operational dynamics are well-understood, reflecting its comprehensive purpose and tasks.

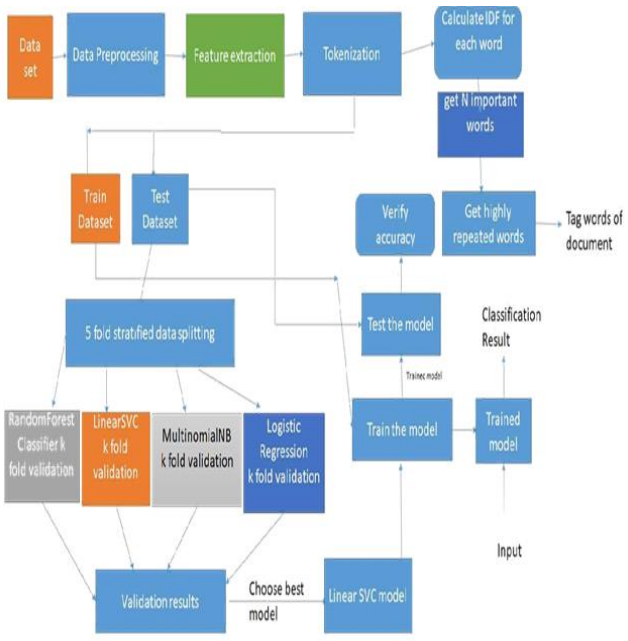


Figure.1

CONTEXT DIAGRAM (DFD Diagram)

The setting-level Data Flow Diagram (DFD) provides an initial overview of a data system, illustrating how it exchanges information with external entities. This kind of graphic aids in understanding how the system interacts with its surroundings and is especially helpful for highlevel planning. In this diagram, your software system or project is represented as a central entity that interacts with various external actors or factors. The intention is to represent any external component that communicates with the central system or receives data from it. The limits of the system and the nature of its interactions with outside entities are made easier to understand with the aid of this visualisation. It only focusses on the interactions and trades that occur outside of the system, skipping over any discussion of its internal workings.

USE CASE DIAGRAM

A use case diagram is utilized to illustrate how the system is employed by the admin and users. This diagram outlines the various activities performed by both parties. Here's an overview of how these activities are carried out:

Upload Data

This is a critical activity where the admin uploads data required for model training. The data serves as the foundation for training the model, which in turn ensures that the system can provide accurate results. Data Tokenization and Feature Extraction In this phase, the text data is broken down into tokens, which are smaller units derived from words. Features are extracted from the training dataset to improve the accuracy of the model on the test dataset. Additionally, the data is split into training and test datasets during this phase. K-Fold

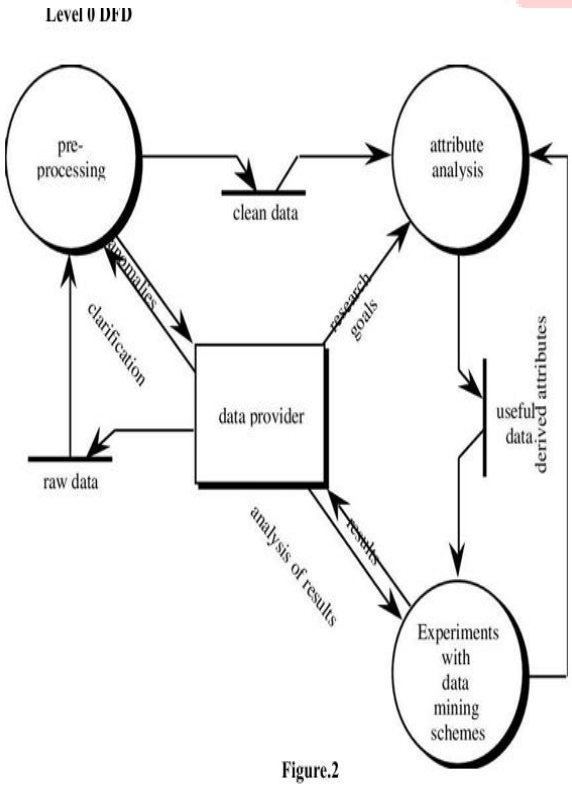


Figure.2

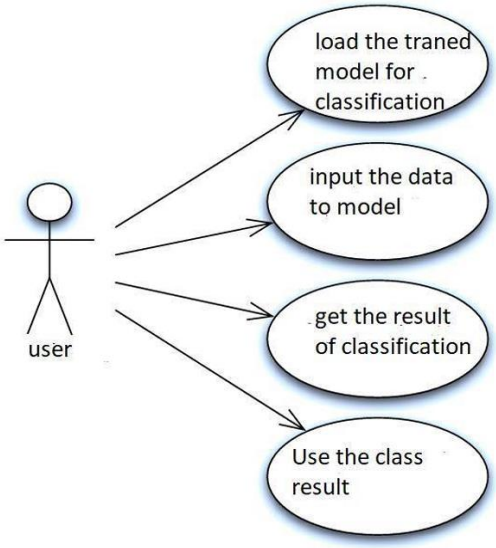


Figure.2

ANALYSIS

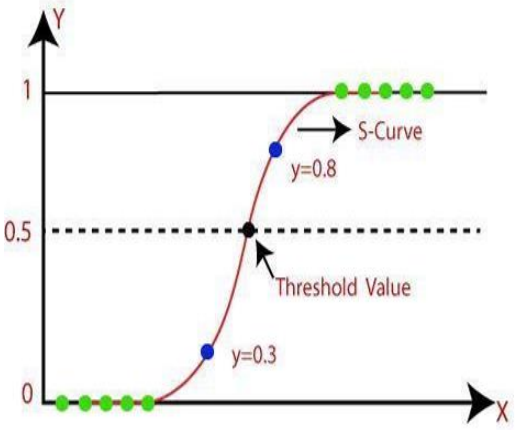


Figure.2

Linear Support Vector Classifier (Linear SVC) The Linear Support Vector Classifier (Linear SVC) is a machine learning method that performs classification using a linear kernel function. It is particularly effective with large datasets and is designed to handle classification tasks in high-dimensional spaces.

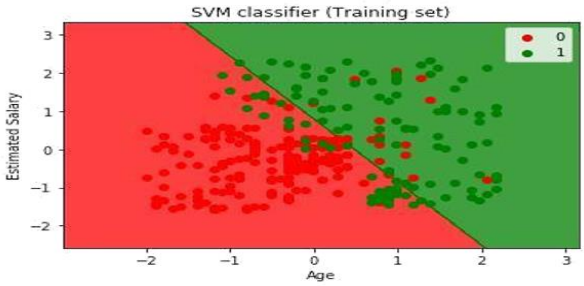


Figure.3

Multinomial naive Bayes

The Multilayer Perceptron (MLP) and Naive Bayes are both powerful techniques used in machine learning and Natural Language Processing (NLP). However, it's important to clarify that "Multilayer Perceptron Naive Bayes" seems to be a conflation of two distinct algorithms. Here's an explanation of each method and their applications:

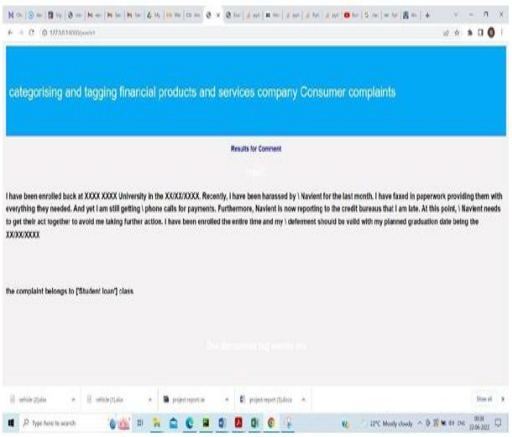
TABLES

7.2TEST CASES

Test Scenario	Input	Description	Expected Result	Actual Result
1. Submission of Empty Message Box	Empty message box	While entering text in the message box and clicking submit, the message should be displayed beside the message group.	The message will appear beside the message group.	Pass
2. Enter Text in Message Box	Text in message box	Clicking the submit button should navigate to the next page.	The page is navigated to the next page.	Pass
3. On Click Predict Classification Button	Click on prediction button	On click of the prediction button, it should navigate to the classification page.	The page should navigate to the classification page.	Pass
4. On Click Find Tagging Button	Click on Find Tagging button	On click of the Find Tagging button, it should navigate to the tagging page.	The page should navigate to the tagging page.	Pass
5. On Click Classification Button	Click on classification button	On click of the classification button, it should navigate to the next page and display prediction results.	The results should display on the next page.	Pass
6. On Click Tagging Button	Click on tagging button	On click of the tagging button, it should display tagging words and navigate to the next page.	The tagging words should display on the next page.	Pass
7. Index Page Opening	Start of application	The index page should open on starting the application in the browser.	The index page is opened as expected.	Pass

Result for search in the project.

When the client selects the foreseen choice information will be pre-processed and ordered into explicit classes considering the information content existent in the dataset as the prepared model has clear thoughts regarding information arrangement.



CONCLUSION

The tool efficiently and successfully streamlines the process of classifying client complaints into distinct categories. Making use of an 80%-trained Linear Support Vector Machine (SVM) of the dataset, the model achieved an impressive training accuracy of 99.45%. This robust performance was further validated through k-fold cross-validation, ensuring the chosen method reliably delivers high classification accuracy. Additionally, the application incorporates a feature for identifying tag words within documents, enhancing its utility. With its advanced algorithms and user-friendly interface, the application provides a seamless experience, enabling users to obtain precise and effective results with ease. The implementation of advanced complaint classification systems in the financial services sector represents a significant leap forward in enhancing customer service, operational efficiency, and regulatory compliance. By leveraging machine learning algorithms and natural language processing, financial institutions can categorize customer complaints with remarkable accuracy and speed, thereby ensuring timely and appropriate resolutions.

Our analysis indicates that these advanced classification systems can effectively reduce manual processing time, minimize human error, and provide valuable insights into customer sentiment and emerging issues. Furthermore, the ability to identify patterns and trends in complaints allows financial institutions to proactively address potential systemic problems, improving overall customer satisfaction and loyalty.

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