**Customer Complaint Analysis Model Documentation**

**Introduction**

This documentation outlines the functionality, usage, and evaluation of a model designed for customer complaint analysis. The model is capable of categorizing consumer complaints into various financial service categories with high accuracy.

**Functionality Overview**

The model leverages Natural Language Processing (NLP) techniques and machine learning algorithms to analyse and categorize customer complaints based on textual narratives. It utilizes the following key components:

1. Data Loading and Preparation:

The model begins by loading the complaint data from a CSV file and preparing it for analysis.

1. Text Pre-processing;

Text pre-processing techniques such as tokenization, stop-word removal, and TF-IDF vectorization are applied to convert textual data into numerical features suitable for machine learning algorithms.

1. Model Building;

A logistic regression model is trained using the TF-IDF features extracted from the complaint narratives.

1. Model Evaluation;

The trained model is evaluated using various metrics such as accuracy, precision, recall, and F1-score to assess its performance in categorizing customer complaints.

1. Real-time Prediction;

The model allows users to input their complaint text and receive real-time predictions of the complaint category.

**Dependencies**

The model relies on the following Python libraries:

* numpy
* pandas
* matplotlib
* nltk
* sklearn
* textblob
* seaborn

Ensure that these libraries are installed in your Python environment before running the code.

**Usage**

1. Data Loading:

The model expects the complaint data to be provided in a CSV file format. Ensure that the file path is correctly specified when loading the data.

2. Text Pre-processing:

The model automatically pre-processes the complaint narratives by removing punctuation, stop words, and applying TF-IDF vectorization. No additional pre-processing steps are required.

3. Model Training:

To train the model, execute the code segments related to model building and evaluation. Adjustments to the model architecture or hyperparameters can be made as needed.

4. Real-time Prediction:

After training the model, users can input their complaint text when prompted. The model will then predict the category of the complaint based on the trained classifier.

**Model Evaluation**

The model achieves an accuracy of **86.89%** on the test data, indicating its effectiveness in categorizing customer complaints. It demonstrates strong performance across various financial service categories, with precision and recall rates exceeding **90%** for some categories.

**Conclusion**

The customer complaint analysis model offers a valuable tool for organizations to efficiently categorize and address consumer complaints. By leveraging NLP techniques and machine learning algorithms, the model streamlines the complaint handling process and enhances customer satisfaction.