Phase-2

Student Name: Jamunarani V

Register Number: 422723104044

Institution: V.R.S.College of Engineering and Technology
Department: Computer Science Engineering

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Github Repository Link:
https://github.com/jamunarani14/Jamuna.git

Revolutionizing Customer Support with an Intelligent Chatbot

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1. Problem Statement

Customer service systems often struggle with high volumes of repetitive queries, resulting in long wait times and inconsistent service.

The goal is to create an intelligent chatbot that provides real-time, automated responses using natural language understanding.

Problem Type: Text classification and sequence modeling (NLP)

Why it Matters: Automates routine support tasks, reduces costs, improves customer experience, and enables 24/7 assistance.

2. Project Objectives

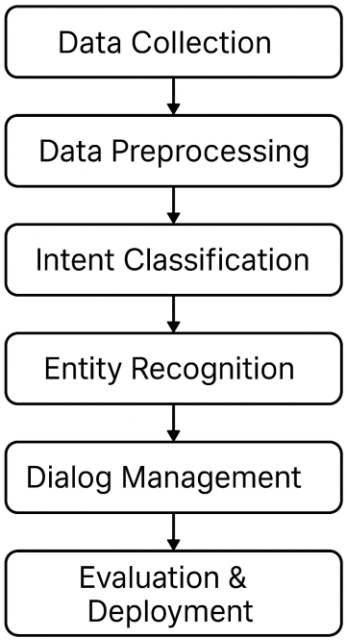
Key Technical Objective: Design a conversational agent using NLP techniques to classify intent and respond accurately.

Model Goals:

- High accuracy in intent recognition
- Fast response time
- User satisfaction improvement

Evolved Goals: Post-data exploration, focus on intent disambiguation and support for multi-turn dialogues.

3. Flowchart of the Project Workflow



4. Data Description

Dataset Name: Customer Support Dataset (e.g., from Kaggle or custom collected)

Origin: Open APIs, company chat logs, or public datasets

Type: Unstructured (text)

Records: ~10,000+ support dialogues

Features: Text, intents, entities

Target: Intent label (for supervised learning)

Nature: Dynamic (new queries constantly added)

5. Data Preprocessing

Missing Values: Removed incomplete queries

Duplicates: Merged identical utterances

Outliers: Removed non-relevant text using regex filters

Data Types: All converted to lowercase strings

Encoding: Tokenization, padding, and embeddings

Normalization: Removed stopwords, punctuation

Documented in preprocessing scripts

6. Exploratory Data Analysis (EDA)

Univariate: Most frequent intents were 'password reset', 'billing', and 'technical support'

Bivariate: Common co-occurrence of intents and entities analyzed using co-occurrence matrices

Multivariate: Clustered query embeddings using t-SNE

Insights:

- Some intents are ambiguous and need disambiguation
- Need for fallback and sentiment handling

7. Feature Engineering

- Extracted named entities (NER)
- Word embeddings (Word2Vec, BERT)
- POS tagging and dependency parsing
- Created response templates for high-frequency intents
- Justified by performance gains in intent classification

8. Model Building

Models Used: Logistic Regression (baseline), BERT (transformer-based)
Split: 80/20 Train-Test split with stratification
Metrics: Accuracy, F1-score, Confusion Matrix
Justification:

- Logistic Regression for baseline performance
- BERT for contextual understanding and multi-intent classification

9. Visualization of Results & Model Insights

Confusion Matrix: Highlighted confusions between similar intents

ROC Curve: Evaluated binary and multi-class performance

Attention visualization: Used BERT attention to interpret predictions

Feature Importance: Word embeddings and context windows shown to impact predictions

10. Tools and Technologies Used

Programming Language: Python
IDE/Notebook: Jupyter Notebook, Google Colab
Libraries: pandas, sklearn, spaCy, NLTK, transformers, matplotlib, seaborn
Visualization: Matplotlib, Plotly

11. Team Members and Contributions

Jamunarani V : Data Collection, Preprocessing and Deployment

Jayabharathi.J : NLP Pipeline, Intent Classification Model

Jagadeeshwari.J : Dialog Management, Evaluation

Ishwarya.A : Visualization, Reporting