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AI-Based Customer Support Chatbot

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Abstract -

This paper presents the development of an AI-based customer support chatbot using natural language processing (NLP) and deep learning models. The chatbot is designed to automatically respond to frequently asked customer queries using a pre-trained transformer model from Hugging Face. The system utilizes a curated dataset of common customer service questions and answers, fine-tunes a DistilBERT model for question-answering tasks, and integrates with a Gradio-based web UI for real-time interaction. The objective is to enhance customer experience by offering quick, reliable, and automated assistance. This paper outlines the methodology, model selection, data preparation, testing, and deployment processes. The chatbot achieved high accuracy and response confidence on common queries, proving its efficacy for customer service applications.

Key Words: AI Chatbot, Natural Language Processing, Transformers, Customer Support, Deep Learning, Gradio.

1. INTRODUCTION

With the rapid evolution of artificial intelligence, automating customer support through chatbots has become an efficient and scalable solution. Traditional rule-based bots have limitations in understanding diverse user queries. This paper explores the use of transformer-based language models to build a smart customer support chatbot capable of understanding and answering various user queries with high confidence. The implementation focuses on using Hugging Face's DistilBERT model for question answering, structured training data, and real-time deployment using Gradio.

2. METHODOLOGY

This section describes the development methodology of the chatbot.

2.1 Data Preparation

A dataset of 10 frequently asked customer questions and corresponding answers was prepared in a structured dictionary format and converted into a pandas DataFrame. This includes queries related to operating hours, return policies, password reset procedures, payment methods, and more.

2.2 Model Selection

The chatbot uses the pre-trained model `distilbert-base-uncased-distilled-squad` from Hugging Face. The model and tokenizer are loaded to evaluate customer questions against known answers using confidence scores derived from the model's start and end logits.

2.3 Answer Matching Logic

The chatbot compares the user's input with existing answers using NLP techniques. If a question's confidence score exceeds the threshold, the corresponding answer is returned. Otherwise, a default message is shown.

2.4 UI with Gradio

The final model is deployed using Gradio, a Python library that provides a simple interface for machine learning models. The chatbot UI accepts text input and returns both the predicted answer and a confidence score.

3. RESULTS

The chatbot accurately responded to customer queries that matched its training data, with high confidence levels (>0.8). It successfully handled variations in phrasing such as "Where is my order?" vs. "How can I track my order?". The interface was intuitive and responsive.

4. CONCLUSIONS

An AI-based chatbot leveraging pre-trained transformer models can significantly improve customer support systems. It reduces response time, increases availability, and ensures consistency in answers. Future work includes expanding the dataset and incorporating multilingual support.

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