

Building a Generative AI Model for Problem Understanding and Solution Generation from Diverse Text Sources

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ABSTRACT - In this research paper, we present the development of a generative AI model aimed at analysing text data from multiple sources, including screenshots, documents, and community interactions. The primary objective of the proposed model is to minimize human intervention while providing timely solutions to users' queries, thereby enhancing efficiency and reducing response time. The research outlines a systematic approach to building the model, encompassing essential steps such as data collection, annotation, and pre-processing. A diverse dataset, containing real-world examples of user problems and corresponding solutions, is compiled and utilized for fine-tuning a pretrained language model. The selection of an appropriate pretrained model, such as GPT-3.5, enables the system to leverage existing language knowledge effectively. Furthermore, the study emphasizes the significance of fine-tuning the model on the annotated dataset to tailor it to the specific task of problem understanding and solution generation. Through this process, the AI system acquires domain-specific knowledge, enabling it to decipher intricate patterns and nuances in user queries. The core functionality of the AI model centres on its capability to analyse text data from screenshots, documents, and community interactions, extracting relevant information to comprehend the underlying user problem. By employing advanced natural language processing techniques, the model provides timely and accurate solutions, reducing the need for manual intervention and enhancing overall system performance. In conclusion, this research paper contributes to the growing body of knowledge in the realm of AI-driven problem solving and demonstrates the potential of generative models to revolutionize customer support and user assistance. The proposed model's effectiveness in understanding diverse text sources and generating solutions in a time-efficient manner holds promise for applications in various industries, fostering automation and augmenting human expertise.

Key Words: generative AI model , text analysis

1. INTRODUCTION

Over the past decade, the rapid rise of digitalization has transformed the way we interact with various services, making everything more accessible through online portals. However, with this digital shift comes an inevitable increase in challenges faced by users during processes like onboarding and purchasing. According to a recent survey, [1] a significant 81% of people emphasize that receiving excellent customer service plays a pivotal role in influencing their decision to make another purchase. Addressing these user-related issues effectively is crucial for enhancing customer experience and fostering loyalty.

In response to these challenges, the application of generative AI technology for analysing customer problems emerges as a promising solution. By leveraging the power of advanced text analysis, this cutting-edge AI model can comprehensively understand user queries and extract valuable insights from customer interactions. Consequently, businesses and organizations can benefit from reduced customer service burdens, leading to more efficient and seamless customer experiences.

Moreover, the integration of generative AI enables companies to gain meaningful insights into customer behaviour patterns, allowing them to make informed decisions and optimize their services. Understanding the subtle nuances in the way customers communicate and express their concerns through text empowers organizations to cater to their needs more effectively.

This research paper delves into the development and implementation of a generative AI model, specifically designed to analyse user interactions and provide solutions promptly. By optimizing customer support processes and enhancing user satisfaction, this transformative AI technology holds the potential to reshape the landscape of customer service and drive lasting benefits for businesses across various industries.

I. WORKING PRINCIPLE

1.1 Generative ai text analysis

[2] The emergence of generative AI has revolutionized the technology landscape, offering the potential to create human-like text and comprehend complex linguistic structures. Numerous companies have harnessed the power of generative AI to conduct diverse text analysis and extract valuable, actionable insights from vast amounts of data. By leveraging this transformative technology, businesses can gain a deeper understanding of customer preferences, market trends, and user behaviour, thereby empowering them to make informed decisions and drive innovation across various industries.

1.2 open cv object detection



Using OpenCV, a computer vision library, we can detect both text and objects in images and draw bounding boxes around the identified regions using green colour. The process involves loading the image, pre-processing it, and applying edge detection to find contours. After filtering the contours to identify potential text and object regions, we draw bounding boxes around them in green to visualize their locations. Additionally, text recognition (OCR) can be applied to extract the text content from the detected text regions, while object recognition algorithms can be used to identify and label various objects present in the image. This combined approach allows us to gain insights into both textual and visual elements within the image, facilitating various applications such as image understanding, object tracking, and more.

2. TOOLS USED

System	Software requirements
Operating system	Windows 11, macOS 12+, Ubuntu 20.04, CentOS 8
CPU	CPU with 16 CORES
GPU	Graphics card with DX12 (shader model 6.0) capabilities

3. FEATRES

3.1 SOLUTION[4]

Our project offers a comprehensive solution for addressing user-reported problems by analysing the text they submit. Using our approach, the model categorizes the problems into three distinct types. The "Red" category signifies critical issues that demand immediate human intervention, highlighting high-priority concerns that require expert attention.

Meanwhile, the "Yellow" category indicates that the model can provide a solution based on predefined documents; however, there is an element of uncertainty regarding its effectiveness, making human validation and fine-tuning potentially necessary. Lastly, the "Green" category represents straightforward issues that the model can promptly solve without any human involvement, streamlining the resolution process for low-complexity matters. This categorization framework optimizes the problem-solving procedure, enabling prioritization of critical cases and automating resolutions where feasible. By efficiently allocating resources, our project empowers users to receive timely and effective solutions, ensuring a balance between automated support and human expertise for complex scenarios.

3.2 INSIGHTS

Our model harnesses user data from diverse sources to generate valuable insights derived from various forms of text. It meticulously analyses the data to discern patterns in user behaviour and preferences. By aggregating information from most frequent searches, product purchase inquiries, raised complaints, and feature requests, our model offers a holistic view of user engagement. Each day, it compiles a comprehensive report that curates the mentioned elements with precision and proper justification. This report provides valuable information to businesses and organizations, shedding light on customer demands, pain points, and desires. With these insights, companies can make informed decisions to enhance their offerings, improve customer satisfaction, and optimize their services to align better with user needs. By leveraging a wide array of textual sources and employing advanced data analysis techniques, our model facilitates data-driven decision-making, driving innovation, and growth across various industries.

3.3 SENTIMENT

Our model exhibits a unique approach to text analysis, employing a multi-faceted categorization system. It classifies words into three distinct types: Type A, representing abusive language; Type B, denoting semi-abusive expressions; and Type C, signifying general language commonly used in normal conversations. Additionally, our model thoroughly examines the grammatical structure of the text, enabling it to differentiate between bot-generated content and text written by regular human beings. By utilizing this sophisticated categorization and grammar analysis, our model offers comprehensive insights into the nature of user-generated content. This ability to identify abusive or semi-abusive language helps maintain a respectful and safe environment in user interactions. Furthermore, the capability to discern between bot-generated and human-written content enables accurate and meaningful interpretations of user queries and responses. Overall, our model's innovative approach to text analysis empowers businesses and organizations to understand the sentiment and intent behind user interactions better. By recognizing linguistic patterns and ensuring a respectful environment, it contributes to improved customer experiences and more authentic interactions.

3.4 Road Map

Our models serve as invaluable roadmaps for companies, offering insightful glimpses into future trends through advanced text analysis. By leveraging vast amounts of textual data from diverse sources, our models identify emerging patterns, sentiments, and key indicators that shape the business landscape. Through in-depth analysis of customer feedback, social media interactions, market trends, and industry reports, our models can forecast what the future trends may look like. Using [3]natural language processing and machine learning techniques, our models extract and analyse sentiments, opinions, and preferences from user-generated content. This enables companies to gauge customer satisfaction, anticipate demands, and identify potential areas for improvement. By monitoring the sentiment towards their products or services, businesses can proactively address issues and enhance customer experiences. Moreover, our models can detect emerging keywords, phrases, and topics in the text, providing companies with early insights into new market trends. This enables businesses to stay ahead of the competition, innovate their offerings, and capitalize on emerging opportunities. By offering a comprehensive roadmap based on text analysis, our models empower companies to make data-driven decisions and align their strategies with the evolving market landscape. This foresight ensures that businesses are well-positioned to adapt and thrive in the dynamic and ever-changing future.

4.WORKFLOW / ARCHITECTURE



Text Extraction and Processing:

Text extraction and processing refer to the techniques used to retrieve and analyze textual information from various sources, such as documents, websites, social media, or user-generated content. The process typically involves the following steps:

1. **Text Extraction:** Text extraction involves capturing text data from unstructured sources, like images or scanned documents, using Optical Character Recognition (OCR) tools. OCR software recognizes characters and converts them into machine-readable text.
2. **Data Pre-processing:** Once the text is extracted, it undergoes pre-processing steps to clean and prepare it for analysis. This may include tasks like removing irrelevant characters, converting text to lowercase, tokenization (splitting text into individual words or tokens), and removing stop words (commonly used words that add little value to the analysis).
3. **Text Analysis:** Text analysis encompasses a range of techniques to extract valuable insights from the processed text. Some common approaches include sentiment analysis (determining the sentiment or emotion expressed in the text), named entity recognition (identifying entities like names, locations, or organizations), topic modelling (grouping similar texts into topics), and language translation.

Model Creation using Tool Names:

To create the above-mentioned model that categorizes text into different types (Type A, Type B, Type C), and analyses grammar for distinguishing bot-generated content, the following tools can be used:

1. **Natural Language Toolkit (NLTK):** NLTK is a popular Python library used for natural language processing tasks. It provides various functionalities for tokenization, stop word removal, and sentiment analysis.
2. **Scikit-learn:** Scikit-learn is a powerful Python library for machine learning. It can be used to build and train machine learning models, such as classifiers, for categorizing text into different types (Type A, Type B, Type C).
3. **TensorFlow or PyTorch:** These deep learning frameworks can be employed for training models to identify bot-generated content by analysing grammar patterns and linguistic structures.
4. **OpenNLP or spaCy:** OpenNLP or spaCy are other useful natural language processing libraries that can be utilized for named entity recognition and other text analysis tasks.

By integrating these tools and libraries, the model can effectively extract, pre-process, and analyse text data, resulting in the categorization of text and identification of bot-generated content based on grammar analysis.

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