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RESEARCH ARTICLE

SPECIFIC PURPOSE PRE-TRAINED CHATBOT FOR ENTERPRISE RELIABILITY ENGINEERING

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Abstract

With the increased interest of enterprises in finding reliability of their systems to work under different situations, resilience concept has got significant recognition. Reliability engineering is application of various principles, methods to make products work without any failure and in a cost efficient manner. Various parameters such as MTBF are used in calculating the failure rate of the system. The research is based on using pre trained model which uses API provided by the open AI. Open provides the API which is also used by chatgpt. Model responds to queries related to reliability of the system with help of a chatbot. Chatbot is an software application which mimics human like chats with the user. It is highly efficient and available which takes input in the form of text. The use of chatbot is increasing tremendously in various industries for various purposes. The popularity of Chat-GPT, which also uses the same Open AI API, has been rising dramatically in recent days. This AI-driven product has dominated the market and might be a huge help in providing responses to questions about resilience. As a result, to innovate and improve the dependability of systems, we have developed an implementation of ChatGPT. In this implementation, we will be utilizing natural language processing tools that will help us to boost user interaction by presenting innovative information about how systems function in various conditions.

Introduction:-

In this information age, usage of chatbots is vital among different industries. They simplify the things by providing the useful data to the customer instead of making them search in pool of information [1].By integrating the natural language processing, complicated questions are being responded to in a much simpler way. Coming to the reliability, it can be defined as the capacity of a system or product to carry out its intended functions for a predetermined amount of time and under predetermined circumstances[2].Application of principles, methods make the systems work under a normal state even under a disruption. Protection of the system can be done finding

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different parameters such as availability, MTBF, maintainability and necessary actions can be taken to reduce the effect. [3,4]

Today, there is a significant rise in the chatbot field after making use of artificial intelligence. Artificial intelligence is the capacity of a digital computer to take decisions like intelligent beings. Various kinds of learning are applied for making the machine execute complex tasks. Main goal of AI is replicating similar human activity which can be applied in many industries such as hospitals, marketing, education, reliability and many more [5].In particular, artificial intelligence can be used to improve reliability of a database by filling values which are missing.

ChatGPT is a public tool developed by openai on November 2022. It is created with a major emphasis on having conversations with others and uses one of the openAI's large language model, GPT-3.5.Reinforcement learning specifically makes ChatGPT unique with the help of RHLF technique. This technique is based on finding the accuracy of the given output by taking the feedback from the user. Main aim is to reduce the undesirable, false outputs [6].Coming to reliability engineering, it maintains the system in normal state by calculating different values such as potential causes, magnitude of a problem, necessary precautions needed to take before any such disruption occurs[7].Maintaining the resilience of an enterprise is also important for its development which can be achieved using ChatGPT. Regular activities such as real time monitoring and alert notifications makes the enterprise ahead of everyone.

Taking feedback from the user to optimize the model made ChatGPT unique. This is known as reinforcement learning from human feedback (RLHF).Main goal is to create a model with human reference and it generates a reward model with user preferences. There are negative impacts such as printing wrong text.

Specifying, estimating, and assessing the system dependability are all considered to be parts of the development process for reliability prediction and estimation. The reliability of the system has a direct impact on its quality. It's crucial to realize how a model should be applied[8].

Literature Survey:-

Reliability is considered as one of the important metrics by customer for any product or service. Reliability relays on hardware as well as software components to deliver useful product. In real-time environment, noticing the behavior of change in system can be observed because of run time changes such as failures, deployment. A system's reliability model can be created. Yet, the outcome is different models for hardware and software. The basic hardware reliability model comprises of all hardware components, and the failure rates of the equipment make it simple to determine the logistics support needs for replacement parts, maintenance staff, training, etc. Software components are not prone to wear out or independent failure[9].The resilience of the software components increases with time whereas, hardware components reliability decreases because of the change in physical structure.

Model can be developed for analyzing the resilience of system based on chatbot responses and visualization data about system. It is found out that visualization techniques help in finding the reason for change in behavior. Main objective of techniques is to find the change of patterns in failure components[10].

Software operating without errors for a specific amount of time in a predetermined environment is known as software reliability. In software reliability, there is difference between failures and faults which must be noticed. A software application fails when the user believes it has stopped providing the promised service. They are classified under different severity levels and consequences caused brings huge loss for enterprise. A fault is defined as the internal error. Most of the time, fault can be located and fixed. It is also referred as 'bug'. Prediction can be done which is divided into "reliability prediction" and "early prediction". Early prediction deals with visualizing failures and taking necessary precautions to prevent them. Most of the models use reliability prediction which estimates how quickly a product may break under different conditions[11].Different software models are built for finding reliability of hardware components according to their standard values.

A quantifiable measurement of how well a suggested design adheres to the design objectives is provided by prediction, which also enables comparisons between various design suggestions. Reliability prediction provides possibility of the model to meet requirements. It is considered as a tool rather than predictor. Failure data can be used in finding precision of the model and accuracy can be increased[12].In this type of model, only failure data is considered rather than system structure. Any stage of the product lifecycle can benefit from the usage of reliability

predictions. You may proactively deal with reliability concerns by including reliability predictions into your overall reliability programmed. This enables you to guarantee that your components reliability and quality standards keeps your enterprises goals at the forefront.

Methodology:-

Currently, the usage of reliability chatbot is very limited in different industries. It is helpful in producing dynamic reports and extensive monitoring. Algorithms used by the enterprises are complex as well as expensive. Usage of neural networks makes it much harder to understand. The data which they have is in unstructured form and makes it difficult for the algorithms to understand. This makes it difficult to implement in small organizations.

The reliability bot, on the other hand, implements chatbot functionality using a pre-trained API that has been proven by OpenAI. The ChatGPT, whose popularity has recently soared due to its promptness and correctness with regards to any type of enquiry, uses the same API approach. This API model has received ongoing updates from OpenAI, with the most recent one is GPT-4. In this study, we will use an API that is a version of itself, connecting to the API through the chatbot application's backend.

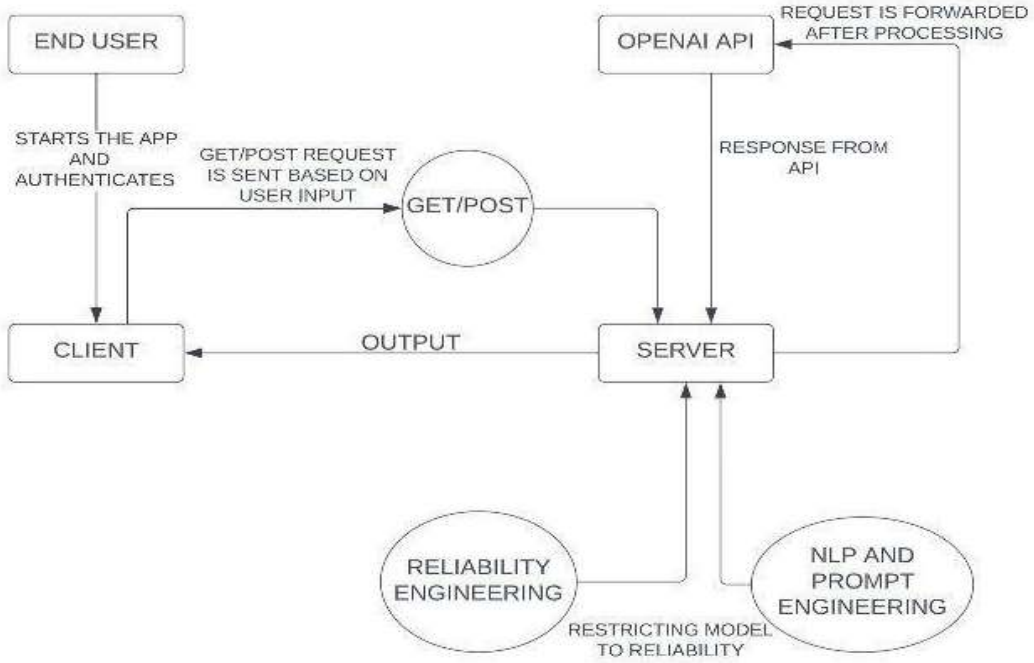

Fig.:- Architecture and Working process of the model.

Client-Server architecture is used for the model as shown in the figure. It is also stated as networking computing architecture where all the workload from the client end is distributed. With the increasing need for the organizations, horizontal and vertical scaling of the resources can be done which is beneficial to them. Vertical scaling is useful when there is a sudden rise in the number of customers. Horizontal scaling can be based on the need of the customer.

Front End

Client is the front-end part of the model. ReactJS and CSS are used to make the front-end appealing with less significant code. It is the interactive part of the model which takes user input and sends to the server side in the form of GET/POST request. These types of requests help in creating the instance of query and send large amount of data. Different react components are styled using a cascading style sheet. There are many different components, such as message, header, chat box, input, and so on. These components are all a part of the same component.

Back End

NodeJS is used for implementation of the backend. It is used for server-side programming and primarily deployed for back-end services. Major tasks are performed here includes segmentation of the query, forwarding the request and restricting the model to reliability. Model is restricted to reliability domain and various principles; techniques

are applied to find the performance of the components. Using NodeJS, we can integrate Open AI API with chatbot to get response for the query. Server-end connects to the verified API using API key. Natural language processing is being implemented to understand queries which are in human language.

Api Key.

It is defined as unique identifier with which the model can respond to all the user queries. One API key have been used for developing the model which integrated the API with the project. Any number of unique API keys can be generated and it is integrated with the model using NodeJS. Steps involved in creating API key is:

1. Open the internet browser and search for 'openai.com'
2. Click the API button which appears on top-right
3. After signing-up, Click on your profile where you can find view API keys. Click on it
4. Here, the unique generated key which can be copied and used in the project.

Main aim of this work is to create a chatbot which can respond to all the queries related to resilience of systems, databases. For responding back, front-end, and back end are combined by linking client to the server. Depending on the query, they are responded using API.

Implementation Analysis

Prompt Engineering

Artificial intelligence concept that produces desired output from user inputs is termed as prompt engineering. Response is made more useful when query is more specific. For example, output is more sensible when user asks 'Write a paragraph about reliability engineering'. Keywords take an additional weight to produce the result

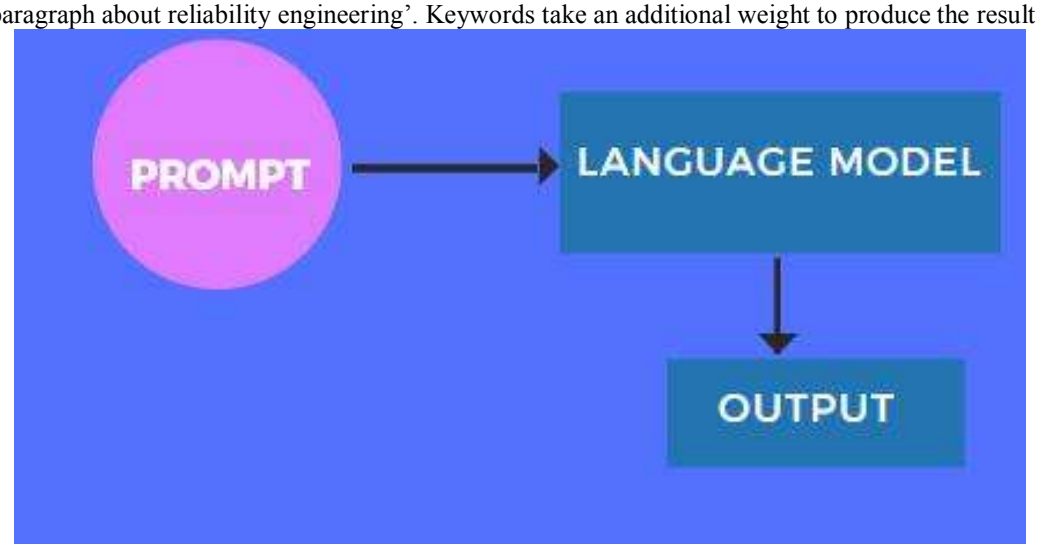

Fig.:- Flow of prompt.

Token Generation

Token is considered as piece of word which is a part of user input. Before processing it to API, input is broken into tokens which include sub-words and trailing spaces. For example,

```
This is reliability engineering
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This sentence contains 4 tokens 'This', ' is',' reliability',' engineering'.Depending on the language, token generation may vary. The maximum number of token for the model is 521. Words are handled by the API based on their information in the corpus data. The Davinci model starts with the prompt, transforms it into a list of tokens, analyses the tokens, and then returns the predicted tokens to the words we see in the output. Depending on how they are organized inside the text, what can look to us as two words that are the same could be generated as separate tokens. To develop project requirements, more tokens were needed than to extract and aggregate keywords.

Output

Fig.:- Website layout.

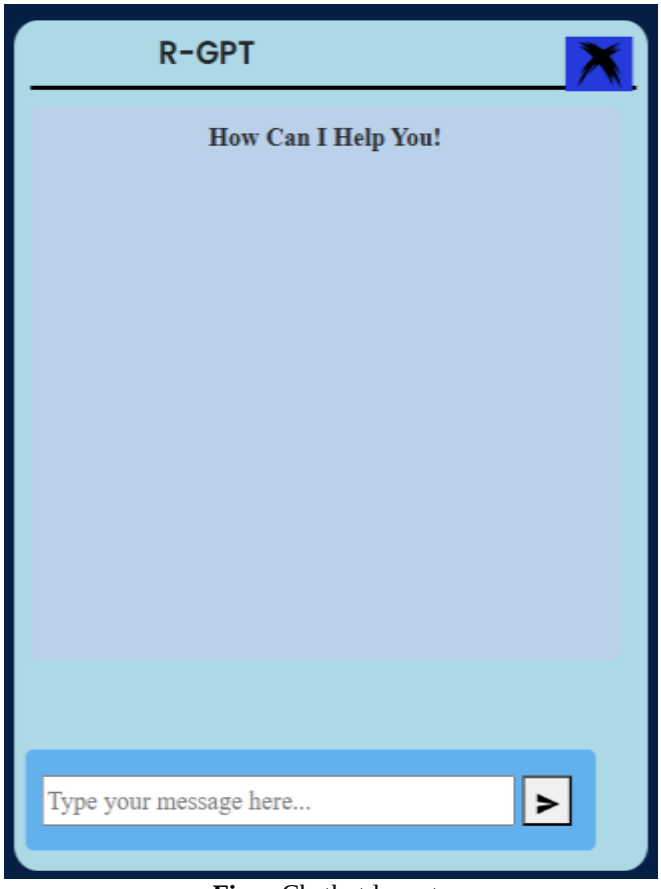

Fig.:- Chatbot layout.

Fig.:- Chatbot responding to user.

Conclusion:-

Technological changes have already started to begin, and artificial intelligence is transforming the world by making it much simpler. Reliability engineering is a critical component to ensure the efficient and secure operation of complicated systems. It seeks to reduce the likelihood of failure and to make sure that, when it does, defects may be immediately and effectively diagnosed, which is termed as reliability prediction. By enhancing the reliability of systems and components, it helps to lower costs and boost efficiency. Existing organizations consider reliability as a major factor and this model helps to provide an interactive interface for the customer to provide details about resilience. By implementing various methods, early prediction can also be done which helps the enterprise to minimize the loss. The work of site reliability engineers can also be reduced by automating many tasks and performing maintenance. With the model focusing on reliability, the developed model is useful in the market for the growth of an enterprise by finding minute changes in their operating environment.

Future Enhancement

With the development being in the early stages, there is a potential growth in the usage of reliability bots in the coming years. More sophisticated tools can be used on the failure data for finding the patterns which helps in finding the root cause of the problems. Main usage of resilience being support, it can be used for development of company by finding potential outliers. In the future, the application is likely to improve its capabilities and helps the newly growing enterprises to develop and perform various operations at their convenience.

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