

PESBOT

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Abstract

PESBOT is an AI-powered chatbot aimed at delivering resourceful information on PES University in an interactive manner. It is both a retrieval and generative based chatbot. It has a personality of its own, which makes conversations with it very alike to another human being, hence making it pleasant and enjoyable. PESBOT was built to be used by the students & faculty members of PES University (RR Campus). We envision a future where a lot of our day-to-day work will be handled by Virtual Assistants and we wanted to contribute to building towards this vision in our own way by building something which can be used by our fellow students and teachers. Such a solution can be extended to other universities in a relatively easy manner.

Keywords

Virtual Assistant; Natural Language Understanding (NLU); Actions; NoSQL Database

I. INTRODUCTION

The chatbot is catered towards students of PES University, RR Campus. There are 5,000+ students enrolled in PES University, making it one of India's largest and most prestigious universities. Currently, we're limiting our scope to the Computer Science Engineering (CSE) department. Our chatbot will provide an interactive method for students and teachers to access information - through a virtual assistant.

We're using the Google Assistant platform to implement this, which enables our chatbot to be accessible on many different devices. Google Assistant is a fast growing platform which is available on iOS devices, Android powered devices, websites, smart home speakers, car entertainment systems and many more. Developers can build their own actions on Google Assistant which can be accessed from all these devices. By using the Google Assistant platform, we're leveraging the power of Google's Natural Language Understanding (NLU) algorithms - built by their years of experience in understanding search queries. This platform enables us to accurately understand the user's

queries - no matter how differently they're framed. As an example, a user can ask -

"Is it a holiday tomorrow?"

"Is tomorrow working?"

"Do I have college tomorrow?"

And our chatbot should be able to understand that all these queries basically mean one and the same thing. Once we've understood what the user's query is, it is time to process this query. To process the query we're using the Google Assistant platform, we develop using a tool called Dialogflow.

II. PROBLEM STATEMENT

Today, students & teachers have two main sources of getting information - the PESU website and the PESU mobile app. However, obtaining information from these sources is both time consuming and cumbersome. Our solution will provide an alternative, interactive method to access this information - through a virtual assistant in a more convenient and fun manner.

III. DATASET

Data collection for our chatbot was done mainly in 2 ways:

- 1) Through information provided by CSE Department
- 2) From the PES University website

We took data such as faculty details, course details, faculty-subject-section mapping etc. From the CSE Department. Which was provided to us in excel and PDF Format.

The remaining data such as general information about PES, the various clubs and extracurricular activities etc was obtained by scraping the PES University website using BeautifulSoup Python Library.

The data we obtained was in PDF, Excel or text format. The steps to process & store the data were as follows:

- 1) Tables were converted to CSV format.
- 2) From CSV, we converted it to JSON format. The JSON format dataset provided us with a convenient way to store the data in the NoSQL database. The NoSQL database used by us is Firebase Cloud Firestore.
- 3) Now to push our data (which is in JSON Format) to the Firebase database, we created a python script. The python script uses the APIs provided by Firebase and connects to our database in the cloud using a service account key. We then create appropriate collections and sub-collections and push the data. As our data is in JSON, corresponding key-value pairs are created in our database.

We chose Firebase Cloud Firestore for two main reasons:

- The primary reason for choosing Cloud Firestore is its complete integration with the Google Assistant platform. We use Firebase Cloud Functions to handle our backend processing. Cloud Functions connects to our Cloud Firestore database and handles our requests.
- Cloud Firestore is a powerful NoSQL Database comparable to other popular NoSQL databases such as MongoDB.

IV. LITERATURE SURVEY

With our goal set in our mind, we set out to building our very own 'PESBOT'. However, building a virtual assistant is no easy task. We made use of various modern technologies to make our assistant as capable and advanced as possible. Here's a highlight of the technologies used:

A. Dialogflow

Dialogflow is a platform developed by Google to build human-computer interaction technologies based on natural language conversations. Dialogflow offers a web interface to build and test conversation scenarios. Using Dialogflow, we recognize the entities in the sentence entered by the user and based on these entities an appropriate intent is called. Every intent has a corresponding fulfillment that processes the intent. Fulfillment is a service that handles an intent and carries out the corresponding Action. The fulfillment figures out a relevant response based on the functions

we defined and sends that back to the Assistant, which ultimately returns it to the user.

B. Natural Language Understanding (NLU)

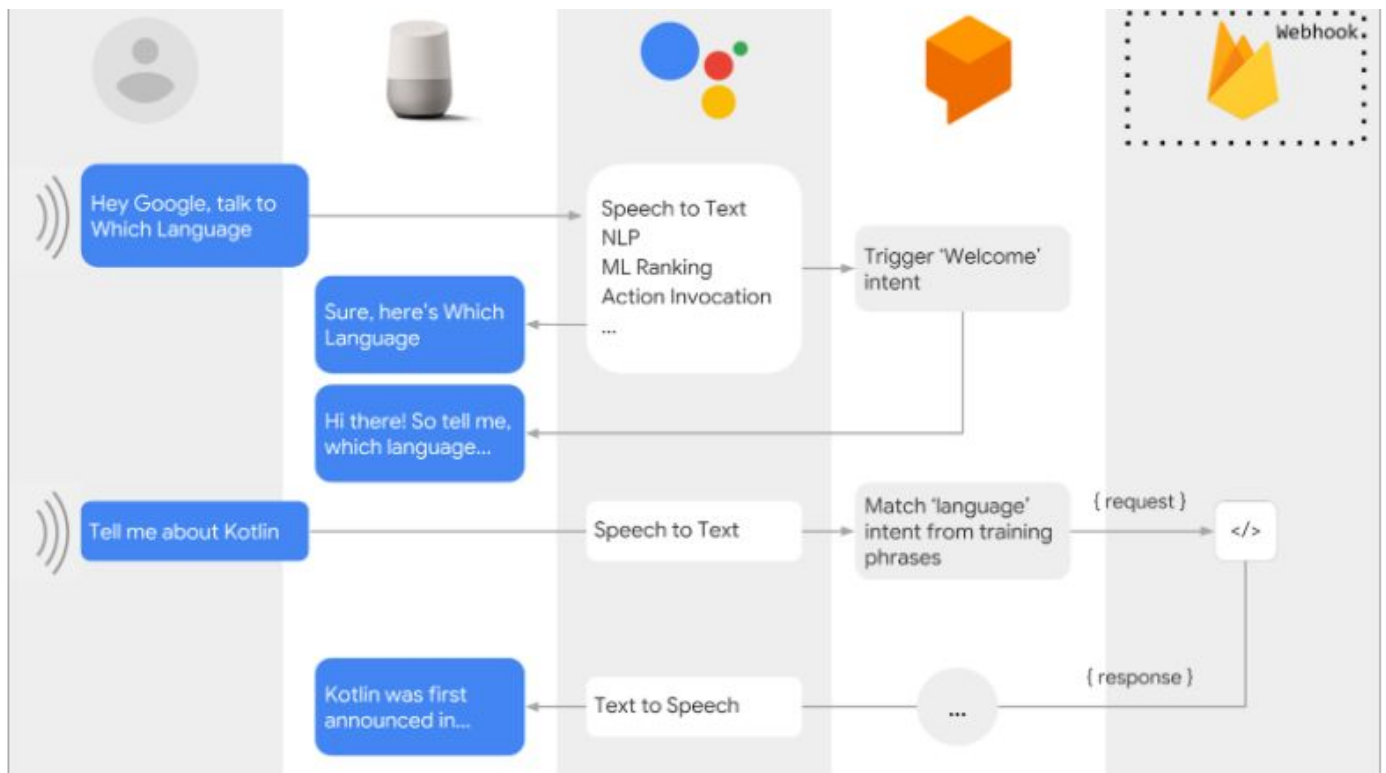
Natural Language Understanding (NLU) is Artificial Intelligence that uses computer software to interpret text and any type of unstructured data. We also say that it is the method by which computers understand human language. This allows users to interact with the computer using sentences commonly used. NLU can digest a text, translate it into computer language and produce an output in a language that humans can understand. It is a subset of the understanding and comprehension part of natural language processing. Natural language understanding interprets the meaning that the user communicates and classifies it into proper intents. For example, it is relatively easy for humans who speak the same language to understand each other, although mispronunciations, choice of vocabulary or phrasings may complicate this.

NoSQL

The NoSQL term can be applied to some databases that existed before the relational database management system. NoSQL databases are increasingly used in big data and real-time web applications. The data structures used by NoSQL databases (ex: document) are different from those used by default in its counterpart relational databases(ex: tables) making some operations faster in NoSQL. These data structures are considered to be more flexible compared to the ones used in relational databases. Types of NoSQL databases:

1. Key-value store: uses a map or dictionary as its fundamental data model. data is represented as a collection of key-value pairs.
2. Document store: In the database the documents are identified uniquely with the help of a 'key'. documents can be organised in various ways (collections, tags).
3. Column-based Store: Each storage block contains data from only one column.
4. Graph-based: A network database that uses edges and nodes to represent and store data.

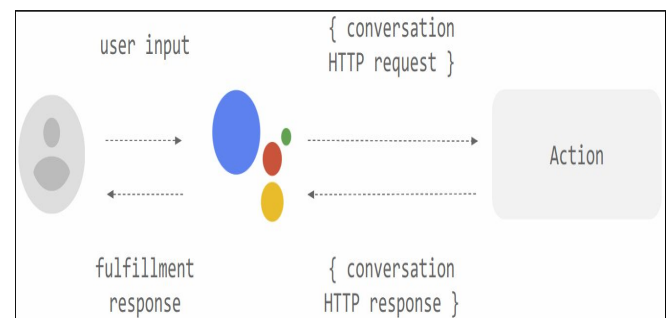
V. BLOCK DIAGRAM



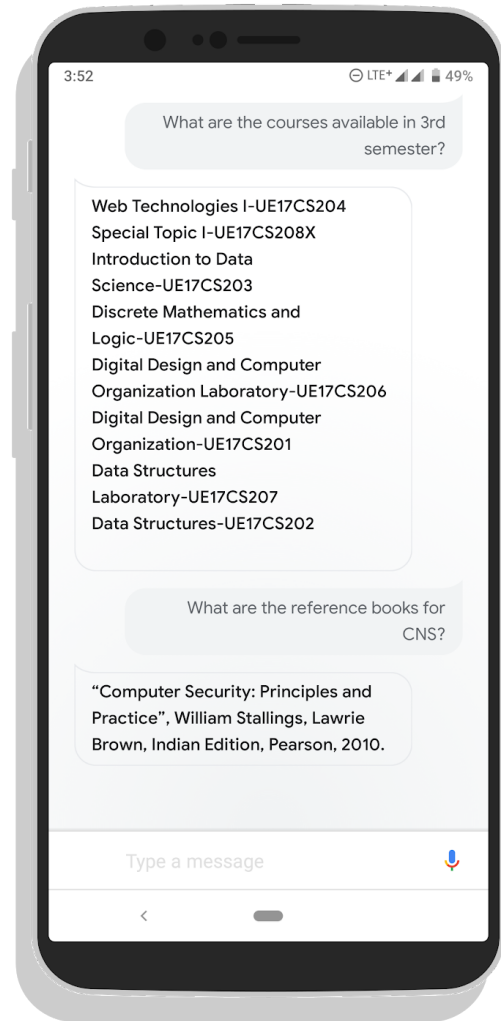
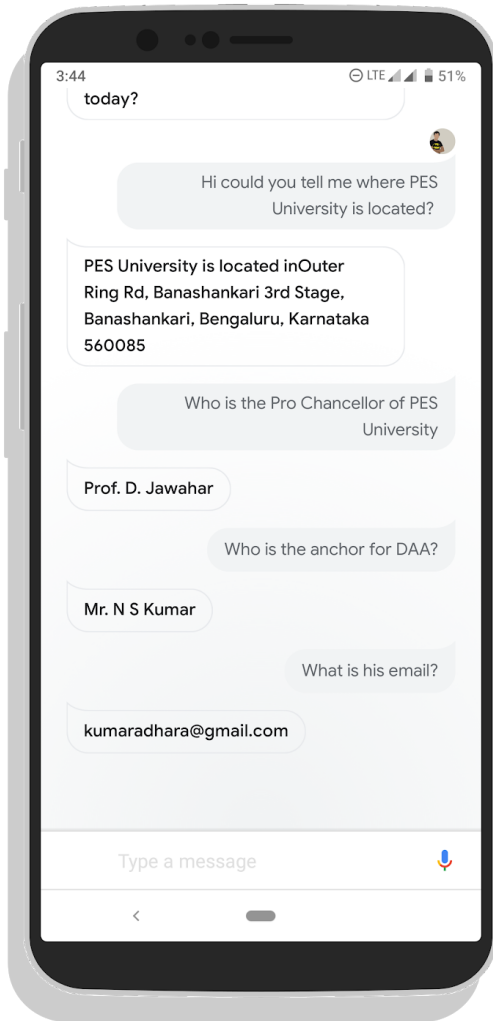
VI. DETAILED DESCRIPTION

Here's an overview of how this process will work for our action, 'PESBOT':

1. User starts interaction with Google Assistant and invokes our action by saying the phrase, 'talk to PESBOT'. Google assistant contains a directory of all invocation phrases, all of which have to be unique. While publishing our action, the uniqueness of this phrase is validated. We can also directly ask the query in while invoking PESBOT such as "talk to pesbot who's the anchor of daa"
2. PESBOT greets the user with a welcome message. The user can also make small talk with the chatbot by asking questions like "how are you?" The user now asks his query.
3. Our action identifies the query and maps it to a corresponding intent.
4. The intent is fulfilled using Firebase Cloud Functions and accessed the data stored in our Cloud Firestore Database.
5. The fulfilment function then generates an appropriate response and sends it back to the user through Google Assistant.



VII. USER INTERFACE (UI)



Here is an example conversation on “PESBOT”.

PESBOT is able to handle general questions about PES University such as where it is located and who is its Pro Chancellor.

We can also ask for details on the anchor for a particular course (in this example, DAA - Design and Analysis of Algorithms). We can also get their corresponding email ID. One easy to overlook feature here is that while querying the email, the user did not have to specify the anchor name. It was automatically taken from the previous context. A very convenient feature making the conversation more realistic.

Here’s another example, where the user is interested in finding out more information on the courses in a particular semester. PESBOT efficiently returns to the user a list of all the courses. Further if the user needs to know what reference books to use for a course, PESBOT can provide a list of the recommended reference books as prescribed in the Course Information.

VIII. ACKNOWLEDGEMENTS

- [1] Prof. Preet Kanwal, our guide and mentor for this project.
- [2] CSE Department of PES University for providing data.

IX. REFERENCES

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