

**Engineering Faculty.**

**Course: Systems Analysis.**

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**Technical report**

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**General system representation**

1. **User input**  
    The user enters a string of characters as a message to the chatbot, making a query through a graphical interface.
2. **Text preprocessing**  
    The chatbot performs tasks to clean and prepare the message for analysis, including:

* **Tokenization**: Splitting the text into words or smaller units.
* **Stopword removal**: Discarding common words like "of," "the," "a."
* **Normalization**: Converting text to lowercase and correcting spelling errors.

1. **Natural Language Understanding (NLU)**  
    The chatbot interprets the user's query purpose, focusing on the meaning rather than the literal text. The main objectives are:

* **Intent detection**: Identifying the user’s primary intent.
* **Entity recognition**: Extracting specific information from the message.

1. **Processing and decision-making**  
    Based on the detected intent and entities, the chatbot decides how to respond. It queries the database provided and may take conditions related to the found information into account.
2. **Response generation**  
    Based on the decision, the chatbot generates an appropriate message for the user, using generative models to create natural and contextual responses.
3. User output  
    The generated response is delivered to the user in text form through the interface.

**Sensitivity analysis**

To make a sensitivity analysis in the system that domain the chatbot, it’s necessary to have some information about him, for answer some questions very useful for implementing of that.

1. **Training Data**

That has the possibility of making a measure about the impact of quantum and quality of pre-data give to chatbot for them training. By that step, it's timely be sure that the answers given to the user in the moment that he makes a question, be right and have sense.

1. **Querys out of context**

This point, is very important, in general, the systems are unpredictable so although the chatbot expect a type of questions or inputs at part of the user, that questions aren’t necessarily of the type that chatbot expect it, and having that possibility inside the system, it’s useful to consider them, and seem what are the behavior.

1. **User language**

It’s a measure of how much sensitive the chatbot is for the different types of syntaxis or languages at each user, so it’s necessary to see how chatbot answers and interprets those inputs.

**Complexity analysis**

The objetive of that analysis it’s understand the behavors of the chatbot, having account of some aspects that compose the system.

1. **Execution time**

That point is one of the most important, because it shows the time that a proccess inside the chatbot can take and how more productive they could be, and the complete system.

1. **Components communication**

It defines the communication between the logical part of chatbot and its visual part, between API’s or another querys methods.

1. **Error handling**

By the end, errors between the use of chatbot are very likely, so it’s necessary to have a solution previously seem for those cases.

The errors can be of syntaxis, or type of question, etc.

**Emergent Behaviors**

1. **Adaptation to user language**

As the chat interacts more, it adapts to the language patterns that users have, beginning to recognize jargon, abbreviations or informal language

1. **Improved intent detection**

Along with a sensitivity analysis, the system could recognize user intentions of greater complexity. ⁤⁤Becoming familiar with the types of inputs, to predict more effectively.

1. **Generalization of responses to new situations**

From training with a variety of data, the chatbot could begin to generalize responses to new situations. ⁤⁤Designing responses with information not initially specified. ⁤

1. **Handling ambiguous or incomplete queries**

From the improvement in sensitivity, the model will be able to manage incomplete or inaccurate queries, and subsequently be able to infer remaining information.

1. **Improve error handling**

By tracking how the chatbot reacts and responds to poorly formulated or nonsensical questions, it could suggest to the user a guide to ask appropriately or try to understand their intention.

1. **Autocorrection and Handling of Typographical Errors**

The chatbot will learn to handle and autocorrect typos and handle input with such errors.