CS 458/535 - Natural Language Processing

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1   Problem Statement

Our Idea is to build a system whose purpose is to develop an efficient way of human – machine communication. It will be through both text and speech. The simpler idea is to create a system which will listen to "us" and will be able to "reply", probably in a satisfactory way (at least, this is the motivation).

We'll use English language only (or Urdu is fun, but, can we? Especially in speech? It's worth exploring if it's in our power!) "Kaka, you up?" "For you, sir, always." article graphicx

2   Motivation

The motivation behind Kaka is to create a chatbot that can communicate in a manner closer to regular human interaction than your typical chatbot such as Siri or Cortana. As with any human interaction, humor and elements such as figurative speech and empathetic qualities or understanding make the conversation more diverse, promote engagement as well as understanding between both parties, and that is what we hope to accomplish with Kaka.
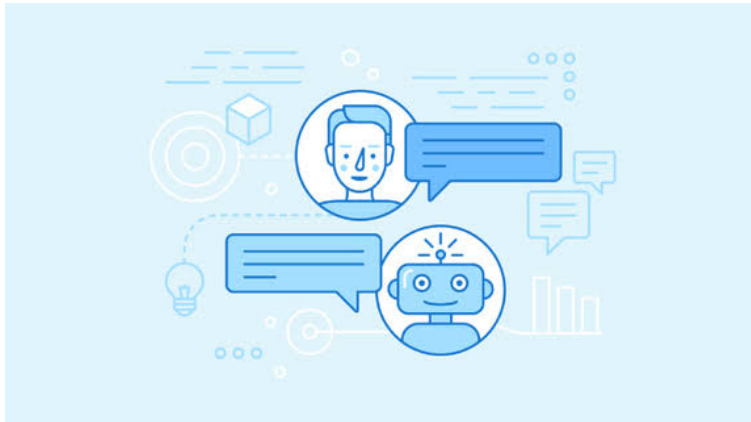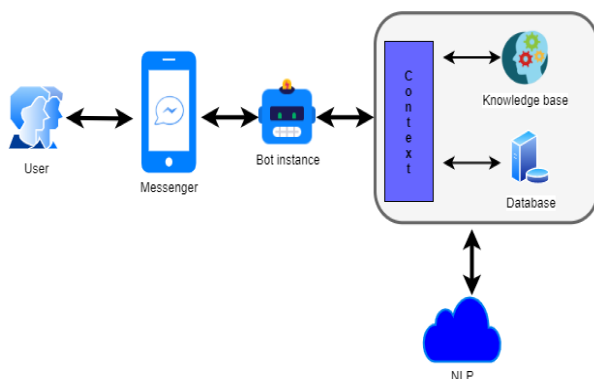

Figure 1: Communication between human and chatbot

Statement Problem

3   Background

Readers should have used smartphones and have some experiences using other chatbots like cortana and siri(Optional)

4   Related Work

(Zareen Sharf and Dr Saif Ur Rahman, 2018) goes over processing **Roman Urdu** as a natural language, the approach to it involves parsing the raw data containing Roman Urdu into a more regular format, identifying parts of speech and then working and operating with it like with English or a more typical natural language processing system.

(Peng-Yu Chen, Von-Wun Soo, 2018) illustrates an approach to humor recognition using deep learning methods and convolutional neural networks. It discusses justifications for the system, methods and implementation. Datasets for both humour and non-humour were used to more accurately have the system recognise humour, as it would provide a stronger base for making a distinction.

(Li Zhou , Jianfeng Gao , Di Li , Heung-Yeung Shum, 2020) covers the implementation of XiaoIce, a popular virtual assistant in China released by Microsoft that possesses empathetic and social skills. XiaoIce's core functionality comes from its Conversation Engine, which runs on several subsystems like a dialogue manager, an Empathetic Computing module, and other such modules that make XiaoIce a robust system. We can see from some technologies used here that they can be used to create something very close to our project objective, by maintaining dialogue states and recognizing the presence of humor or non-literalism present in the conversation.

It is evident related work to the project proposed has been done and published even in recent years, so the domain of the task is not set without validity, and there are many sources of information and inspiration to draw from over the course of this project.

5   Proposed Work

The exact implementation will go in a bottom-up manner, starting from the basics and building our way up. The first step will be creating a language model that can distinguish humor, tones, and fully recognize and classify text by contexts and negations or other such modifiers. For this we will use appropriate datasets to supply our model with, drawn from the internet, tools used, made by ourselves, or any other possible source. The next step will be to implement speech recognition to add another dimension to the existing language model, and testing how it works before we make the main system. Finally, we will move on to creating the actual chatbot system, which will involve use of neural networks and deep learning, and/or the Python library Chatterbot, and the language model created previously. Kaka must learn to respond to the now classified inputs appropriately and accurately, and this sort of training process will be kept up constantly.

For a system with the scope we have defined, the model and data used will be significantly large, so the need for a database or a large storage source may exist. After everything is done, we will attempt to add on another dimension of speech and text recognition to Kaka, that being of Urdu, or Roman Urdu more specifically. If possible, within the available time, another feature to add would be voiced responses, however, this would require another subsystem to replicate human voice with tone adjustment and distinction to properly convey the appropriate attributes for any conversation at hand, however this can be considered a bonus feature to the overall system. The possible tools we may use are: • TensorFlow / PyTorch • NLTK / TextBlob • UrduHack • SpaCy • BERT • ChatterBot • MySQL

6   Evaluation Methodology

To evaluate Kaka, we will be having several, possibly hundreds of conversation sessions as tests, and see how accurately Kaka can respond to all of them, or at least in a satisfactory manner in regard to what we have set out to create. These sessions will attempt to cover all sorts of edge case topics, and non-standard responses. Preferably, the experiments will include testers and volunteers from outside the team to give us a wider range of input and more room for analysis on how well Kaka can function relative to its programming. Being a chatbot, Kaka will learn from any conversations it has of course, however there may be cases that Kaka classifies

Figure 2: Overview

responses incorrectly or the learning and training produces errors and bugs, in which case manual fine-tuning will be needed.

7 Hypothesis

Kaka is expected to be able to understand conversation elements that are sarcastic, carry undertones, or indicate a response that is not related to the topic at hand in literal terms but may do so in the form of double meanings and subtitles.

8 Proposed Timeline

The tentative weekly timeline giving concrete milestones would be as follows. Modify the following timeline for your project.

- **June 3**:This proposal.

- **June 6**:Familiarization with models, algorithms

- **June 10**:Implementation of Kaka

- **June 18**:Evaluation in progress.

- **June 21**:Complete experiments.

- **June 25**:Writing report.

- **June 26**:Presentation and Final report due.

References

Li Zhou , Jianfeng Gao , Di Li , Heung-Yeung Shum. (2020). The Design and Implementation of XiaoIce, an Empathetic Social Chatbot . Association for Computational Linguistics.

Peng-Yu Chen, Von-Wun Soo. (2018). Humor recognition using deep learning. Association for Computational Linguistics, 113–117.

Zareen Sharf and Dr Saif Ur Rahman. (2018). Performing Natural Language Processing on Roman Urdu. In IJCSNS International Journal of Computer Science and Network Security, VOL.18 No.1 (pp. 141-148).