NLP, the present and future to move chatbots to the next level

Nowadays, talk to robots is an everyday activity. Virtual assistants like Alexa, Google or Siri are extremely popular and is quite surprising to find features we didn't know they were possible to answer.

However, I want to see what is behind this? How a chatbot with NLP architecture looks like?

Let's go back in time:

ELIZA, the first chatbot, was implemented as a parody of a psychological counseling session. ELIZA took the role of the patient.

ELIZA was developed in MAD-SLIP language. ELIZA's algorithm was based on keywords. Once a keyword was found, the system looked into a workflow of instructions and rules. This is the opposite of Artificial Intelligence learning, where the inputs are data and answers, and the output are the rules the model found.

ELIZA was able to recognize natural language (with some limitations on punctuations). To choose the appropriate answer, the first step consisted on identifying key words, after that, Eliza applied a "transformation rule", which has two parts: decomposition and reassembly.

For example: In the sentence: "It seems that you hate me"

- Decomposition:

1	2	3	4
It seems that	You	Hate	Me

Key words: "you" and "me"

- Reassembly: What makes you think I hate you?

    Where:

    - o "What makes you think" ➔ Reassembly expression used when someone makes an assertion of something. If we think about it, could be used in many cases when you want to deep in details and generate a dialog.
    - o "Hate" ➔ In this case, this word is not relevant. Could be anything, and the reassembly expression would be the same.

Because the purpose of ELIZA was to go in details about statements as a psychological session. This behavior had very interesting results and the dialog was very similar to a human to human interaction.

However, in the absence of key words and lack of context identification, ELIZA failed to develop a coherent dialog.

Nowadays our lives are rounding by bots. We can use them to ask for recommendations, to control devices or simple chat with some features such as: news, weather and others.

There are bots with open domain and close domain. Alexa and Siri are examples of open domain. Bots for restaurant bookings are closed domain. That means they are focused on one particular task and are trained for that field only.

Bots technology could be based on rules (similar to ELIZA) or powered by artificial intelligence using generative models to provide responses.

Artificial Intelligence bots use NLP and Natural Language Understanding (NLU) algorithms to process input and generate sentences. NLU is at the core of any NLP task. It is a technique to implement natural user interfaces such as a chatbot. NLU aims to extract **context** and **meanings** from natural language user inputs, which may be unstructured and respond appropriately according to **user intention**.

For example: In the question: "What is the weather in Pasadena?"

- User intention: Learn the weather forecast.
- Entity value: Pasadena

However, while the user asks continuously about this location. The bot will learn that this is where they live, so Pasadena will become the **context.** Next time when he asks only:

What's the weather?, the bot will identify that the user is at home and will provide the weather for Pasadena.

As we can see in the previous example, many rules and steps are required to provide an answer. Even the most advanced systems such as Alexa, Siri and Cortana are semi-rule based, using Artificial Intelligence when it is required, such as context identification.

Bots present and future possibilities are countless. Customer service, booking and reservations, technical assistant, e-learning, etc. In COVID time when social distance is the new normal, bots could be a possibility to keep interaction.

SOURCES

https://web.stanford.edu/class/linguist238/p36-weizenabaum.pdf

https://www.researchgate.net/publication/320307269_Chatbots_An_overview_Types_Architecture_Tools_and_Future_Possibilities