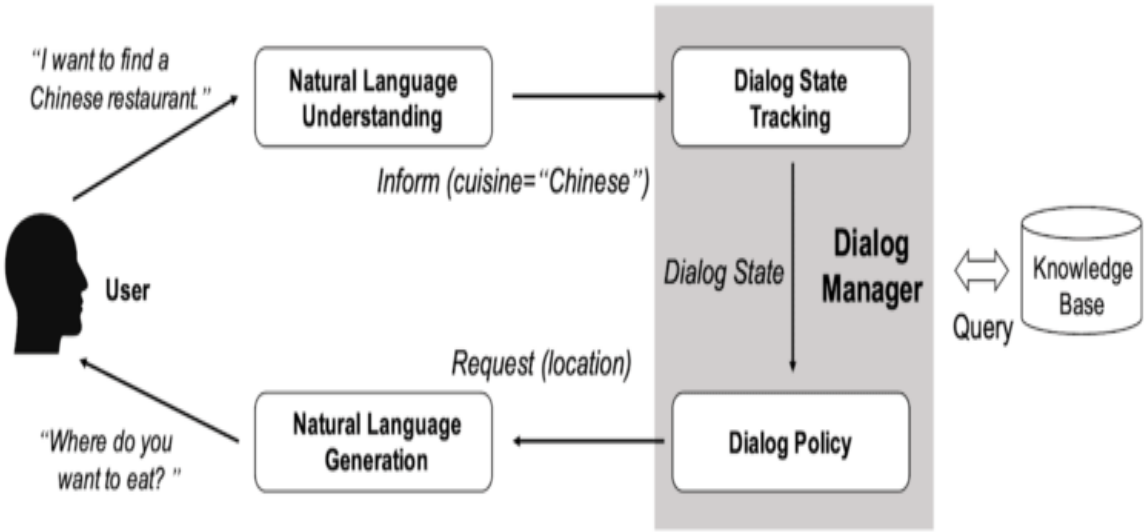
How do chatbots work?



In simple words, chatbots aim to understand users' queries and generate a relevant response to meet users' needs

Chatbots can be divided into 3 types based on the response-generation method:

1. **Rule-based chatbots**: Rule-based chatbots rely on if/then logic to generate responses based on predefined conditions and responses. These chatbots have limited customization capabilities but are reliable and are less likely to go off the rails.
2. **AI-based chatbots**: AI-enabled chatbots rely on NLP to scan users' queries and recognize keywords to determine the right way to respond. Additionally, some AI-based chatbots self-improve by using users' data as new training data in order to expand the knowledge database and improve their responses.
3. **Hybrid chatbots**: Hybrid chatbots rely both on rules and NLP to understand users and generate responses. These chatbots' databases are easier to tweak but have limited conversational capabilities compared to AI-based chatbots.

- **What are the components of a chatbot**?

Typically, chatbots consist of 7 components, and they are structured as following:

- **Natural language processing**

Natural language processing (NLP) enables chatbots to convert users' text and speech into structured data to be understood by a machine. NLP consists of the following steps:

- **Tokenization**: also called lexical analysis, is the process of splitting the string of words forming a sentence into smaller parts "tokens" based on its meaning and its relationship to the whole sentence.
- **Normalization**: also called syntactic analysis, is the process of checking words for typos and changing them into the standard form. For example, the word "tmrw" will be normalized into "tomorrow",
- **Entity recognition**: the process of looking for keywords to identify the topic of the conversation.
- **Semantic analysis**: the process of inferring the meaning of a sentence by understanding the meaning of each word and its relation to the overall structure.

- **Natural language understanding**

Natural language understanding (NLU) is a subfield of NLP which focuses on understanding the meaning of human speech by recognizing patterns in unstructured speech input. NLU solutions have 3 components:

- **Dictionary** to determine the meaning of a word
- **Parser** to determines if the syntax of the text conforms to the rules of the language

- **Grammar rules** to break down the input based on sentence structure and punctuation

NLU enables chatbots to classify users' intents and generate a response based on training data.

➢ Knowledge base

A knowledge base is a library of information that the chatbot relies on to fetch the data used to respond to users. Knowledge bases differ based on business needs. For instance, the knowledge base of an e-commerce website chatbot will contain information about products, features, and prices, whereas a knowledge base of a healthcare chatbot will have information about physicians' calendars, hospital opening hours, and pharmacy duties. Additionally, some chatbots are integrated with web scrapers to pull data from online resources and display it to users.

➢ Data storage

Chatbot developers may choose to store conversations for customer service uses and bot training and testing purposes. Chatbot conversations can be stored in SQL form either on-premise or on a cloud.

➢ Dialog manager

A dialog manager is the component responsible for the flow of the conversation between the user and the chatbot. It keeps a record of the interactions within one conversation in order to decide how to respond. For instance, if the user says "I want to order strawberry ice cream" and then within the conversation says "change my order to chocolate ice cream", the dialog manager will enable the bot to detect the change from "strawberry" to "chocolate" and change the order accordingly.

- **Natural language generation**

Natural language generation (NLG) is the process of transforming machine-produced structured data into human-readable text. After understanding users' intent, NLG has 4 steps to generate a response:

- Content determination: Filtering existing data in the knowledge base to choose what to include in the response.
- Data interpretation: Understanding the patterns and answers available in the knowledge base.
- Document planning: Structuring the answer in a narrative manner.
- Sentence aggregation: Compiling the expressions and words for each sentence in the response.
- Grammaticalization: Applying grammar rules such as punctuations and spell check.
- Language implementations: Inputting the data into language templates to ensure a natural representation of the response.

- **User interfaces**

Conversational user interfaces are the front-end of a chatbot that enable the physical representation of the conversation. They are classified into text-based or voice-based assistants. And they can be integrated into different platforms, such as Facebook Messenger, WhatsApp, Slack, Google Teams, etc.

- **What are the best practices of chatbot development?**
  Identifying target audience and understanding their needs

- Setting realistic goals about chatbot implementation
- Understanding which business area will benefit most from the chatbot
- Selecting the right user platform
- Improving usability and reachability of chatbot