Project 6: Chatbot Deployment with IBM Cloud

Watson Assistant

Phase 2:Innovation

Consider implementing advanced features such as natural language understanding (NLU) for more accurate user intent recognition.

Implementing Natural Language Understanding (NLU) can indeed improve user intent recognition. NLU involves advanced techniques like semantic analysis, entity recognition, and context comprehension to better understand user input. It can enhance the accuracy of your application's responses and provide a more intuitive user experience.

What is intent recognition and why is it important in NLP?

Intent recognition is a term used in natural language processing (NLP) to describe the purpose or intent behind a linguistic expression, such as an affirmation or a question. Where data is concerned, intent recognition refers to the intent behind a query or action performed using specific data. For example, a user searches the Internet with the object of looking for information about a service on a website, or wanting to buy a service online, etc. Detecting that intent behind linguistic expressions is a key task in NLP and can be used to improve the response that automated systems give to humans.
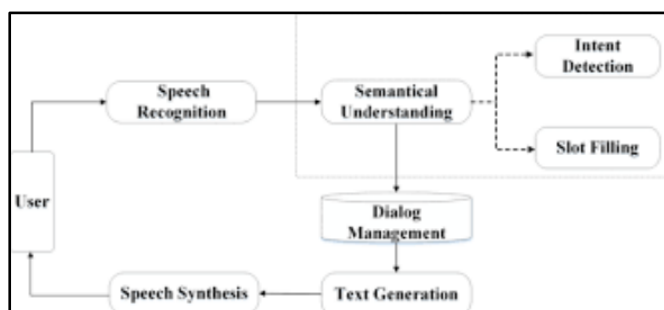
How does it work?

Intent recognition relies on natural language processing

and machine learning techniques to perform its tasks. In general, the process consists of several steps:

1. Text analysis:

First, the input text must be analyzed and divided into its lexical and syntactic components. This includes tasks such as sentence segmentation and grammatical tagging.
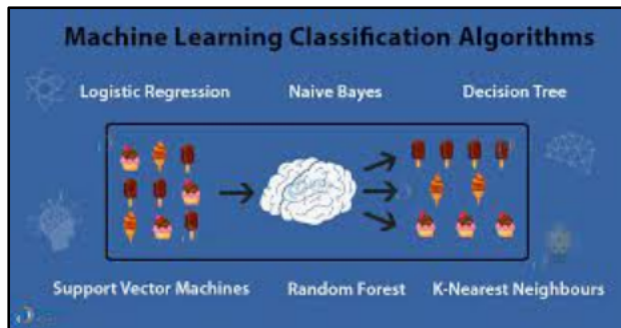
2. Feature extraction:
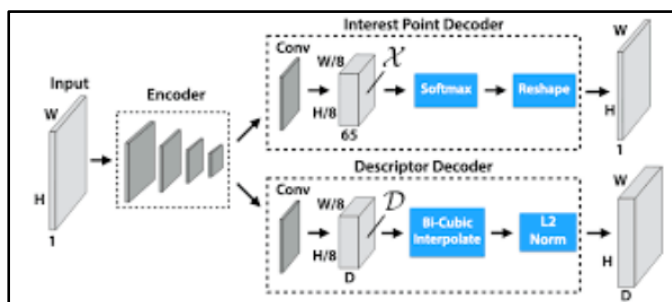
Next, relevant text features are extracted, such as keywords, phrases and language patterns.
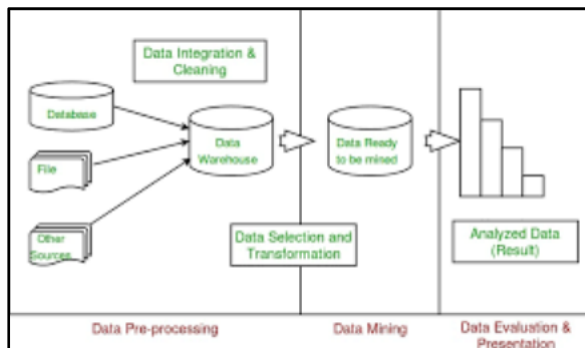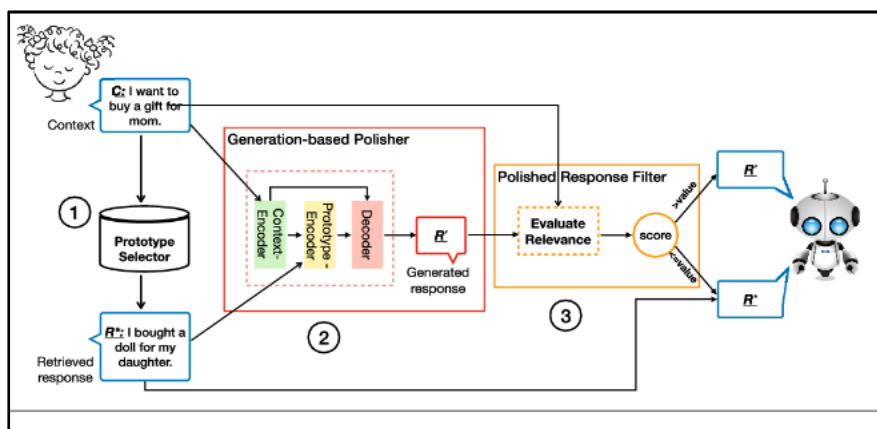
3. Classification:

Once the text features have been extracted, machine learning models are used to classify the text into different intents.

4. Entity identification:

In some cases, it is necessary to identify the entities mentioned in the text, such as people, places, organizations, etc. This is done by means of entity extraction techniques.

5. Response generation:

Once the user's likely intent has been determined, a

response generator is used to provide an appropriate response.

How can intent recognition benefit a business?

Intent recognition can be useful to companies for many different reasons:

1.It helps improve user experience.

It understands the intent behind a question or comment, so companies can provide the user with a concrete and relevant response to fit the demand. This enhances customer experience and increases satisfaction.

2. It increases efficiency.

By automating the understanding of intent, a company can respond to a greater number of questions and requests more quickly and accurately, increasing efficiency in customer service and support processes.

3. It improves service personalization.

Being able to understand the intent behind a text entry allows companies to provide personalized services and offers, which increases the likelihood of customer conversion and retention.
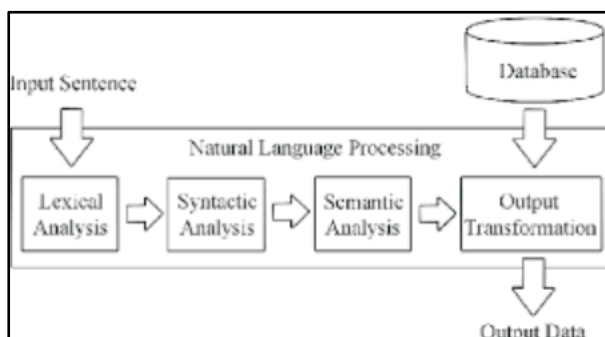
4. It helps with decision-making.

By analyzing customer intent and conversation data, it can help companies make informed decisions about products, services, marketing strategies and more.

NLU involves advanced techniques:
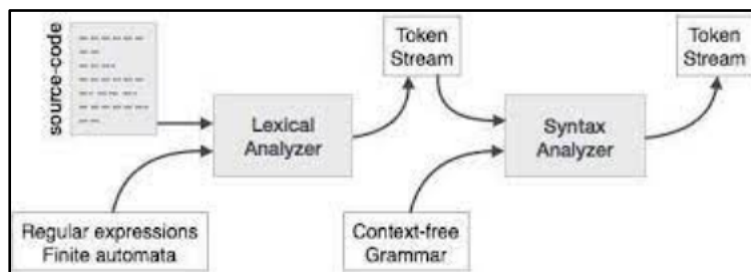
1.Semantic Analysis:

Semantic Analysis is a subfield of Natural Language

Processing (NLP) that attempts to understand the meaning of Natural Language. Understanding Natural Language might seem a straightforward process to us as humans. However, due to the vast complexity and subjectivity involved in human language, interpreting it is quite a complicated task for machines. Semantic Analysis of Natural Language captures the meaning of the given text while taking into account context, logical structuring of sentences and grammar roles.

Parts of Semantic Analysis:

Semantic Analysis of Natural Language can be classified into two broad parts:

1. Lexical Semantic Analysis:

Lexical Semantic Analysis involves understanding the meaning of each word of the text individually. It basically refers to fetching the dictionary meaning that a word in the text is deputed to carry.

2. Compositional Semantics Analysis:
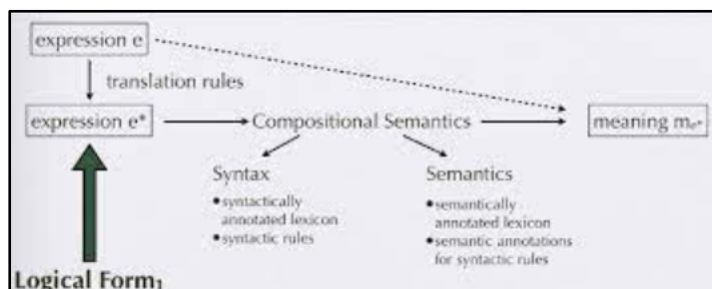
Although knowing the meaning of each word of the text is essential, it is not sufficient to completely understand the meaning of the text.
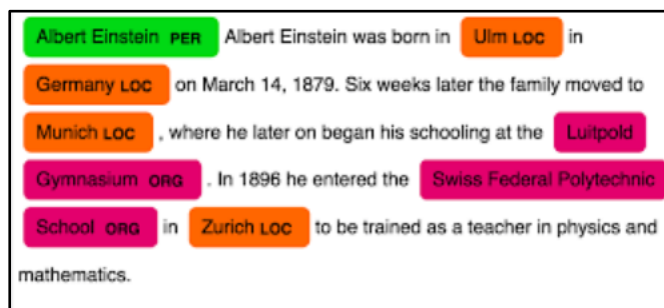
2.Entity Recoginition:

Entity recognition is a specific type of NLU that

focuses on identifying the entities in a message and then extracting the most important information about those entities. There are two types of entities: named entities and numeric entities.

1.Named entites:

Named entities are grouped into categories, such as people's names, business names and locations.
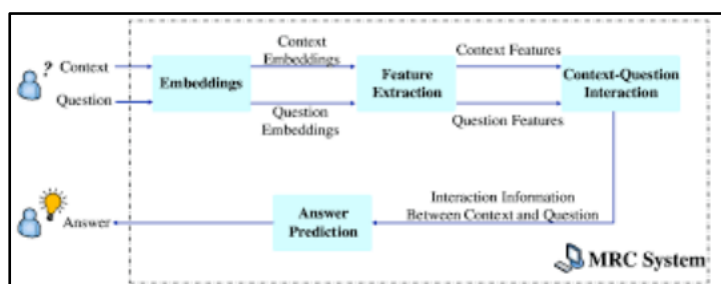
2.Numeric entites:

$$\text{Scale estimates } \hat{s} = S_{Gauss}(\Gamma_s, c)\, s_0 \text{ based on } \mathcal{Q}_{(x,y), \Gamma-norm}L$$
$$\text{at the center of a Gaussian blob}$$

| c	$\Gamma_s = 0$	$\Gamma_s = \frac{1}{4}$	$\Gamma_s = \frac{1}{2}$
0	1.000	0.778	0.600
1/2	0.839	0.650	0.498
$1/\sqrt{2}$	0.751	0.578	0.440
1	0.641	0.487	0.367
$\sqrt{2}$	0.519	0.385	0.283
2	0.402	0.285	0.199

Numeric entities are recognized as quantities, dates, currencies and percentages.
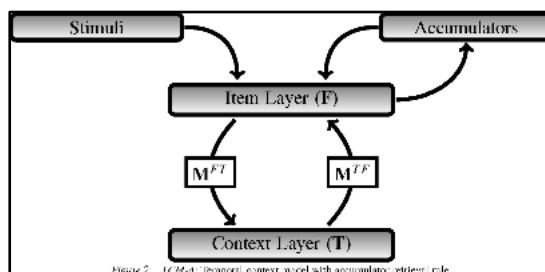
3. Context Comprehension:

Context comprehension is a crucial aspect of Natural Language Understanding (NLU). It involves the ability to analyze and understand the context in which a statement or question is made. Here's how it works:

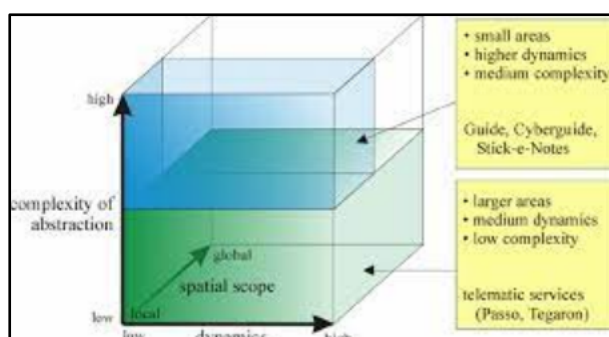1. Contextual Understanding:

Edit with WPS Office
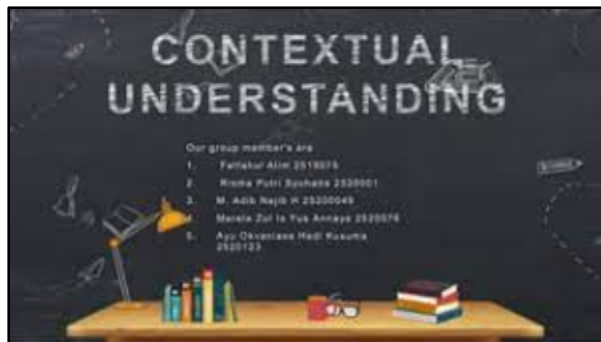
NLU systems need to consider the entire conversation context, not just the current user input. This helps in understanding references, pronouns, and previous interactions. For example, if a user asks, "What's the weather like today?" Understanding that "today" refers to the current date requires context comprehension.

2. Temporal Context:

NLU systems should be aware of time-related information. They need to understand past, present, and future references to provide relevant responses. For instance, recognizing that "next week" refers to a future date is part of context comprehension.

3. Spatial Context:

Understanding spatial context involves recognizing

location-based information. If a user asks about nearby restaurants, the system needs to interpret "nearby" based on the user's current location.

4. Topic Continuity:
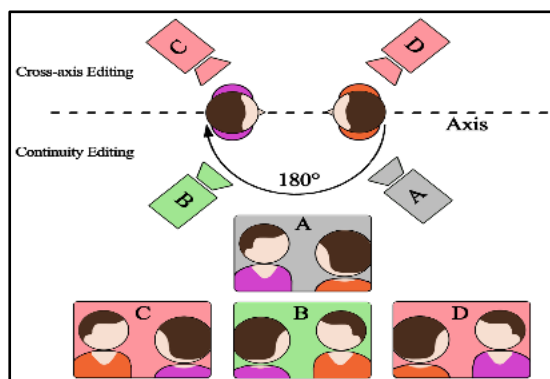
NLU models should maintain a coherent understanding of the ongoing conversation topic. This helps in following a conversation thread and responding appropriately.
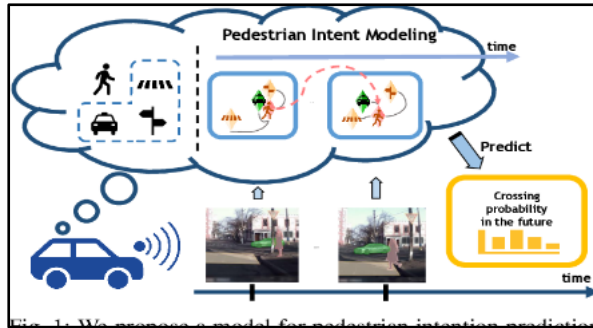
5. User History:

Keeping track of the user's history within the conversation can aid in providing more personalized and context-aware responses. This includes remembering user preferences, past queries, and interactions.

6. Intent Prediction:

Fig. 1: We propose a model for pedestrian intention prediction

Context comprehension also plays a role in predicting the user's intent. By analyzing the context, the system can make more accurate predictions about what the user is likely to ask or do next.