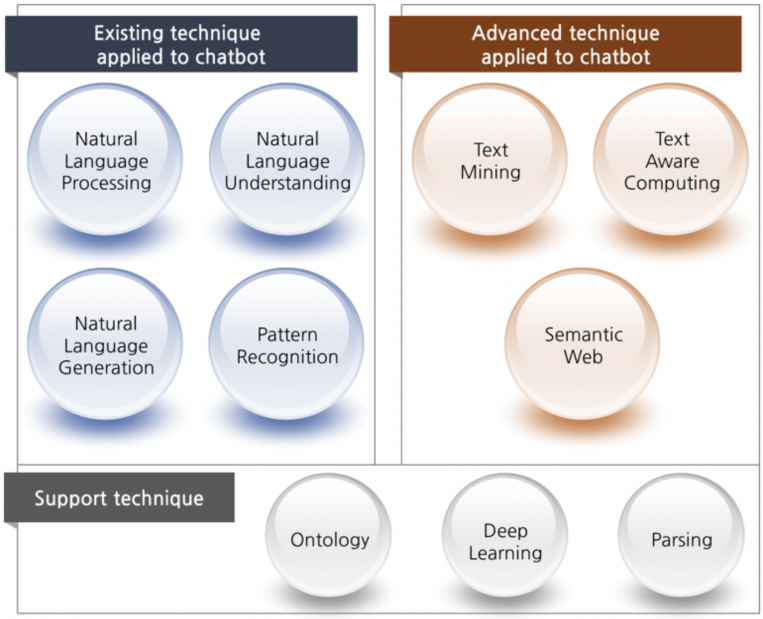
Literature review on Systematic Review on Chatbot Techniques and Applications

Introduction

- A chatbot is a computer program or an artificial intelligence program that participates in a conversation via auditory or textual methods.
- In this paper, they introduced 5 different chatbot technologies:
    1. NLP
    2. Pattern Matching
    3. Semantic Web
    4. Data Mining
    5. Context-aware computer.
- This chatbot study have two main aims:
    1. To see how well chatbots can understand users' messages.
    2. How well chatbots can provide answers that are appropriate in context.
- Natural Language Processing (NLP) comprises three distinct yet interconnected subfields: Natural Language Understanding (NLU), Natural Language Generation (NLG), and Natural Language Interaction (NLI).
- NLP finds wide-ranging applications across diverse domains, including but not limited to chatbots, information retrieval, Question-Answering (QA) systems, automatic document classification, clustering of newspaper articles, interactive agents, automated translation systems, and language interpretation.
- NLU is a more advanced technology within the realm of natural language processing, as it focuses on understanding human language with greater depth and intricacy than traditional NLP.
- On the other hand, NLG is a sophisticated technology that goes beyond NLP, as it is capable of generating natural language content in a more detailed and refined manner.

- Pattern recognition is a branch of AI that process the problem of a computable mechanical device (computer) recognising a target



Overview of techniques used for chatbots.

- Semantic web is a technology framework enabling computers to understand the meaning of information and relationships between resources on the internet. Ontology, a key component of the Semantic Web, defines concepts and constraints in a machine-readable way. Unlike the regular web, where information is merely presented, the Semantic Web fosters smarter interactions.

  For example, it allows a chatbot to comprehend the concept of "banana" being yellow, enhancing natural and intelligent conversations. This empowers machines to process data in a more meaningful manner, contributing to a smarter, interconnected web where knowledge is readily accessible and reusable for various applications.
- Data mining enables chatbots to analyse large and unstructured text data, helping them find valuable and new information.
- Data mining can be applied to the chatbot in two ways:
  1. Association analysis

     Association analysis involves finding patterns in a dataset where certain properties often occur together. For example, it helps identify common associations among frequently asked sentences.
  2. Regression analysis

Regression analysis is used to determine what a dependent variable is via independent variable analysis.

- Text-aware computing is a smart technology that connects real-world situations to virtual spaces, offering intelligent services based on how users interact with it. It uses information provided by users and the typical responses of chatbots to understand the user, the surroundings, make decisions, and take actions accordingly. This technology works well in specific places like factories and hospitals where traditional chatbots need more information from their surroundings to function effectively.

NLP

- NLU is a field of deep study in NLP. Electronic devices such as smart phones and tablet computers require an NLU engine that interprets the user input and provide meaningful output or facilitates work with one or more applications that can be accessed through electronic devices.
- NLG is important in chatbots with voice recognition systems.
- In the past, Natural Language Generation (NLG) has been approached using two main methods: template-based and algorithmic. Template-based NLG involves creating predefined frameworks or rules for specific purposes, which are then used to generate natural language output.
- There are 3 techniques in NLP:
    1. NLP
    2. NLU
    3. NLG

Pattern Recognititon

Pattern recognition is a technique used in chatbots to identify and analyze patterns for various conditions after applying NLP technology.

It enables chatbots to create more detailed and realistic responses without the application of NLP technology and complementing the absence of machine learning technologies, forms, syntax, and semantic NLP modules with the AIML-based architecture system.

There are two approaches to pattern recognition in chatbots:

1. A depth-priority search algorithm
2. Interpreting grammar according to keyword patterns.

Semantic Web

- The Semantic Web is an advanced technology that aims to transform the World Wide Web into a meaningful web by distinguishing between current and past terms and extracting relevant information from various documents.
- It uses the concept of ontology, which is the philosophical study of being, to extract knowledge from the Semantic Web.
- This technology enables chatbots to comprehend the meaning of information and relationships between resources on the internet, empowering them to have more intelligent and natural conversations.

Data Mining

- Text mining is a valuable and widely used technology with high commercial value, offering in-depth analysis instead of superficial results.
- High-speed network-bound cluster systems are employed for large-scale topical searches, ensuring high availability, scalability, and capability.
- The current chatbot paper lacks an exploration of data mining techniques, which is an essential aspect of text mining.
- Data mining involves discovering patterns in large datasets using machine learning, statistics, and database systems.
- Recent technological advancements in processing power, storage capacity, and inter-connectivity have led to a significant increase in digital data, making data mining crucial for extracting valuable knowledge from vast repositories.
- Data mining has become an interdisciplinary field, applied in various industries, science, engineering, and government, with the potential to profoundly impact society.
- The rising recognition of data mining's value has resulted in a demand for innovative data mining technologies and skilled professionals trained in the field.

Text aware computing

- Text-aware computing adapts to different scenarios, providing various functions. For instance, in noisy places, computers can display louder text for clear communication, while in meetings, they can show text in lower tones to avoid disruptions.
- This technology enables computers to offer real-time schedules and even identify specific individuals.
- Text-aware computing goes beyond system comprehension, focusing on "understanding the context" and "concepts that the computer understands" .
- Researchers have studied ways to "re-model contextual data," "process technology," and "improve security" for effective context recognition.

Various techniques

- In the development of chatbots, Python is a popular choice, often used alongside powerful libraries like Natural Language Toolkit (NLTK) and TensorFlow.
- NLTK is a leading platform that allows Python programs to handle human language data. It provides various functions like classification, tokenisation, syntax analysis, and more, making it great for text processing and semantic understanding.
- On the other hand, TensorFlow is an open-source machine learning library used by Google, which adds machine learning capabilities to chatbots and other applications.
- Both NLTK and TensorFlow empower developers to create sophisticated and intelligent chatbots with ease.

There are many APIs supported by chatbot platform websites, such as :

1. Chatfuel.com
2. Conversable.com
3. Dialogflow.com
4. Gupshup.io
5. RASA.com
6. Manuchat.com
7. Danbee.ai
8. Playchat.ai

Further References for our project who are based on Universities

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