```python
        return "I'm just a bot, but thanks for asking!"
    elif "bye" in user_input:
        return "Goodbye! Have a great day!"
    else:
        return "I'm sorry, I didn't understand that."

def main():
    print("Welcome to the Simple Chatbot!")
    print("Type 'bye' to exit.")

    while True:
        user_input = input("You: ")
        if user_input.lower() == 'bye':
            print("Chatbot: Goodbye! Have a great day!")
            break
        else:
            response = get_response(user_input)
            print("Chatbot:", response)

if __name__ == "__main__":
    main()
```

Output:

```
Welcome to the Simple Chatbot!
Type 'bye' to exit.
You: hello good afternoon
Chatbot: Hi there! How can I assist you?
You: how are you
Chatbot: I'm just a bot, but thanks for asking!
You: bye
Chatbot: Goodbye! Have a great day!
```

EXERCISES

A. Multiple Choice Questions:

1. Which of the following is NOT a common task in NLP?
   a) Machine translation
   b) Text summarization
   c) Speech recognition
   d) Image recognition

2. What is the main challenge/s of NLP?
   a) Handling Ambiguity of Sentences
   b) Handling Tokenization
   c) Handling POS-Tagging
   d) All of the mentioned

3. What is a chatbot?
   a) A physical robot used for chatting purposes.
   b) A computer program designed to simulate conversation with human users, especially over the internet.
   c) An advanced form of search engine.
   d) A tool used for sending automated emails.

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4. Which of the following is an application of Natural Language Processing (NLP)?
    a. Autonomous vehicles
    b. Predicting stock prices
    c. Sentiment analysis
    d. Virtual reality gaming
5. Which of the following statements about Voice Recognition Interfaces is true?
    a. They solely rely on text-based inputs.
    b. They are incapable of understanding multiple languages.
    c. They convert spoken language into text or commands.
    d. They require a physical keyboard for interaction.

ANSWERS

1. d. Image recognition
2. a. Handling Ambiguity of Sentences
3. b. A computer program designed to simulate conversation with human users, especially over the internet.
4. c. Sentiment analysis
5. c. They convert spoken language into text or commands.

B. Short answer questions:

1.   How does NLP help in email filtering? Give a real-life example.

Ans. NLP plays a crucial role in classifying incoming emails as "important" or "spam," improving email sorting and enhancing user experience. It utilizes language processing techniques to analyze email content, identify patterns, and make accurate filtering decisions.

Real-life Example:

Scenario: Imagine a professional's inbox flooded with various emails, including work-related messages, promotions, and potential spam.

NLP algorithms can scan through the email content, looking for indicators of importance like keywords, sender reputation, and email structure. By leveraging NLP for email filtering, important work emails are prioritized and separated from less critical or spam messages.

2.   List the steps of NLP Processing.

Ans. The steps of Natural Language Processing (NLP) processing include:

Lexical Analysis, Syntactic Analysis, Semantic Analysis, Discourse Integration, Pragmatic Analysis

3. Briefly explain the two types of chatbots.

Ans.

Rule-based Chatbots:	AI-powered Chatbots
They work on predefined rules and decision trees to provide consistent and accurate answers to specific questions.	Utilize natural language processing (NLP) and machine learning algorithms to respond based on learned patterns and interactions, providing personalized responses.
Advantages: Easy to develop and maintain, Provide 24/7 availability for immediate and consistent support.	Advantages: Offer personalized interactions based on user preferences and history. Improve efficiency and cost savings by automating tasks and reducing service costs.
Limitations: Struggle with understanding complex language High development costs and resource requirements.	Limitations: Prone to biases from training data and lack of transparency in decision-making Ethical considerations regarding privacy, manipulation, and responsible use.

4. Briefly explain the classification problem. Give at least two examples.

Ans. Classification is a type of machine learning problem where the goal is to predict the categorical class labels of new observations based on past data. In classification, the output variable is a category or class label.

Two examples of classification problems are:

Email Spam Detection: Given a set of emails labeled as spam or not spam, the task is to classify new email messages as either spam or not spam.

Handwritten Digit Recognition: Classifying images of handwritten digits (0-9) into their corresponding numeric values.

5. Define the following:

   (a) Intent   (b)Entity   (c) Dialog

Ans. (a) In the context of the provided document summaries, the term "intent" primarily refers to the purpose or objective behind a user's contact with chatbots or the desired outcome of a particular communication.

(b) An entity is a noun: a person, place, or thing. Eg: . If a user asks, "What are the hours for the Bangalore office?", then providing business hours is the intent and Bangalore is the entity.

(c) A dialog is a flowchart—an IF / THEN tree structure that illustrates how a machine will respond to user intents. A dialog is what the machine replies after a human asks a question.

C. Long Answer Questions:

1.   Explain the structure of a chatbot.

Ans. A chatbot has a "frontend" and a "backend".

- The frontend of a chatbot serves as the messaging channel through which users interact, providing a user-friendly interface. The one limitation of the frontend is that it may lack contextual understanding, meaning it might struggle to grasp the full meaning or context of user messages beyond the immediate input.
- The backend of a chatbot is where the hard work takes place. The backend operates application logic and has enough memory to remember earlier parts of a conversation as dialog continues.
- Chatbots understand a question by breaking it into parts and relating those parts to things in its memory. A chatbot's goal is to identify entities and intents, then use what it is found to trigger a dialog.

2.   "A syntax tree is created as part of the procedure to visually represent semantic links." Identify the phase of NLP processing?

Ans. The phase of NLP processing that involves the creation of a syntax tree to visually represent semantic links is the Syntactical Analysis phase.

In syntactical analysis, the aim is to check the grammar, word layouts, and word relationships in a given text. One of the key tasks in this phase is to create a syntax tree, also known as a parse tree, which represents the grammatical structure of the sentence and visually displays the relationships between words. This helps in understanding the syntactical constructs and semantic relationships within the text, thereby aiding in the overall comprehension and analysis of the language.

D. Case Study questions:

1. Imagine you are a customer service manager at a global e-commerce company facing increasing customer inquiries across multiple channels. To alleviate the strain on your support team and enhance customer satisfaction, you decide to implement a chatbot solution. Develop a case study outlining the challenges you faced, the criteria you used to select a chatbot platform.

   Ans.
   - High Volume of Customer Inquiries: Managing the increasing number of customer inquiries across various channels, including email, live chat, and social media, was overwhelming for the support team.
   - Response Time and Availability: Ensuring timely responses and 24/7 availability for customer queries without round-the-clock human support.
   - Scalability: The need for a solution that could scale with the company's growth and handle a diverse range of customer queries effectively.

- Consistency in Responses: Maintaining consistency in responses across different channels and ensuring accurate information delivery to customers.

➢ Criteria for Selecting a Chatbot Platform:
- Natural Language Processing (NLP) Capabilities: A chatbot platform with advanced NLP capabilities to understand and respond effectively to natural language queries.
- Integration with Multiple Channels: Ability to seamlessly integrate with various communication channels like website chat, social media etc.
- Customization and Personalization: Platform that allows customization to reflect the brand tone and offers personalized experiences to customers.
- Analytics and Reporting: Provision for detailed analytics on chatbot interactions, customer satisfaction metrics etc.
- Scalability and Flexibility: Platform that can scale with the company's growth and adapt to evolving customer needs.
- Training and Support: Adequate training resources and customer support from the chatbot platform provider to ensure smooth implementation and ongoing maintenance.

2. Imagine you are a customer experience lead at a telecommunications company, currently relying on a rule-based chatbot to handle customer queries. However, due to limitations in scalability and adaptability, you are considering a transition to an AI-based chatbot solution. Detail the challenges faced during the transition, and the observed impact on customer service efficiency and satisfaction.

Ans. Challenges Faced During Transition:

➢ Knowledge Base Transition
➢ Training Data Quality
➢ Technical Integration
➢ Training and Skill Development
➢ Regulatory Compliance

Observed Impact on Customer Service Efficiency and Satisfaction:

➢ Enhanced Scalability
➢ Adaptability to Varied Queries
➢ Personalized Customer Interactions
➢ Reduced Response Time
➢ Analytics and Insights

E.Competency Based Questions:

1.Reena's e-commerce website struggles with a high volume of customer inquiries. They're considering a chatbot to help. Should it be rule-based or AI-powered?

Here's how Reena can decide:

Rule-based chatbot:

- Pros: Faster development, lower cost, perfect for answering simple, repetitive questions (e.g., order tracking, delivery status).
- Cons: Limited understanding of complex questions, can't adapt to new inquiries, frustrating for users if it can't answer their specific needs.

AI-powered chatbot:

- Pros: Handles complex questions and learns over time, improves customer experience with more natural conversations.
- Cons: Higher development cost, requires training data and ongoing maintenance, may not be perfect initially and could misunderstand complex inquiries.

What factors Reena must evaluate to decide which chatbot best suits their needs and budget.

Ans- Factors to consider:

- Types of customer inquiries: If most questions are repetitive (tracking, returns), a rule-based chatbot might suffice. Complex inquiries (product recommendations, troubleshooting) would benefit from AI.
- Budget: AI chatbots require more investment.
- Technical expertise: Implementing and maintaining AI chatbots might require additional resources.

2.You're a compliance officer for a bank launching a new chatbot for customer service. The chatbot can answer basic questions about accounts, transfers, and suspicious activity. However, some customers might ask for specific account details like balances or transaction history. How can you ensure the chatbot complies with data protection regulations and protects sensitive financial information, while still being helpful to customers?

Ans-To address this, you can implement a two-pronged approach:

1. Security: Require multi-factor authentication (PIN, password, etc.) before revealing sensitive information. The chatbot can also deflect requests for specific details by offering alternative solutions (e.g., suggesting the mobile app for checking balances).
2. Transparency: Inform users upfront that the chatbot can't share sensitive data without authentication. Additionally, provide an easy option to connect with a live customer service representative for complex issues requiring such information disclosure.

3.Rahul's marketing team developed an app that understands text input. He wants to use the app to analyse customer reviews and improve the clarity of their promotional messages. How can Rahul leverage discourse integration techniques based on customer conversations to craft more effective marketing messages?

Ans- Rahul can analyse references and connections within reviews to understand what features resonate with customers (e.g., long battery life) and how they talk about their needs (e.g., "perfect for travel"). By using techniques like reference ("We heard you need a long-lasting battery...") and connectives ("This phone boasts a powerful battery, therefore keeping you connected all day"), Rahul can create clear and relevant messages that address customer priorities.

4. Jyoti is tasked with improving a healthcare chatbot for a hospital. Patients often ask the chatbot repetitive questions about symptoms, appointment scheduling, and basic medical information. How can Jyoti leverage NLP techniques to make the chatbot more helpful and engaging for patients?

Ans- Jyoti can use techniques like intent recognition and entity recognition to understand the user's goal (e.g., scheduling an appointment) and specific details (e.g., type of doctor). By implementing information retrieval from a medical knowledge base, the chatbot can answer basic medical questions accurately.

5. Ashmita's cinema chain is launching a new mobile app with a chatbot for ticket purchases and movie recommendations. Moviegoers often ask repetitive questions about showtimes and struggle to discover new movies they might enjoy. How can Ashmita leverage the chatbot functionalities to address these issues and improve customer experience?

Ans- Ashmita can focus on functionalities that answer FAQs with a clear interface (e.g., showtimes, ticket prices) and integrate a recommendation engine. The chatbot can analyze user data (past purchases) to suggest similar movies or upcoming releases that align with their preferences. This personalized approach can help users discover new favorites while addressing their most common questions, leading to a more engaging and satisfying moviegoing experience.