❖ OVERVIEW OF CHATBOTS TYPES & THIER PROS AND CONS:

Artificial intelligence (AI) and natural language processing (NLP)-powered chatbots can improve customer experiences by offering quicker and more effective assistance. Chatbots come in a variety of forms, each with special benefits and drawbacks.

1. Scripted, Rule-based chatbots:

Overview: These chatbots follow preset guidelines to function. User inputs are paired with predetermined responses in a planned flow.

Advantages:

- Simple to create and execute.
- dependable when it comes to managing structured, repeated jobs like FAQs.
- fast reaction time.
- economical for basic customer service exchanges.

Disadvantages:

- Lack of adaptability; they are only able to respond to preset queries.
- Lack of scalability; inability to comprehend or react to intricate or unexpected user requests.
- little personalisation and user interaction.

2. AI-Powered Chatbots:

Overview: These chatbots process and comprehend natural language by utilising AI and NLP. They are more sophisticated and provide a lively and perceptive dialogue flow.

Advantages:

- Able to decipher user input's context, intent, and meaning.
- the capacity to use machine learning (ML) to learn from previous discussions.
- Respond to more complicated enquiries and offer individualised interactions.
- able to function with various clientele and languages.

Disadvantages:

- Costlier to create and maintain.
- Large datasets are needed for training.
- For extremely complicated or domain-specific searches, human involvement can be required.
- possible difficulties comprehending complex language, particularly regional accents or slang.

3. Hybrid Chatbots:

Overview: Hybrid chatbots integrate AI capabilities with rule-based answers. They employ a simple set of guidelines, but they also use AI to manage trickier questions.

Advantages:

- Offers a harmony between intelligence and simplicity.
- effectively responds to both basic and more complicated consumer enquiries.
- When necessary, it switches to human agents to provide a better user experience.
- less expensive than chatbots with full AI capabilities.

Disadvantages:

- Needs a carefully thought-out flow to strike a balance between AI-driven and rule-based replies.
- If not properly developed, AI might not reach its full potential.

- more complicated to maintain than rule-based bots.

❖ Key NLP Concepts and Their Relevance to Chatbot Development

Natural Language Processing (NLP) enables chatbots to interact with users more naturally by understanding and processing human language. Key NLP concepts play a critical role in developing efficient, accurate, and user-friendly chatbots.

1. Tokenization

- **Concept**: Tokenization is the process of breaking down text into individual elements or "tokens" like words or phrases.

- **Relevance**: Tokenization is essential for helping the chatbot understand the structure of sentences, detect key phrases, and make sense of user queries. In a chatbot for Toutche, tokenization helps identify relevant pieces of information like order numbers, bike models, or dates.

2. Named Entity Recognition (NER)

- **Concept**: NER involves identifying and classifying named entities within the text, such as names, dates, locations, or product models.

- **Relevance**: For a chatbot supporting a brand like Toutche, NER can detect specific customer names, product models, serial numbers, or order details in customer queries, making the bot capable of delivering personalized support.

3. Intent Recognition

- **Concept**: Intent recognition involves determining what the user wants to achieve with a particular query.

- **Relevance**: This is one of the most critical aspects of chatbot design. It allows the bot to determine whether a user wants to make a purchase, track an order, request maintenance advice, or something else. For Toutche, accurate intent recognition can significantly reduce confusion and speed up customer resolution times.

4. **Sentiment Analysis**

- **Concept**: Sentiment analysis determines the emotional tone of the user's query—whether it is positive, negative, or neutral.

- **Relevance**: Sentiment analysis helps the chatbot adjust responses based on the user's emotional state. For example, if a customer is frustrated or angry about a late order, the bot can acknowledge the issue empathetically and prioritize their request.

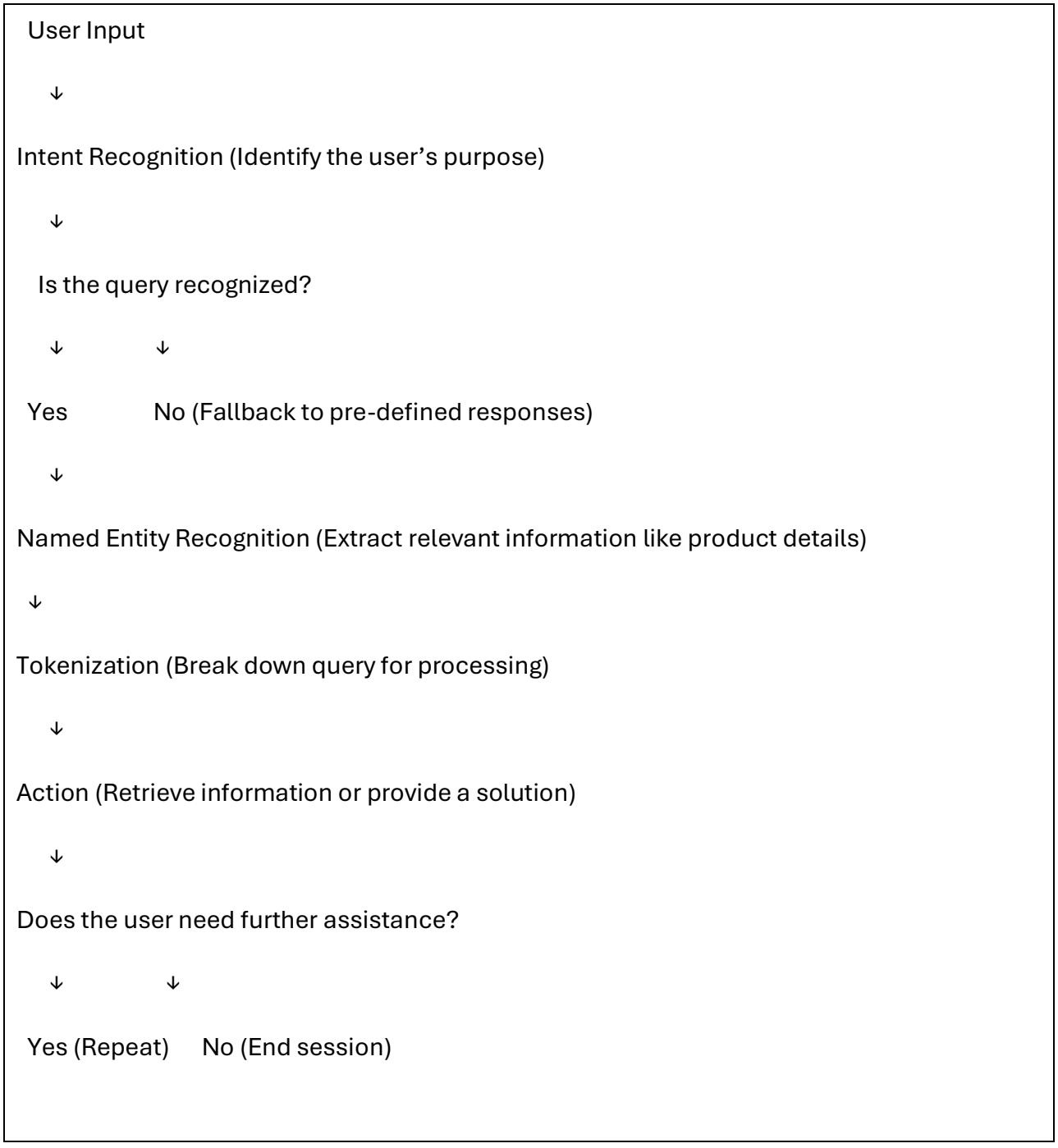
5. **Contextual Awareness**

- **Concept**: Contextual awareness refers to the bot's ability to remember and reference past interactions or related conversations within the same session.

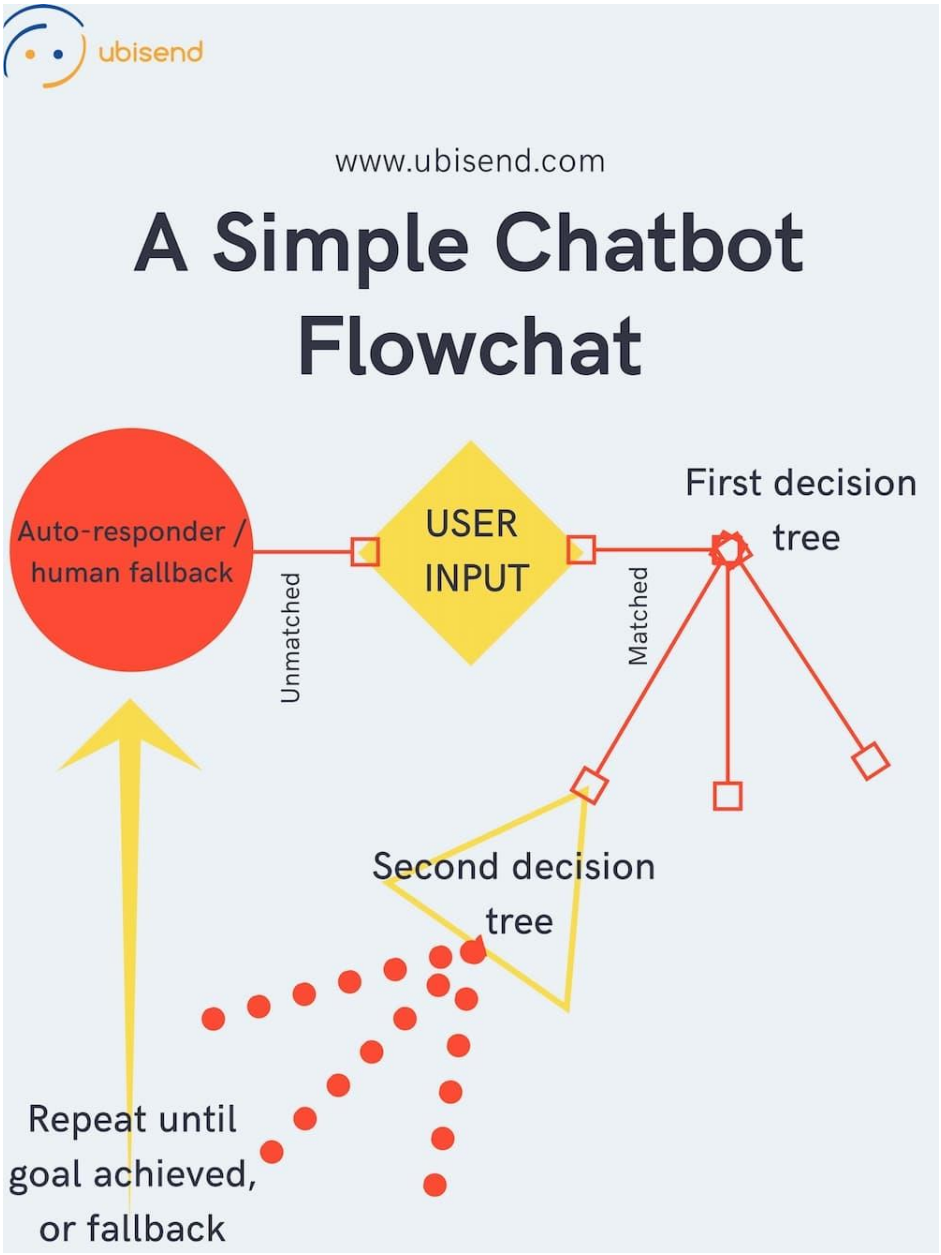
- **Relevance**: For a customer-centric brand like Toutche, context-awareness allows the chatbot to provide continuity in interactions, so customers don't have to repeat information. This enhances user experience, especially when dealing with complex issues over multiple interactions.

❖ Flowchart of a Basic Chatbot's Decision-Making Process:

--Here's a simplified flowchart illustrating how a basic chatbot might handle a customer query:



- This flowchart illustrates the basic process where the chatbot identifies user intent, extracts important details, and executes actions, such as providing information or transferring to a human agent.



--Flowchart of simple chatbot--

❖NLP Challenges in Developing a Chatbot for Toutche:

Developing a chatbot specifically for Toutche—a company offering electric bikes—may present some unique NLP challenges. Below are three potential challenges and initial ideas to address them.

a) Being Aware of Product-Specific Terms and Technical Jargon

Challenge: Consumers of electric bikes could employ shorthand, technical jargon, or product-specific words (such as "battery capacity," "range," or "hub motor"). These terms might be difficult for the chatbot to comprehend, which could cause it to misunderstand consumer enquiries.

Solution: To become familiar with the pertinent vocabulary, a domain-specific natural language processing model can be trained using Toutche's product manuals, frequently asked questions, and customer support logs. The bot's language model can also incorporate a dictionary of important electric bike words.

b) Managing Multi-Turn Conversations

Challenge: A lot of consumer interactions entail several steps, such requesting order information first and then asking about delivery. The bot can give irrelevant answers or lose context if it is unable to manage multi-turn interactions.

Solution: To assist the chatbot remember crucial information throughout exchanges, use contextual awareness strategies like transformers or Long Short-Term Memory (LSTM) networks. The bot can provide logical answers without requiring users to repeat themselves since it remembers past queries from a session.

c) Correctly Handling Customer Sentiment

Challenge: Customers of electric bikes may become irate about delivery delays, performance issues, or technical difficulties. Customers may become even more irritated if the chatbot responds inappropriately if it is unable to comprehend the sentiment behind such comments.

Solution: To determine user emotions, employ sentiment analysis techniques. When the chatbot detects unfavourable emotion, it can be designed to respond with more helpful and sympathetic responses. In order to provide better customer service, it can also escalate the conversation to a human agent when emotions run high.