JAYPEE INSTITUTE OF INFORMATION TECHNOLOGY, NOIDA

B. TECH VI SEMESTER

Software Requirements Specification for

Chatbots using Artificial Intelligence

Version 1.0

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1. Introduction

1.1 Purpose

The purpose of this SRS document is to provide a comprehensive specification for the development of an AI chatbot. This document will outline the functional and non-functional requirements for the chatbot. This document will outline the functional and non-functional requirements for the chatbot, including the user requirements, system requirements, use cases, user interface design, technical architecture, data management, testing and quality assurance, and deployment and maintenance strategies.

The scope of this project is to develop an AI chatbot that can assist users with [customer service , educational and information delivery ,entertainment and gaming, personal shopping assistant, news delivery, appointments and scheduling]. The chatbot will be designed to provide an intuitive and user-friendly experience and will be integrated with

1.Messaging platforms like Facebook , Telegram, WhatsApp.

2. **E-commerce platforms**: Chatbots can be integrated with e-commerce platforms such as Shopify, Magento, and WooCommerce to provide customers with product information, recommendations, and support.

3. **Voice assistants**: Chatbots can be integrated with voice assistants such as Amazon Alexa and Google Assistant to provide hands-free, voice-activated interactions.

4. **Banking and financial services**: Chatbots can be integrated with banking and financial services systems to help customers manage their accounts, make payments, and access financial information.

5. **Healthcare systems**: Chatbots can be integrated with healthcare systems to provide patients with information, support, and appointment scheduling.

The chatbot will be developed for websites to provide customers with quick, convenient support and information , desktop and laptop computers as they can act as standalone software applications and many more platforms in coming future. It is noted that it is a part of larger system.

1.2 References

The following resources were used in the creation of this SRS document:

- Book Conversational AI: Chatbots Publisher IEE
- Implementation of a Chatbot using Natural Language Processing Niranjan Dandekar1 , Suyog Ghodey2
- A Study of Today's A.I. through Chatbots and Rediscovery of Machine Intelligence

  July 2015 Authors :Anirudh Khanna
- Artificial Intelligence Techniques for Chatbot Applications Publisher IEEE

These references provided valuable insights and information on the latest trends and best practices in the development of AI chatbots. The information from these resources was used to inform the functional and non-functional requirements outlined in this SRS document.

2. Overall Description

2.1 User Classes and Characteristics

The AI chatbot will be designed to meet the needs of the following user classes:

- **Customers** : The target audience for the AI chatbot is customers because the chatbot is designed to provide a user-friendly experience for customers who are looking for information, support, and assistance. The chatbot will be accessible to customers through various channels, such as websites, mobile apps, and messaging platforms, and will be able to answer questions, provide product information, and assist with troubleshooting and problem resolution.
- **Employees**: The target audience for the AI chatbot also includes employees, as the chatbot can be a valuable tool for enhancing the efficiency and productivity of internal operations. By providing employees with quick access to information and support, the chatbot can help employees to perform their tasks more effectively and efficiently.
- **Partners** : The target audience for the AI chatbot also includes partners, as the chatbot can provide a range of services and support to help them better understand the products, services, and programs offered by the business. he chatbot can also help businesses to improve their partner engagement and satisfaction by providing partners with quick, easy access to information and support, and reducing the time and effort required to get the help they need.

User Characteristics

- **Technical Proficiency**

The AI chatbot will be designed to provide a user-friendly experience for users with varying levels of technical proficiency. This includes users who may not have prior experience using chatbots, as well as those who are more technically savvy.

- **Language and Communication Skills**

The chatbot will be designed to understand and respond to user queries in multiple languages, and to support users who may have limited language or communication skills. The chatbot will be able to understand natural language queries and provide responses in a clear and concise manner, using simple language and avoiding technical jargon whenever possible.

- **Motivation and Goals**

Users of the AI chatbot may have a range of motivations and goals, including seeking information, placing an order, requesting support, and enrolling in programs or services. The chatbot will be designed to meet the

needs of these users by providing relevant information, and guiding them through the appropriate steps to achieve their goals.

- **Accessibility Requirements**

  The chatbot will be designed to meet accessibility requirements, and to provide an inclusive experience for users with disabilities. This will include support for users who are blind or have low vision, users who are deaf or hard of hearing, and users with mobility impairments or other disabilities.

- **Context and Background**

Users of the AI chatbot may have a range of backgrounds, including age, education level, and cultural background. The chatbot will be designed to be inclusive and relevant to all users, and to provide a customized experience that takes into account their unique context and background.

Highlighting the most important user class of our product :

In the context of chatbots, it is important to identify the most important user classes and prioritize their needs, as this will help to ensure that the chatbot is designed to meet the needs of the users who are most likely to use it.

Typically, the most important user classes for chatbots are customers and partners, as they are likely to interact with the chatbot on a regular basis and have a direct impact on the success of the business. These users will likely have well-defined needs, including the need for quick and convenient access to information, support, and assistance.

Less important user classes may include employees, investors, and stakeholders, who are less likely to interact with the chatbot on a regular basis. While it is still important to consider the needs of these users, they may have less influence on the success of the business, and their needs may not be as well-defined.

To distinguish the most important user classes for chatbots, it is important to understand the goals and priorities of the business, as well as the needs of the users. This information can be used to prioritize the development of the chatbot and ensure that it is designed to meet the needs of the most important user classes, while also considering the needs of less important user classes as appropriate.

SRS for Chatbots

Functional Requirements

2.1.1. Natural Language Processing (NLP)

The AI chatbot must be able to understand and respond to user queries in multiple languages, using natural language processing (NLP) techniques.

2.1.2. Context Awareness

The chatbot must be able to understand and respond to user queries in the context of the user's goals and current situation, providing relevant information and guidance to support the user in achieving their goals.

2.1.3. Personalisation

The chatbot must be able to provide a personalized experience for users, taking into account their background, context, and preferences.

2.1.4. Integration with Backend Systems

The chatbot must be able to integrate with the business's backend systems, including databases and APIs, to provide accurate and up-to-date information to users.

Non-Functional Requirements

2.1. Usability

The chatbot must be easy to use, with a simple and intuitive interface that supports users in achieving their goals.

2.2. Accessibility

The chatbot must meet accessibility requirements and provide an inclusive experience for users with disabilities.

2.3. Performance

The chatbot must respond to user queries in a timely manner, with minimal latency, and provide accurate and relevant information to support users in achieving their goals.

2.4. Security

The chatbot must be secure, protecting sensitive user information and ensuring the confidentiality and privacy of user data.

2.2 Operating Environment

- **Operating Systems:** The AI chatbot will be designed to be compatible with multiple operating systems, including Windows, MacOS, iOS, and Android. The chatbot will be optimized for each operating system to ensure a consistent and seamless experience for users, regardless of the device they are using.
- **Smart Speakers:** Chatbots can be integrated with voice-enabled smart speakers, such as Amazon Echo or Google Home, to provide hands-free access to information and assistance.
- **Cloud Computing Platforms:** Chatbots can be hosted on cloud computing platforms, such as Amazon Web Services or Microsoft Azure, providing flexible and scalable deployment options.
- **Internet of Things (IoT) Devices:** Chatbots can be integrated with IoT devices, such as smart home systems, providing customers with convenient and automated access to information and support.

Chatbots software can work with a variety of other software components and applications, including:

- **Customer Relationship Management (CRM) Systems:** Chatbots can be integrated with CRM systems to provide customers with quick and convenient access to information, and to support the management of customer interactions and data.
- **Social Media Platforms:** Chatbots can be integrated with social media platforms, such as Facebook or Twitter, to provide customers with quick and convenient access to information and support.
- **Payment Systems:** Chatbots can be integrated with payment systems, such as PayPal or Stripe, to provide customers with secure and convenient payment options.
- **E-commerce Platforms:** Chatbots can be integrated with e-commerce platforms, such as Shopify or Magento, to provide customers with product information and support, and to support the completion of transactions.
- **Natural Language Processing (NLP) Tools:** Chatbots can be integrated with NLP tools, such as OpenAI or Google Cloud NLP, to improve the quality and accuracy of their responses.

2.3 Design and Implementation Constraints

Some common constraints include:

Technical Constraints: Technical constraints refer to the limitations of the technology used to develop and implement the chatbot. For example, the chatbot may be limited by the processing power or memory capacity of the hardware platform it is running on, or the scalability of the software components it is integrated with.

Data Constraints: Data constraints refer to limitations in the data that can be used to train and support the chatbot. For example, the chatbot may be limited by the quality and quantity of data available, or the privacy and security requirements of the data.

User Constraints: User constraints refer to limitations in the ways that users can interact with the chatbot. For example, the chatbot may be limited by the number of supported languages, the ease of use of the interface, or the availability of accessible options for users with disabilities.

Business Constraints: Business constraints refer to limitations imposed by the organization that is deploying the chatbot. For example, the chatbot may be limited by budget constraints, the need to comply with regulations, or the availability of resources to support its development and maintenance.

Time Constraints: Time constraints refer to the limitations on the timeline for the development and deployment of the chatbot. For example, the chatbot may need to be developed and deployed within a specific timeframe to meet business requirements or to take advantage of a particular market opportunity.

It's important to consider these constraints when designing and implementing a chatbot system, as they can have a significant impact on the functionality and usability of the chatbot, and on the success of the deployment.

2.4 Assumptions and Dependencies

Technical Assumptions: The chatbot software will run on a specific hardware platform, such as a cloud-based virtual machine or a standalone server. The software will run on a specific operating system, such as Windows, Linux, or macOS, and the operating system will have a specified version number and patch level. he chatbot software will require a specific level of network connectivity, such as broadband Internet or a local area network, to support communication with other software components and systems.

User Assumptions: The chatbot will be used by specific user groups, such as customers, employees, or partners, and these user groups will have specific demographic characteristics, such as age, education level, and language proficiency. It will be used to support specific user goals, such as resolving issues quickly, reducing response times, or improving customer satisfaction.

Business Assumptions: The chatbot will support specific business goals, such as increasing sales, reducing costs, or improving customer satisfaction. It will integrate with specific business processes, such as order processing, customer service, or marketing, and these processes will be specified in detail.

Data Assumptions: The chatbot will require access to specific data sources, such as customer databases, product catalogs, or support tickets. The data sources used by the chatbot will meet specific quality criteria, such as accuracy, completeness, and timeliness.

Time Assumptions: The implementation of the chatbot will occur over a specific timeframe, with clear milestones and deadlines for completion. The chatbot will be adopted by users over a specific

timeframe, with specific goals for user engagement, adoption rates, and usage patterns, and these goals will be specified in detail.

Dependencies refer to the factors or conditions that must be satisfied in order for the chatbot to work as intended. For example, the chatbot may depend on the availability of specific software components or data sources, or the existence of processes to manage customer interactions and data.

It's important to consider these assumptions and dependencies when designing and implementing a chatbot system, as they can have a significant impact on the functionality and usability of the chatbot, and on the success of the deployment.

Dependencies:

- **Data Sources:** The chatbot will depend on specific data sources, such as customer data, product information, or support articles, and these data sources will be specified in detail.
- **Integration with Other Systems:** The chatbot may need to integrate with other systems, such as customer relationship management (CRM) systems, e-commerce platforms, or support ticketing systems, and these integrations will be specified in detail.
- **API Availability:** The chatbot may depend on specific APIs, such as those provided by third-party data sources, and these API dependencies will be specified in detail.
- **Infrastructure and Platforms:** The chatbot may depend on specific infrastructure and platforms, such as cloud computing platforms, virtualization technologies, or hosting providers, and these dependencies will be specified in detail.
- **Security Requirements:** The chatbot may need to meet specific security requirements, such as data encryption, user authentication, or access control, and these requirements will be specified in detail.
- **Regulatory Requirements:** The chatbot may need to comply with specific regulatory requirements, such as data privacy laws or financial regulations, and these requirements will be specified in detail.

3. External Interface Requirements

3.1 User Interfaces

Chat Interface: A text-based interface with a clean and simple layout, with a neutral colour palette (e.g., black text on a white background). The font used will be clear and easy to read therefore Arial is used.

Voice Interface: A simple interface with minimal design elements, such as a logo or icon, and a neutral colour palette. The interface will provide visual feedback for voice commands, such as a sound or animation to indicate that the command has been received and is being processed.

Touch Interface: A touch-friendly interface with clear and large buttons, icons, or images that are easy to touch and navigate. The interface will use a colour palette that provides good contrast and is easy on the eyes like black-bluish tones.

Visual Interface: A visual interface with graphics, such as icons or images, that are easy to understand and provide clear navigation. The interface will use a colour palette that is consistent with the brand's visual identity and is visually appealing.

Virtual Assistant Interface: A conversational interface with a clean and simple layout, with a neutral colour palette. The interface will use an appropriate font that is clear and easy to read and provide visual feedback for user actions, such as a sound or animation to indicate that a message has been sent.

Web-based Interface: A web-based interface that is optimized for different screen sizes and uses a responsive design. The interface will use a colour palette that is consistent with the brand's visual identity and is visually appealing.

Mobile App Interface: A mobile app interface that is optimized for small screens and touch input, with clear and large buttons, icons, or images that are easy to touch and navigate. The interface will use a colour palette that provides good contrast and is easy on the eyes.

3.2 Hardware Interfaces

Processor: Intel Core i5 or higher, 2.0 GHz or higher.

Memory: 4 GB RAM or higher.

Storage: 500 MB free disk space.

Network Connectivity: Wi-Fi or Ethernet connection with minimum download speed of 10 Mbps.

Display: Minimum screen resolution of 1024 x 768 pixels, with support for both portrait and landscape modes.

Input Devices: Keyboard and mouse, or touch screen for mobile devices.

Peripherals: Webcam and microphone for video conferencing, if required.

Operating System: Windows 10, macOS, or Linux, depending on the target platform.

3.3 Software Interfaces

Operating System: The AI chatbot software will be compatible with popular operating systems such as Windows, macOS, and Linux.

Database: The AI chatbot software should be able to integrate with popular database management systems such as MySQL, PostgreSQL, and Microsoft SQL Server. The database will store the customer information, chat history, and any other relevant data.

Messaging platforms: The AI chatbot software should be able to integrate with popular messaging platforms such as Facebook Messenger, WhatsApp, and Telegram. The chatbot will be able to receive messages from the customers, respond to them, and store the conversation history in the database.

E-commerce platforms: The AI chatbot software will be able to integrate with popular e-commerce platforms such as Shopify, Magento, and WooCommerce. The chatbot will be able to assist customers with product information, order status, and other e-commerce related queries.

Customer Relationship Management (CRM) systems: The AI chatbot software will be able to integrate with popular CRM systems such as Salesforce, Zoho CRM, and HubSpot. The chatbot will be able to access customer information stored in the CRM system to provide personalized support.

Third-party APIs: The AI chatbot software will be able to integrate with popular third-party APIs such as Google Maps, Weather APIs, and News APIs. The chatbot will be able to use these APIs to provide customers with relevant information.

Natural Language Processing (NLP) libraries: The AI chatbot software should be able to integrate with popular NLP libraries such as spaCy, NLTK, and Gensim. The NLP libraries will be used to understand the customer's queries and respond accordingly.

Services needed: The AI chatbot software will have access to cloud-based services such as Amazon Web Services (AWS) or Microsoft Azure to run the application.

Nature of communications: The communication between the AI chatbot and the customers will be real-time, secure, and reliable. The chatbot will be able to handle multiple customer requests simultaneously.

Application Programming Interface (API) protocols: The AI chatbot software will have a detailed API documentation that describes the protocol for communication with other applications and services. The API protocol will be well-defined, secure, and scalable.

Input data items or messages include user inputs such as text, voice, or other forms of communication. The purpose of these inputs is to provide the chatbot with the necessary information to respond to the user's request or inquiry.

Output data items or messages include the chatbot's responses or actions. These outputs are the result of the chatbot's processing of the user's input and may include text, voice.

3.4 Communications Interfaces

Text-based interface: This interface allows users to interact with the chatbot using text inputs such as through a chat window or messaging platform.

Voice-based interface: This interface allows users to interact with the chatbot using voice inputs such as through voice commands or speech recognition.

Visual interface: This interface allows users to interact with the chatbot using visual inputs such as through a visual interface, display, or video call.

Application programming interface (API): This interface allows the chatbot to communicate and exchange data with other software components or applications.

Social media interface: This interface allows the chatbot to interact with users through social media platforms such as Facebook or Twitter.

Web-based interface: This interface allows users to interact with the chatbot through a web-based interface or website.

E-mail: If the chatbot is required to send or receive e-mails, the format of these e-mails should be defined, along with any specific requirements for e-mail functionality, such as attachments or links.

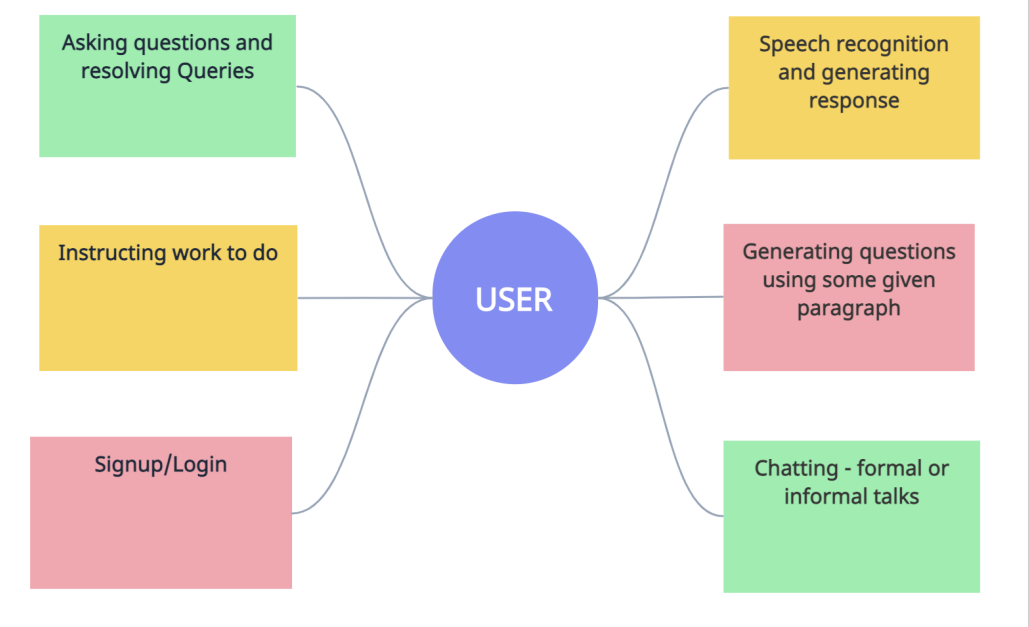
Web browser: If the chatbot is accessed via a web browser, the requirements for the web interface should be specified, including any specific functionality that is required, such as the ability to display images or play videos.

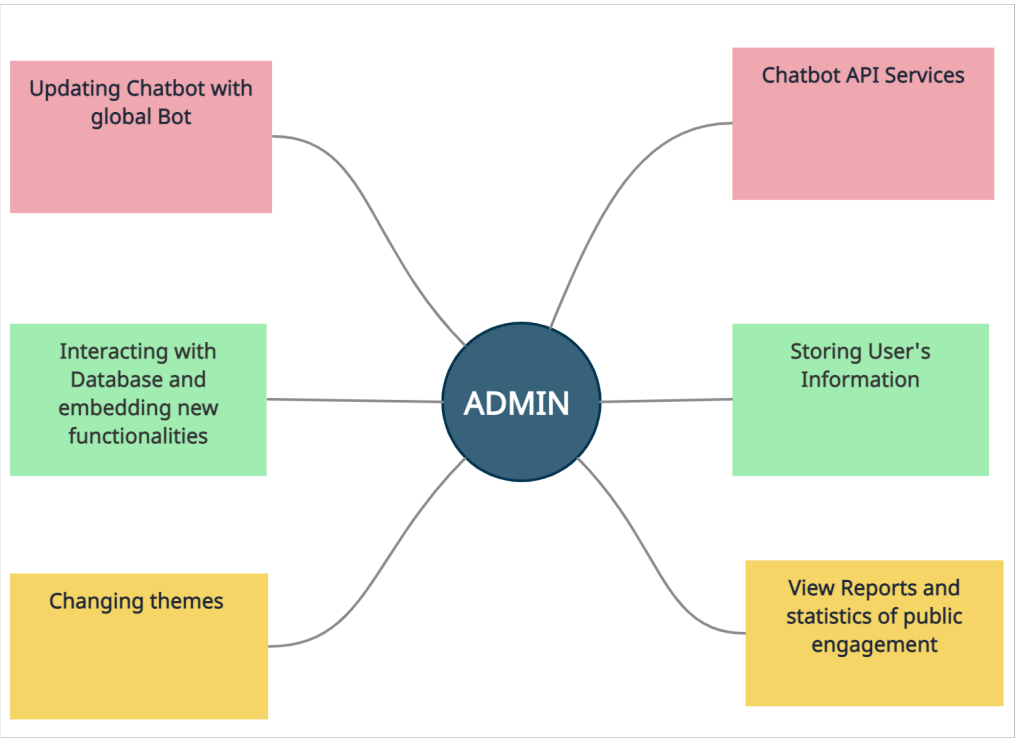
Network server communications protocols: If the chatbot needs to communicate with other servers or applications, the specific communication protocols that will be used should be defined, along with any security or encryption requirements.

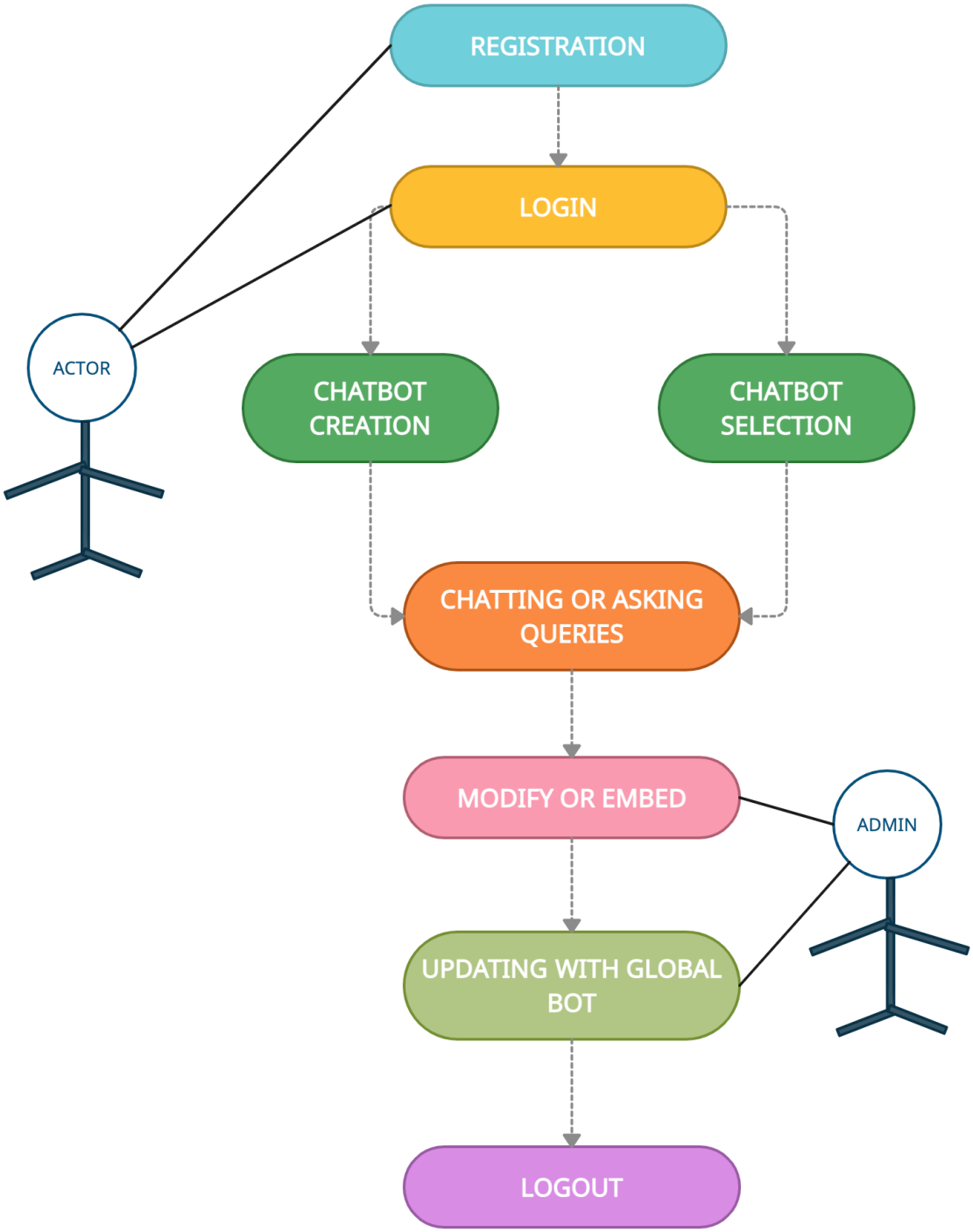
Message formatting: The format of the messages that are sent and received by the chatbot should be specified, along with any requirements for message validation, error handling, and so on.

Communication standards: The specific communication standards FTP AND HTTP both can be used.

4. System Use Cases






REGISTRATION
LOGIN
ACTOR
CHATBOT CREATION
CHATBOT SELECTION
CHATTING OR ASKING QUERIES
MODIFY OR EMBED
ADMIN
UPDATING WITH GLOBAL BOT
LOGOUT

4.1 Use case name and identifier

1. **Actor :** This represents the user or external system that interacts with the chatbot.
2. **System :** This represents the chatbot and its associated components.
3. **Use Case** : This represents a specific interaction between the actor and the system, such as asking a query, accessing the information or resolving a customer service issue.
4. **Connection Line :** This represents the flow of interaction between the actor and the system, including any decisions, conditions and loops.

ACTOR : Customer

SYSTEM : Chatbot

4.2 Asking a Query (Use Case : 1)

- Customer initiates the interaction with the chatbot
- Chatbot greets the customer and asks for the task to be done
- Customer chooses to ask a query
- Chatbot searches for the best match and generate the response and solve the query
- Customer selects one of the response or regenerate it if unsatisfied
- Chatbot confirms the response or regenerate it as instructed by the customer

4.3 Accessing Information (Use Case : 2)

- Customer initiates the interaction with the chatbot
- Chatbot greets the customer and asks for their information request
- Customer provides information about their desired response
- Chatbot searches for the information and presents it to the customer
- Customer acknowledges receipt of the information

4.4 Resolve Customer Service Issue(Use Case : 3)

- Customer initiates the interaction with the chatbot
- Chatbot greets the customer and asks for their customer service issue
- Customer provides information about their issue to be resolved by chatbot
- Chatbot searches for the solution and presents it to the customer
- Customer acknowledges receipt of the solution or requests further assistance if unsatisfied

5. Specific & Other Non-functional Requirements

5.1 Performance Requirements

- **Accuracy:** The chatbot's responses should be accurate and relevant to the user's requests.
- **Speed:** The chatbot should respond to the user's requests in a timely manner, ideally within seconds.
- **Scalability:** The chatbot should be able to handle a large number of concurrent users and requests.
- **Robustness:** The chatbot should be able to handle unexpected or incomplete user input, and provide meaningful responses even in cases of uncertainty.
- **Natural Language Processing (NLP) Capabilities:** The chatbot should have strong NLP capabilities, including the ability to understand and generate natural language text.
- **Context Awareness:** The chatbot should be able to maintain context across multiple interactions with the same user, and provide relevant responses based on the current context.
- **Personalization:** The chatbot should be able to personalize its responses based on the user's preferences and history.
- **Data Security:** The chatbot should have appropriate measures in place to protect the privacy and security of user data.
- **User Experience:** The chatbot's interface and user experience should be intuitive and user-friendly.
- **Integration:** The chatbot should be able to integrate with other systems and databases as needed.

5.2 Safety Requirements

Some of the key safety requirements include:

- **Data privacy and security:** Chatbot collect, store, and process a large amount of personal information, so it is essential to ensure that all data is protected from unauthorized access and theft.
- **Explainability and transparency:** Chatbot should provide clear and concise explanations of how they arrived at their decisions and responses, allowing users to understand the reasoning behind them.
- **Ethical considerations:** Chatbot must comply with ethical principles such as non-discrimination, fairness, and accountability, and they must be designed to prevent any form of harm or abuse.

- **Human oversight:** Chatbot should be designed with human oversight mechanisms in place, allowing human operators to intervene when necessary and to monitor their performance.
- **Accuracy and reliability:** Chatbot should provide accurate and reliable responses to user queries, and they should be tested and validated to ensure their performance and reliability.
- **Compliance with regulations:** Chatbot must comply with relevant laws and regulations, such as data protection laws and privacy regulations.
- **Continual monitoring and improvement:** Chatbot should be continually monitored and improved to ensure their performance and to address any issues that arise.

5.1 Security Requirements

- **Data encryption:** All sensitive information processed and stored by the chatbot should be encrypted to prevent unauthorized access and theft.
- **Access control:** Access to the chatbot's data and functionality should be restricted to authorized users only, and permissions should be carefully managed and monitored.
- **Authentication and authorization:** The chatbot should implement secure authentication and authorization mechanisms to ensure that only authorized users can access its functionality and data.
- **Vulnerability management:** The chatbot should be regularly tested for vulnerabilities and patched promptly to prevent potential security breaches.
- **Incident response plan:** The chatbot should have a well-defined incident response plan in place to respond quickly and effectively to any security incidents that may occur.
- **Regular security audits:** Regular security audits should be conducted to identify and address potential security risks and to ensure that the chatbot's security posture remains robust.

5.4 Software Quality Attributes

Software quality attributes are important considerations for chatbots to ensure that they are effective, efficient, and user-friendly. Some of the key software quality attributes for AI chatbots include:

- **Usability:** Chatbot should be easy to use and navigate, with a user-friendly interface and clear, concise, and relevant responses.
- **Performance:** Chatbot should respond promptly to user requests, with fast query processing times and low latency.
- **Scalability:** Chatbot should be designed to scale to accommodate increasing user traffic, data volumes, and complexity.
- **Reliability:** Chatbot should be designed to be highly reliable, with minimal downtime and minimal risk of data loss or corruption.
- **Maintainability:** Chatbot should be designed to be easy to maintain, with well-documented code, clear and concise design, and modular architecture.
- **Security:** Chatbot should be secure, with robust security measures in place to protect sensitive information and prevent unauthorized access.
- **Privacy:** Chatbot should be designed to protect user privacy, with robust data privacy and security measures in place.
- **Compliance with regulations:** Chatbot should comply with relevant laws and regulations, such as data protection laws and privacy regulations.

6. Other Requirements

- **Natural language processing (NLP):** Chatbot should be equipped with advanced NLP capabilities to enable them to understand and respond to user requests in natural language.
- **Knowledge base:** Chatbot should have a comprehensive and up-to-date knowledge base that enables them to provide accurate and relevant responses to user queries.
- **Machine learning (ML):** Chatbot should be equipped with machine learning algorithms to enable them to continually improve their performance and adapt to changing user needs and expectations.
- **Integration with other systems:** Chatbot should be designed to integrate with other systems, such as customer relationship management (CRM) and enterprise resource planning (ERP) systems, to provide a seamless user experience.
- **User analytics:** Chatbot should be equipped with user analytics capabilities to enable them to track and analyze user interactions, identify trends and patterns, and improve their performance over time.

- **Customization options:** Chatbot should be customizable to allow organizations to tailor their functionality and appearance to meet their specific needs and requirements.

- **Continuous improvement:** Chatbot should be designed with a focus on continuous improvement, with regular updates and enhancements to improve their performance and user experience.

7. System Requirements Chart

Requirement	Description
Operating System	The Chatbot should run on a supported operating system, such as Windows, Linux, or macOS.
Processor	The Chatbot should have a processor with sufficient processing power to handle the workload.
Memory	The Chatbot should have enough memory to support its operations and ensure good performance.
Storage	The Chatbot should have sufficient storage to store its knowledge base, user data, and other information.
Network Connectivity	The Chatbot should have a stable network connection to allow it to communicate with other systems and access its knowledge base.
Natural Language Processing (NLP)	The Chatbot should have advanced NLP capabilities to enable it to understand and respond to user requests in natural language.
Machine Learning (ML)	The Chatbot should be equipped with machine learning algorithms to enable it to continually improve its performance and adapt to changing user needs and expectations.
Integration with Other Systems	The Chatbot should be designed to integrate with other systems, such as customer relationship management (CRM) and enterprise resource planning (ERP) systems, to provide a seamless user experience.
User Analytics	The Chatbot should be equipped with user analytics capabilities to enable it to track and analyze user interactions, identify trends and patterns, and improve its performance over time.
Customization Options	The Chatbot should be customizable to allow organization to tailor its functionality and appearance to meet their specific needs and requirements.

Appendix A: Analysis Models

CHATBOT ARCHITECTURE