GENERATIVE AI-BASED CHATBOT FOR EMPLOYEE AND CUSTOMER SUPPORT AUTOMATION IN LOLC COMPANY

Project ID: R25-036

Project Proposal Report

Kuruppu K.A.V.U - IT21315282

Supervisor: Prof. Nuwan Kodagoda

Co-supervisor: Dr. Lakmini Abeywardhana

BSc (Hons) in Information Technology
Specializing in Software Engineering

Sri Lanka Institute of Information Technology

Faculty of Computing

Department of Software Engineering

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Declaration

I declare that this is my own work, and this proposal does not incorporate without acknowledgement any material previously submitted for a degree or diploma in any other university or Institute of higher learning and to the best of our knowledge and belief it does not contain any material previously published or written by another person except where the acknowledgement is made in the text.

Name	Student ID	Signature	Date
Kuruppu K.A.V.U	IT21315282		27/1/25

	Title	First Name	Last Name	Signature	Date
Supervisor	Prof.	Nuwan	Kodagoda		19/1
Co-Supervisor	Dr.	Lakmini	Abeywardhana		27/1/25

Abstract

Managing employee and customer queries efficiently is a pressing challenge for organizations like LOLC Bank, where decentralized systems result in communication delays, increased operational costs, and reduced productivity. The purpose of this study is to address these challenges by developing a Generative AI-based chatbot that automates employee and customer support processes. This research investigates the inefficiencies of the current system and explores solutions for streamlining communication and automating repetitive tasks through AI-driven technology [1].

The main goal of this research is to create a chatbot that synchronizes well with LOLC internal procedures and responds to inquiries immediately while performing other repetitive tasks. The chatbot will be a centralized system that will provide the users with relevant and context sensitive information to minimize the workload and improve interaction and communication. Some of these are the ability to build a better interface by creating an avatar, building and updating a central and easily scalable knowledge base, the ability to generate responses with the help of artificial intelligence, and integration with internal forms and systems.

One of the major parts of the work is to incorporate an autofill feature that utilizes conversation with the user in order to fill forms. This feature is to reduce the amount of work done by the users, reduce errors and make the process of executing certain tasks such as submitting requests or getting information faster.

The proposed chatbot is expected to increase the efficiency of LOLC Company, decrease the time taken to solve queries and, in the process, increase user satisfaction thus allowing employees to attend to core business responsibilities thereby increasing productivity in the workplace.

Key Words: *Natural Language Processing, Form Filling Automation, Large Language Models, Conversational Form Filling*.

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List of Abbreviations

IT – Information Technology

AI – Artificial Intelligence

LOLC – Lanka ORIX Leasing Company

NLP – Natural Language Processing

LLM – Large Language Model

RAG – Retrieval-Augmented Generation

NLTK – Natural Language Toolkit

BERT – Bidirectional Encoder Representations from Transformers

NER – Named entity recognition

UI – User Interface

1. Introduction

1.1. Background

Today, organizations depend on online forms to collect information and handle service requests in the contemporary environment. However, form-based interfaces, a normality in most applications, pose serious usability problems. A broad survey concluded an array of frustrating experiences with confusing forms that users inevitably fill out incorrectly or not at all [2]. Further research conducted showed that 81% of users have left forms mid-completion when using the Internet, and that this was motivated majorly by issues of form complexity and confusion [3].

Technology is a core aspect of improving the quality of business transactions especially in reducing the effect of errors in business processes. In the words of Bataev and Davydov (2020), the integration of automation systems can greatly enhance the productivity of an enterprise through the reduction of manual work, exclusion of possible discrepancies, as well as the improvement of the general usability and experience for users [4]. In the context of customer service, automating the form filling process not only provides speed to interactions but also provides accuracy to the company which in return helps in providing better support services with time and money efficiency.

Conversational AI-based automated form-filling systems are gradually becoming innovative means of improving customer service. These systems help in cutting down the amount of work done by the users and improve the quality of the work by allowing the users to input information in form of natural language. The idea of this project is to design a conversational chatbot that can adaptively complete the form according to the customer interaction and is implemented in the context of IT support customer service.

This research is designed to go beyond the simple automation of the form filling process while also improving the flexibility and context sensitivity of the chatbot, making the experience more personal and engaging for the user. Thanks to the progress in NLP and machine learning the system will be able to interpret different user inputs. The expected result is to achieve a system that will increase customer satisfaction due to decreased errors and abandonments rate as well as help organization to improve IT support services, hence increasing efficiency.

1.2. Literature Review

The following literature survey is designed to review the previous studies and their methods and approaches to overcome the issues related to the AI based conversational automated form-filling system.

A research study titled “Exploring Large Language Models and Retrieval Augmented Generation for Automated Form Filling” [5]. This research uses LLMs, GPT-3.5 in particular, together with Retrieval-Augmented Generation (RAG) for filling forms with appropriate output that is sensitive to the context of the input form. This is in reference to general purposes forms with integration to the real time web through a browser extension. RAG was employed in order to improve the model’s context awareness, and the quality of the outputs was measured using BERT Score and G-EVAL. However, it is not specific to domains and does not include, for instance IT support workflow. It also offers very little in the way of unscripted conversational input, or free-form user engagement. In addition, multilingual and accessibility features are not discussed. The knowledge of LLMs and RAG lays the ground for conversational understanding and will be further expanded to IT-related situations in the present work.

Another Research related to the automated form-filling domain” Automated government form filling for aged and monolingual people using interactive tool” This work aims at developing a Kannada voice-based chatbot known as ‘Dhvani’ for filling up government forms for aged and monolingual users [6]. The system is developed on Rasa framework and has the knowledge graph for scheme eligibility while voice interactions are used for accessibility. However, the system is restricted to one regional language, Kannada, and has less dynamic or flexible workflow than the true human brain. Also, it depends on the availability of the internet connection and does not provide regression for free form inputs. While the work is very general and makes use of easily understandable examples, it does not scale well for technical fields such as the IT help desk which the proposed research will seek to apply.

A previous work called “Bot Form Filler” chatbot using Python to fill the forms is implemented with the help of libraries such as NLTK, spaCy & Selenium that are tailored for general-purpose web forms. Intent recognition and entity extraction are realized with traditional NLP approaches; Selenium is used for form filling [7]. However, the system is useful, it has a simple approach and does not support much of conversational inputs. It does not incorporate the features of advanced LLMs or domain specialties. The basic structure can be modified and implemented with further advanced NLP, and context awareness to meet the IT support scenarios.

A study titled “An Intelligent Framework for Auto-Filling Web Forms” This framework employs context-aware solutions to predict and automatically fill web forms by employing clustering algorithms and analyzing user’s interactions. In addition, such contextual information as locations, calendars, and semantic grouping of components are applied to increase the accuracy [8]. However, the framework deals only with the structured data, and it does not have an element of real-time conversation. It is not tailored for domain specific processes and does not include provisions to deal with free text input, it does not include provisions for post-correction or

feedback mechanisms. These contextual mechanisms may help to spur improvements in real-time or dynamic adaptation and work processes in the proposed work.

Another related work, “Artificial Intelligence Agent for Contextual Guidance in Form Filling” [9], demonstrates the approaches to use semantic and structural analysis along with adaptive learning to help users to complete the enterprise forms. The study presents an AI agent that uses natural language processing, named entity recognition, and dynamic knowledge base to offer real time assistance, identify errors and validate forms. Despite the contextual awareness and personalization, the system is missing an autofill feature that automatically fills in forms based on the user’s inputs or past data. In addition, the research does not cover conversational interfaces and is devoted to enterprise workflows, which prevents it from being used in unsupervised user interactions. Such restrictions explain the necessity of developing an AI-based form-filling system for IT support, in which the focus should be made on the dynamic conversation and contextual autofill capabilities.

The following research aims to fill these gaps by developing a new domain-specific conversational AI chatbot for IT support and requests cases. Based on the advanced LLMs, improved NLP approaches, and context-sensitive mechanisms, the system is expected to deliver real-time conversational support, increase the quality of data entry, and facilitate the completion of forms, and address accessibility and user experience.

2. Research Gap

Table 1 COMPARISON BETWEEN EXISTING SYSTEMS

Features	Research A (Bot Form Filler)	Research B (KB +Automated Form Filling)	Research C (Automated government form filling language Kannada)	Research D (auto-filling web forms from different web)	Research E (AI agent Contextual Guidance in Form Filling)	Propose System
Conversational Form Filling	✓	✓	✓	✗	✓	✓
Conversational NLP for Intent Extraction	✓	✓	✓	✗	✗	✓
Contextual Form Filling	✗	✓	✗	✓	✓	✓
Form Analysis	✗	✗	✗	✗	✓	✓
Auto Filling Feature	✓	✓	✓	✓	✗	✓
Handling of Complex Workflows	✗	✗	✗	✗	✗	✓
Real-Time Form Adaptation (IT,HR)	✗	✗	✗	✗	✗	✓

This research extends the work in prior studies to overcome their limitations and future work, introducing significant advancements to automated form filling systems. However, existing systems do not have dynamic form adaptation, where form structures change in real time in response to user input and selection. To address this gap, the proposed system is able to dynamically adapt to user actions, and supports personalized workflows that can handle complex structures, such as multiple selection options, radio buttons, and conditional dependencies. Furthermore, while previous work has been concerned with basic form fields and generic use cases, this research focuses on the domain specific needs of IT support and request management. The system incorporates advanced adaptability and tailored workflows to enable natural interactions with forms that are not well explored in the previous work in the context of IT related scenarios. In addition to resolving current limitations, these innovations also meet the

future directions suggested by previous research, for example, in form complexity handling and domain specific solutions.

The proposed system's purpose is to bring conversational AI, context-aware processes, and real-time IT support and HR adaptation to automate the form-filling process. The present automated form-filling chatbot is intelligent, efficient, and based on the latest NLP, LLM, and context-based approaches to provide a domain-specific solution. The system is expected to accommodate complicated processes, enhance the flow of the user interface and respond effectively to the inputs that the users feed into the system, especially in such sectors as IT and human resources.

3. Research Problem

As for the service request forms at LOLC, users are in a way challenged when it comes to filling them due to confusion, lack of knowledge or ignorance of the information that is required. This leads to time loss, delays and at times incomplete or wrong documents being submitted to the intended recipients. Manual creation of forms is still a practice, which contributes to extra time and effort needed to fill in service requests. A study pointed out that form complexity affects the level of frustration of the users and there are typical mistakes that people make when filling forms, such as not reading the instructions, not being detailed enough and not explaining the importance of the project [10], [11]. In the same manner, form filling is always regarded as a task that consumes much time and is boring [3], [2], which results in incomplete or incorrect data entries submissions.

A survey found that 81% of people discontinue filling out an online form midway through the process, and 67% of those who encounter difficulties abandon the process entirely [12]. In the business world, forms are crucial for organizing and standardizing data, with 59% of U.S. workers regularly required to use forms in their jobs [13].

The overall rates of form abandonment are increasing because of several reasons such as complicated and long forms, where the users spend much time and the forms are complex, and where the users are not very sure of the information, they require to fill in the form they end up filling the wrong information.

As requested by LOLC, the goal is to develop a solution that not only simplifies the form-filling process but also facilitates faster completion when users are unsure of what information is required. This research recommends creating a conversational AI-based chatbot integrated into the IT support form submission system. The chatbot will assist users by identifying the required information through conversation and utilizing a knowledge base when necessary. This solution will help complete the necessary fields, improving the quality and completeness of the input data, and reducing the time users spend on the forms.

The main goal of the current research is to contribute to the optimization of the form-filling process, decrease the time spent on it, and increase the level of user satisfaction through the facilitation of interaction. In order to reduce the number of errors made by users while filling in

the forms and to reduce the cases of form abandonment, the study aims to improve the efficiency of the IT support system through developing a conversational AI chatbot.

4. Objectives

4.1. Main Objective

The research objectives are realistic and specific targets that put into words what the research project seeks to accomplish. These are the objectives of the research, and all objectives should be SMART, that is Specific, Measurable, Achievable, Realistic, and Time-bound in order to make assessment of the outcomes easier.

The primary objective of this research project is to design and implement an efficient conversational AI-based chatbot tailored for IT and HR support. The system aims to automate the form-filling process, reducing time consumption, errors, and user frustration while maximizing the accuracy of form submissions and ensuring high form completion rates.

The proposed system seeks to develop and integrate chat-based UI that helps the users to fill the IT and HR support form. It will also be able to scrape information from the user inputs, analyze the intent of the user and fill in the appropriate fields of the form. The extent to which form-filling will be made more efficient through the use of the chatbot will be gained from the time taken by users to fill forms with the chatbot as well as without the chatbot, error rates and user satisfaction before and after the implementation of the chatbot. The realization of a working conversational AI chatbot will be constructed with NLP and LLM based intent extraction and form-filling. Considering the development in NLP and LLMs including GPT-3.5, the system is plausible and implementable, especially at LOLC where there is already workflow and knowledge base within the IT support division. The project is time-bound with the following critical activities aimed at the development of the chatbot and its integration into the system.

4.2. Sub Objectives

Chat UI Design:

- Design a user-friendly chat interface where users can engage with the chatbot in a conversational manner to fill out IT and HR request forms.

Filling the Form Based on a Conversation:

- Develop the system to automatically fill out form fields by extracting the necessary information from a conversation between the user and the chatbot.

Extract Relevant Information (Intent and Keywords):

- Implement NLP techniques to extract key information such as user intent and relevant keywords during the conversation to fill out the required form fields accurately.

Analyze the Form Fields:

- Design a mechanism to analyze form fields and match them with the information provided by the user during the conversation.

Design the Logic for Form Filling:

- Create the logic that will connect the user's input with the corresponding form fields, ensuring the correct data is populated in the right sections.
- Progress Tracking: Keep track of already prompted fields to avoid repetition.

Implement the Form Filling Process:

- Develop the backend logic to handle the automatic population of form fields based on the analyzed data from the conversation.

Populate the Form Fields and Automate Form Filling:

- Complete the system by enabling the full automation of form filling, reducing manual intervention, and improving the accuracy of data entry.

Validation Process:

- Implement a validation mechanism to check for missing or incomplete fields after the form is filled.
- Prompt the user to provide the missing information if any fields are incomplete, using a conversational approach to ensure clarity.
- If the user cannot provide the necessary details, offer the option to escalate the issue to an agent for support.

Final Submission:

- After validating the form and ensuring all required fields are filled, submit the form automatically to the system.

5. Methodology

5.1. Requirement Gathering

To get the most detailed information about the system's form structure to be able to effectively gather requirements for the integration of the Generative AI-Based Chatbot with LOLC Company's IT Support Ticketing System, we need to know what is the structure of the form. Close collaboration with LOLC IT team to analyze the forms, understand the design, fields and functionality of the forms. Also engaging with the supervisor, co supervisor and with the SLIIT research team to get valuable insights, share ideas and ensure alignment with the project's objectives is part of the process. Such collaboration will also facilitate the identification of key features, challenges and opportunities that will enhance the project's objectives.

5.2. System Diagram

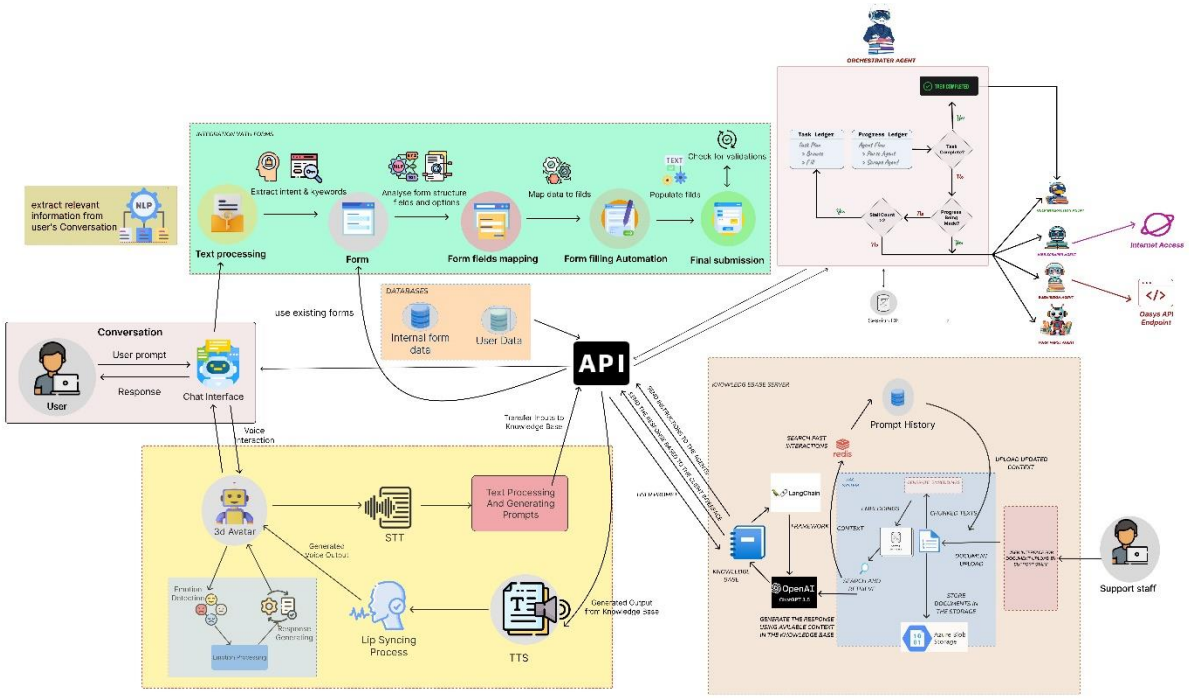

Figure 1: System Diagram

5.3. Individual System Diagram

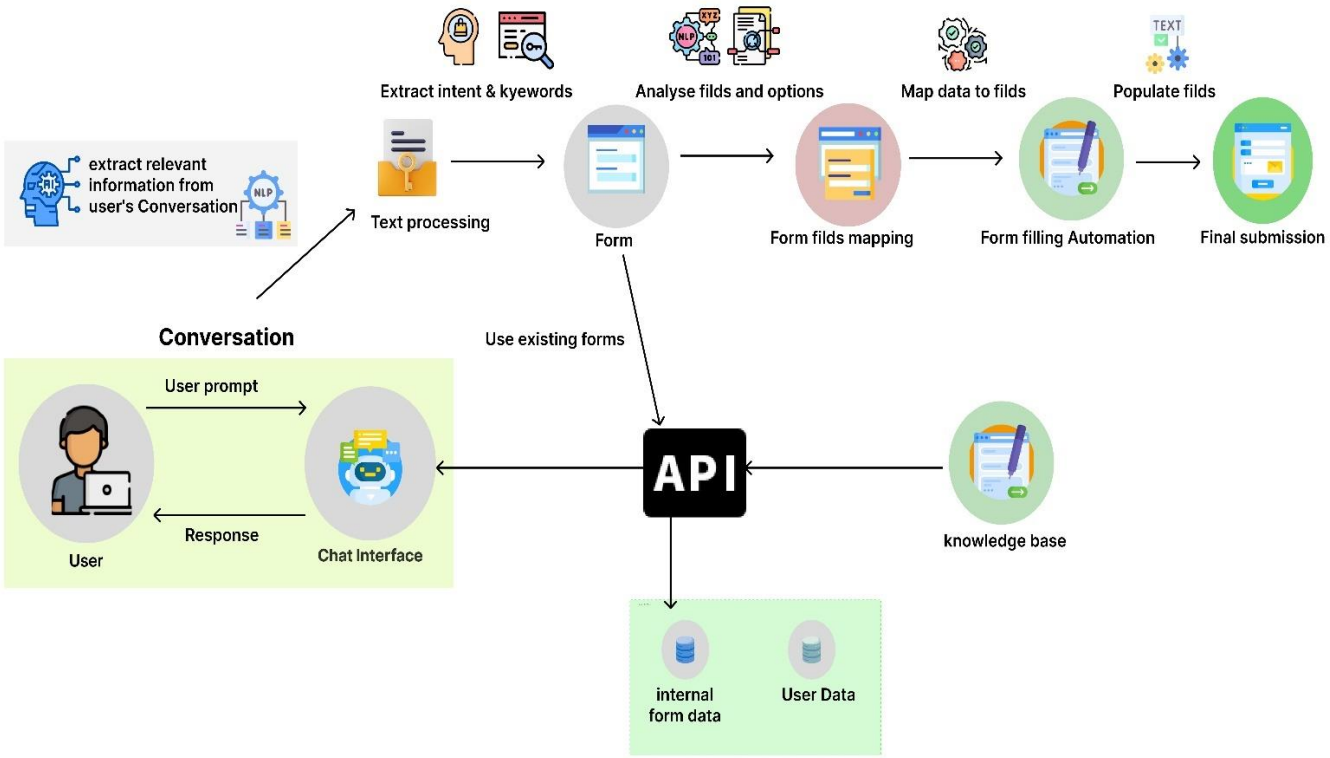

Figure 2:Individual System Diagram

Extract Intent and Keywords from User Conversations

The first step in the process is to extract the intent and keywords from user conversations. This involves understanding what the user wants to achieve (intent) and identifying the critical pieces of information (keywords) necessary to populate the form. The system preprocesses the user input by cleaning and tokenizing the text, then uses a classification model to determine the intent. For instance, when a user says, "My mouse is not working," the system identifies the intent as "Report Hardware Issue" and extracts keywords like "mouse" and "not working." Ambiguities are handled by generating clarifying questions, ensuring accurate understanding of the user's needs.

Form Understanding and Analysis

In this step, the system analyzes the form to understand its structure and content. This includes parsing the form to identify field types (e.g., text, dropdown, radio buttons) and analyze dependencies between fields and underlying conditional logic (for example, if X is selected, then display field Y, etc.). Techniques such as named entity recognition (NER) can be used for this

purpose and extracting metadata such as field labels, options, and instructions. NLP techniques are used for semantic analysis to comprehend the meaning of field labels and their synonyms. Additionally, the system identifies dependencies and conditional logic between fields. For example, if a user selects “IT” in the “Request Type” dropdown, additional fields like “Hardware” or “Software” may appear. The system stores this information in a structured format, such as JSON, to enable dynamic adjustments during the form-filling process.

Automate Form Filling

After extracting user intent and analyzing the form, the system dynamically populates the form fields. It maps the extracted intents and keywords to the corresponding fields. For instance, the intent “Report Hardware Issue” maps to the “Request Type” field with the value “IT,” and the keywords “mouse” and “not working” populate the “Description” field. The system dynamically adjusts to changes in the form structure, ensuring all dependencies are respected. If required fields lack information, the chatbot prompts the user for additional data. For example, if the “Device Name” field is empty, the system asks, “What is the name of the device?” Once all fields are populated, the system validates the inputs and submits the form.

6. Project Requirements

6.2. Functional requirements

1. **Extract Intent and Keywords from User Conversations:**
   - Use NLP techniques to identify the user's intent (e.g., "Report Hardware Issue") and extract relevant keywords (e.g., "mouse").
   - Train or fine-tune a machine learning model for intent detection (such as BERT).

2. **Form Understanding and Analysis:**
   - Analyze form fields dynamically using tools like Selenium or Puppeteer.
   - Understand field types (text, dropdown, radio buttons) and conditional logic (e.g., if "IT" is selected, show "Category").
   - Perform semantic analysis on field labels and instructions to map data accurately.

3. **Automate Form Filling:**
   - Map data to fields.
   - Match extracted keywords with corresponding form fields.
   - Populate form fields programmatically using extracted data.
   - Handle dynamic forms that change based on user input.

4. **Validation Process:**

   - Field Completion Check: After populating the form, validate that all required fields are filled.

- Prompt for Missing Data: If any fields are incomplete, prompt the user to provide the missing information conversationally.
- Escalation to Support: If the user cannot provide the missing information, escalate the task to agent for assistance.
- Cross-Validation: Ensure the correctness of populated fields by comparing the user's input against the form's expected data format or constraints.

6.2. Non-functional requirements

- **Accuracy**: Ensure the intent and keyword extraction achieves a high precision rate.
- **Real-Time Response**: The system should respond instantly to user inputs and fill the form dynamically.
- **Scalability**: Support multiple users and varied forms without degradation in performance.
- **Reliability**: Maintain system uptime and accuracy over extended periods.
- **Performance**: Handle form filling efficiently, even for complex or large forms.
- **Availability**: Ensure the system is always accessible for users.
- **Adaptability:** Enable the system to adapt to changes in form structures, user requirements, and environmental factors with minimal reconfiguration**.**

6.3. User requirements

The system should cater to the following user needs:

Seamless Form-Filling Experience:

- Automate the process of form filling based on conversational inputs, minimizing manual efforts.
- Ensure the process is smooth and intuitive for users without requiring technical knowledge.

Error Reduction:

- Reduce errors in form submissions by validating and auto-populating fields based on extracted data.
- Highlight ambiguous or incomplete fields and prompt the user for clarification or additional information.

Dynamic Adaptation:

- Handle dynamically changing forms that update based on previous selections (e.g., conditional dropdowns or additional fields).
- Adapt to various form structures and layouts seamlessly.

Improved Efficiency:

- Streamline form-filling processes, saving users time and effort.
- Ensure high-speed responses and near real-time auto-filling of form fields.

6.4. Tools and Technology

- Natural Language Processing Models (BERT/ spaCy)
- Form Filling Automation (Selenium / Puppeteer / BeautifullSoupUI)
- Python Flask
- TensorFlow
- Docker

7. Work Breakdown Structure

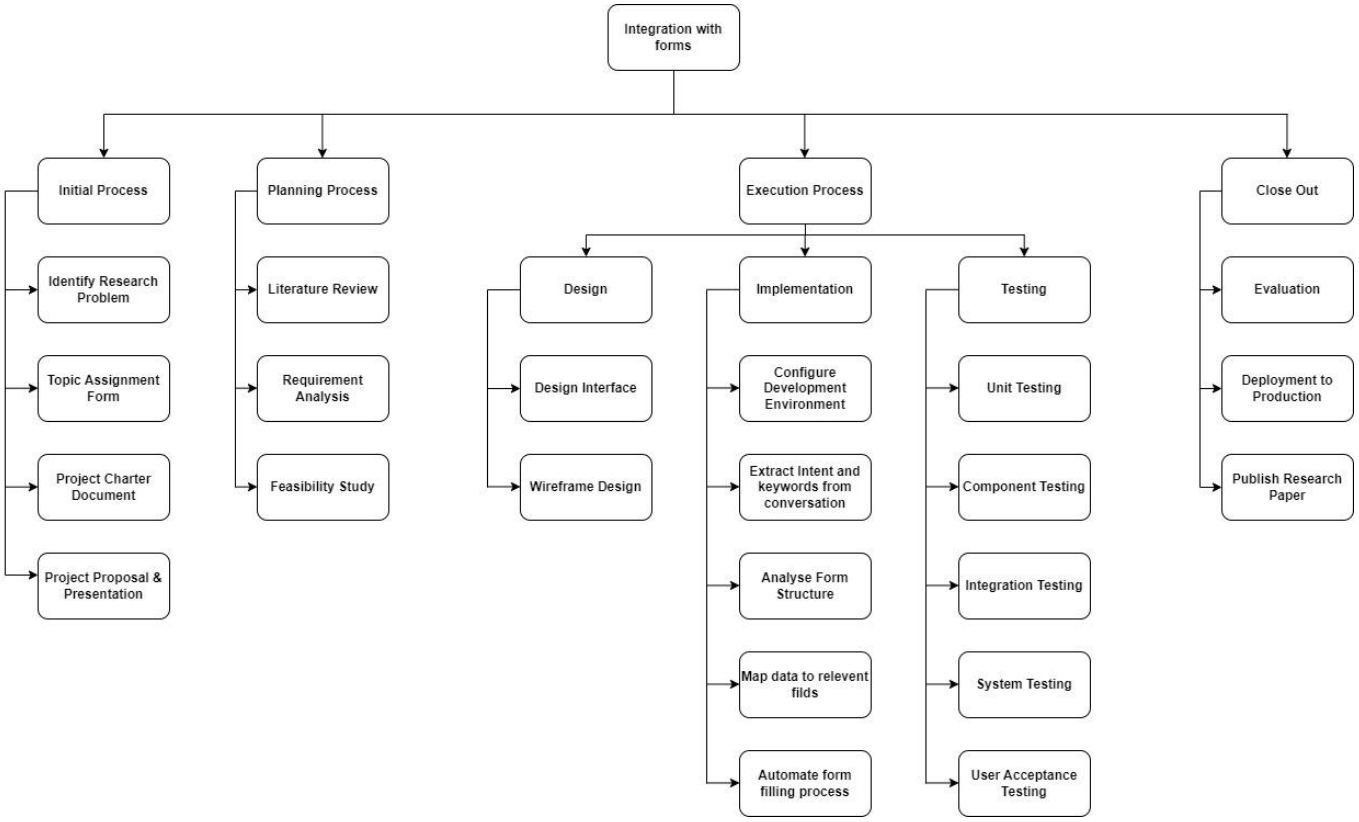

Figure 3 : Work Breakdown Structure

8. Gantt Chart

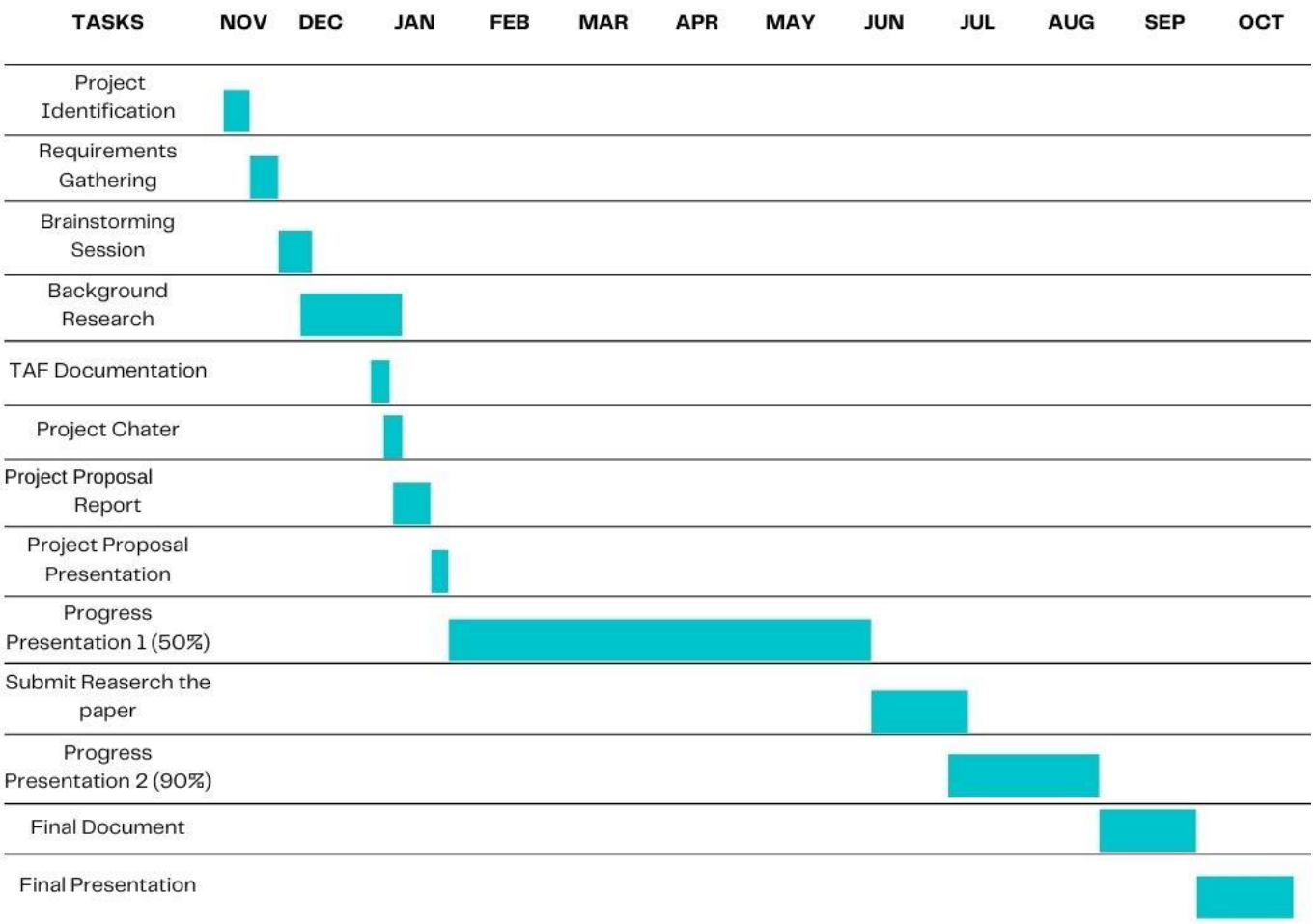

Figure 4: Gantt Chart

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