

Distributed Health Care Framework for Patient Health Record Management and Pharmaceutical Diagnosis

2022-110



Team Members

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Introductory Video

URL:https://drive.google.com/file/d/1Wdt8wgcw_Ru9F-A5llzTLiP5vOE1RKpd/view?usp=sharing



Introduction

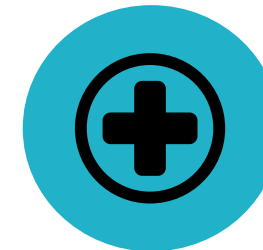


- With the COVID-19 pandemic, the world is confronting various healthcare issues, and healthcare automation is more crucial than ever.
- The pandemic has revealed the limitations of existing digital healthcare systems to handle public health emergencies while maintaining service continuity when people stay at home conducting social distancing.



Research Problem

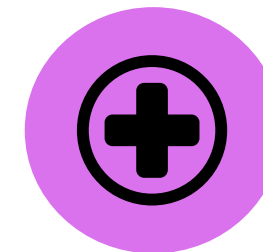
There is no registered population for any health care institution in Sri Lanka, as a result, there is a communication gap resulting in inadequate coordination of care.



EHR (Electronic Health Record) systems are becoming more popular to share patient details between hospitals but accessing scattered data across several EHRs while safeguarding patient privacy remains a challenge.





Research Problem Contd..

Most of these medical records and documents are in printed format and manually entering those into EHR systems is time-consuming and error prone.



Pharmaceutical error is a critical healthcare problem, but it is even riskier to visit doctors for pharmaceutical diagnosis during a pandemic. Healthcare domain is in a need for a conversational agent to give reminders to take medication on time.

Research Gap

Product Name	Securely Store Patient's Data	Access Scattered Data across several EHRs	Scan printed Medical Documents	Drug Identification and give required details(Dosage, Side effects)	Virtual Conversational Medical Chatbot
	✓	✗	✗	✗	✗
	✗	✗	✕	✗	✗
	✗	✗	✗	✕	✗
	✓	✓	✓	✓	✓



Not Present



Partially Present



Present

Main Objective

Solving healthcare issues during COVID-19 by providing a healthcare framework for automatically storing patients' records protecting users' privacy while providing healthcare services like a virtual assistant for pharmaceutical diagnosis for people staying at home conducting social distancing.

Sub Objectives

To protect patients' data privacy while tracking/sharing healthcare records with healthcare professionals.

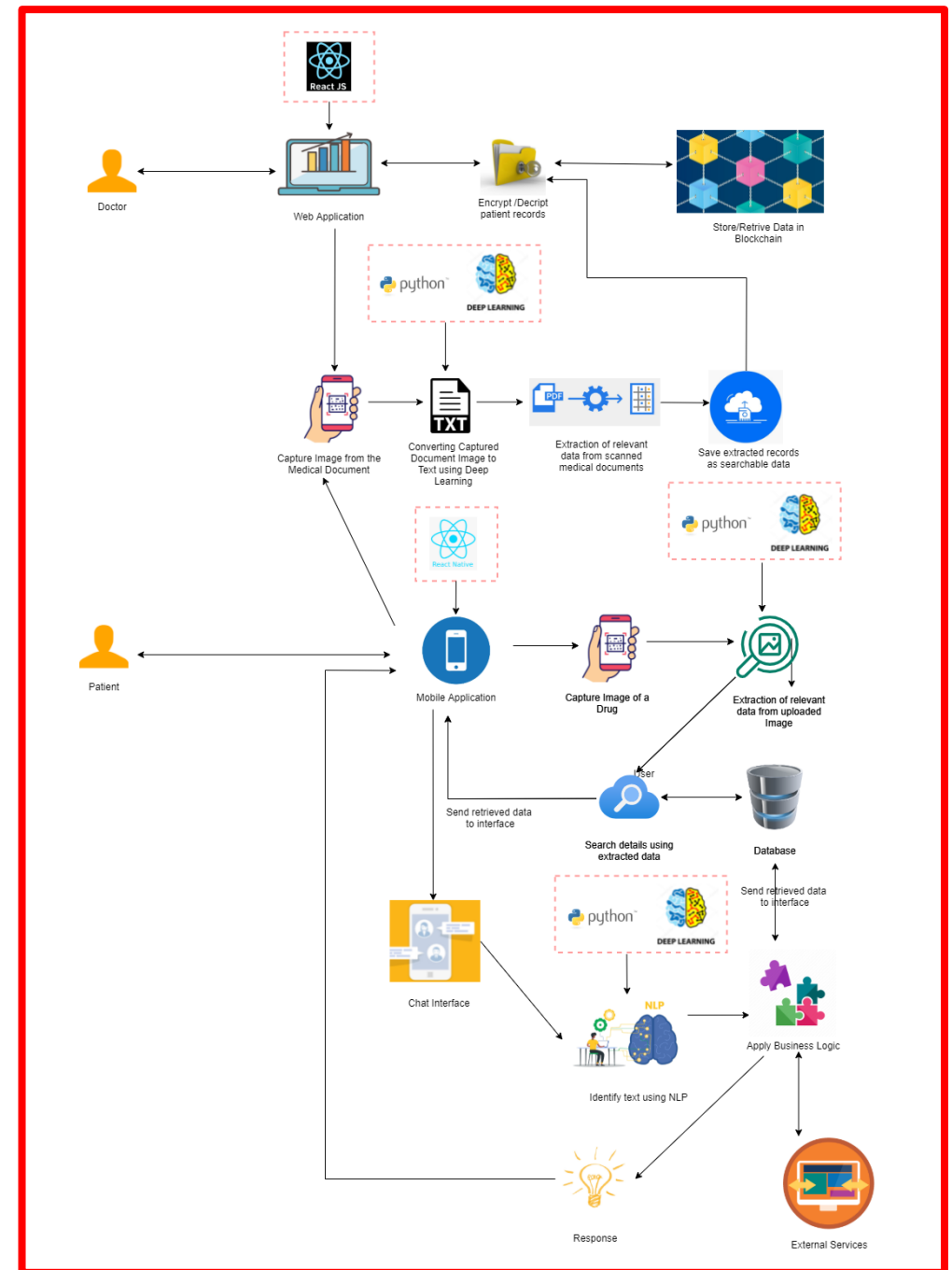
To scan and extract relevant data from Patient Medical Documents using Deep Learning while preventing human errors that cause when manually entering data.

To identify Drugs using Image Processing and extracting pharmaceutical data such as its side effects, dosage, etc.

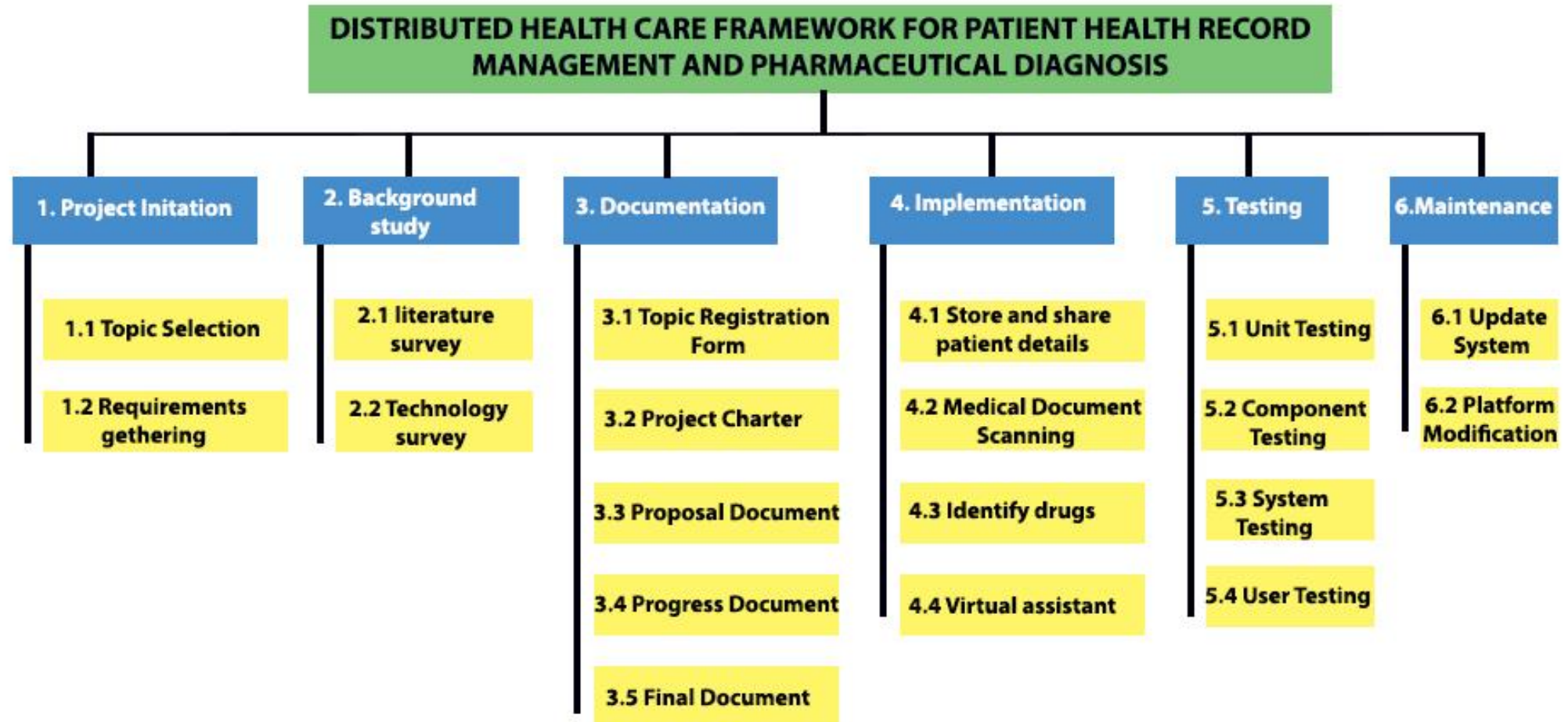
To assist patients with a smart chatbot based on Machine learning and Natural Language Processing for health care assistance



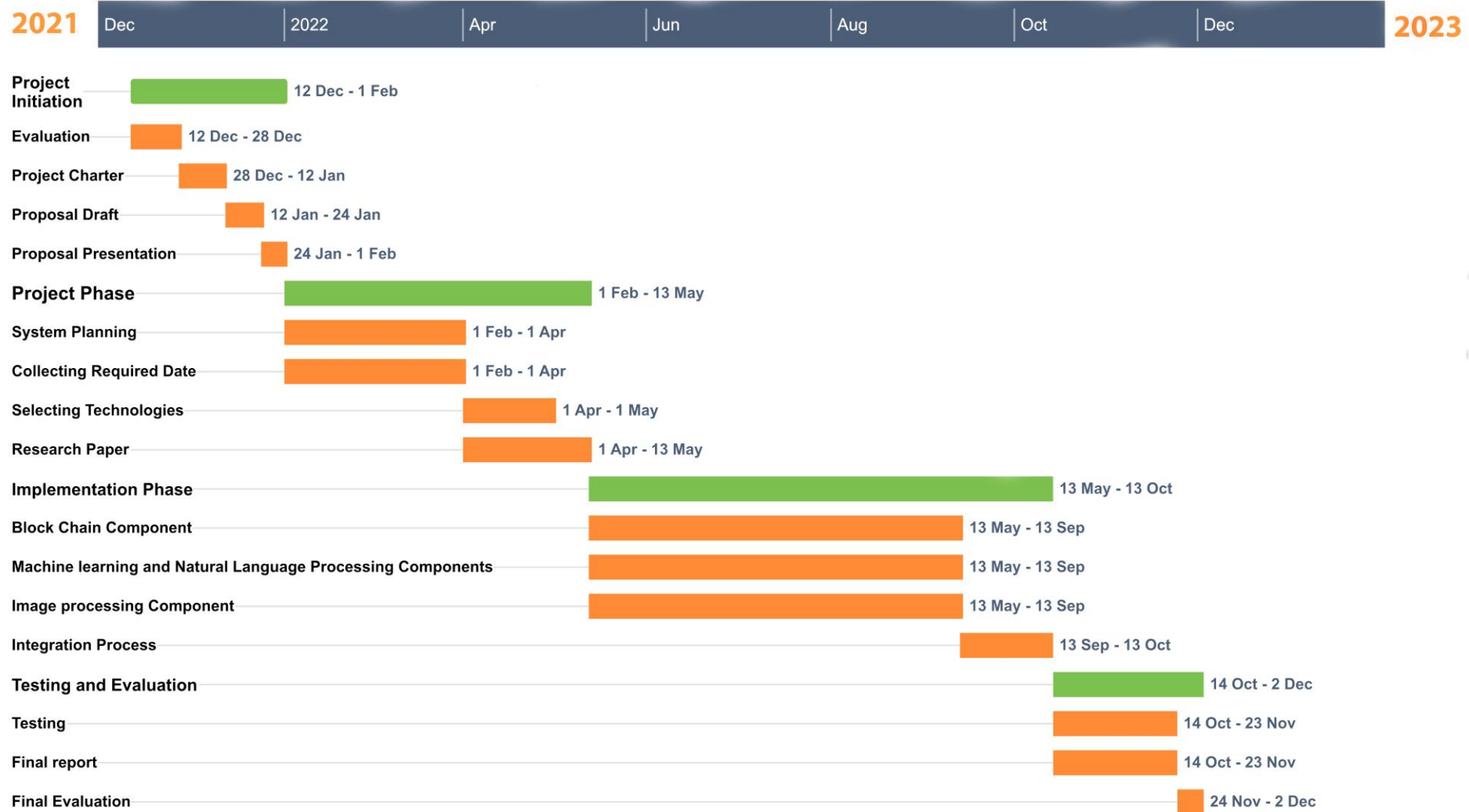
Overall System Diagram



Work breakdown structure



Gantt Chart





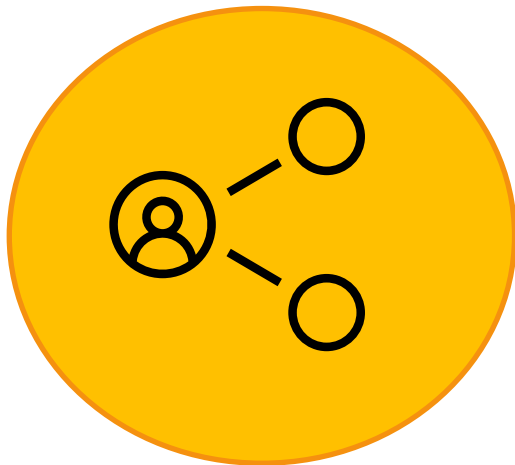
IT19004778 | WICKRAMARATHNA W.G.M.S

Bachelor of Science (Hons) in Information Technology Specializing in Software Engineering

Introduction



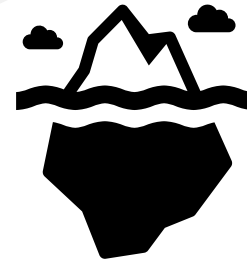
Store patient details in most secure manner



Share patient details with authorized people

**There is no method to
view patients'
medication history**

**Storing patient details
in a secure method**

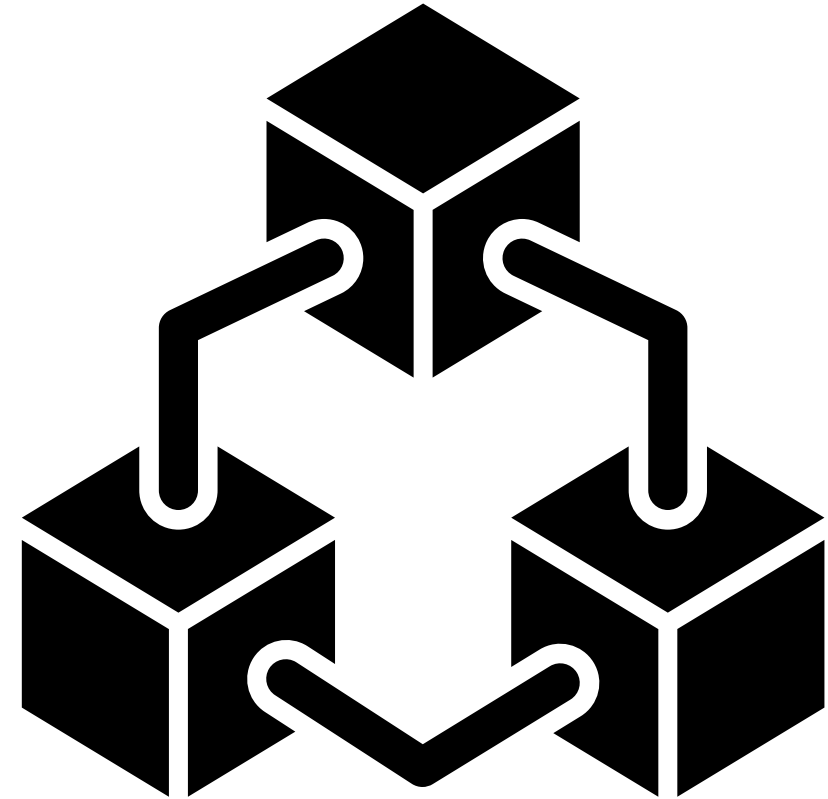


Research Problem

**Sharing patient details
with authorized people**

Research Gap

- There is no much health care product on Blockchain technology
- Most previous research work are for the generic usage, but our solution is designed specifically targeting the healthcare domain
- Use of smart contract technology in Blockchain for automating execution.



Research Gap Contd..

Basis	Private blockchain	Public blockchain
Access	Particular organization or its affiliates who have permission	Anyone
Actors	Familiar	Do not know one another
Consensus	With permission	Permission-less
Data handling	Read and write access for a particular organization	Read and write access for anyone
Efficiency	High	Low
Energy Consumption	Minimal	High
Immutability	Partial	Full
Security	Prone to hacking, manipulation of transactions and stealing of data	Secure
Transaction Cost	Low	High
Transaction Speed	Fast	Slow

Objectives



Main Objective

- To protect patients' data privacy while tracking/sharing healthcare records with healthcare professionals.

Sub Objectives

- Prevent unauthorized access to the system data.
- Use smart contacts to automate the execution
- Prevent unauthorized apply changes to the system data
- Accessible from anywhere

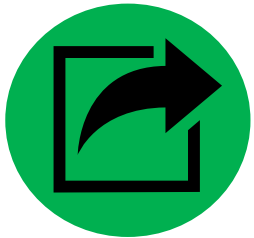
Methodology



Store patient details in Blockchain

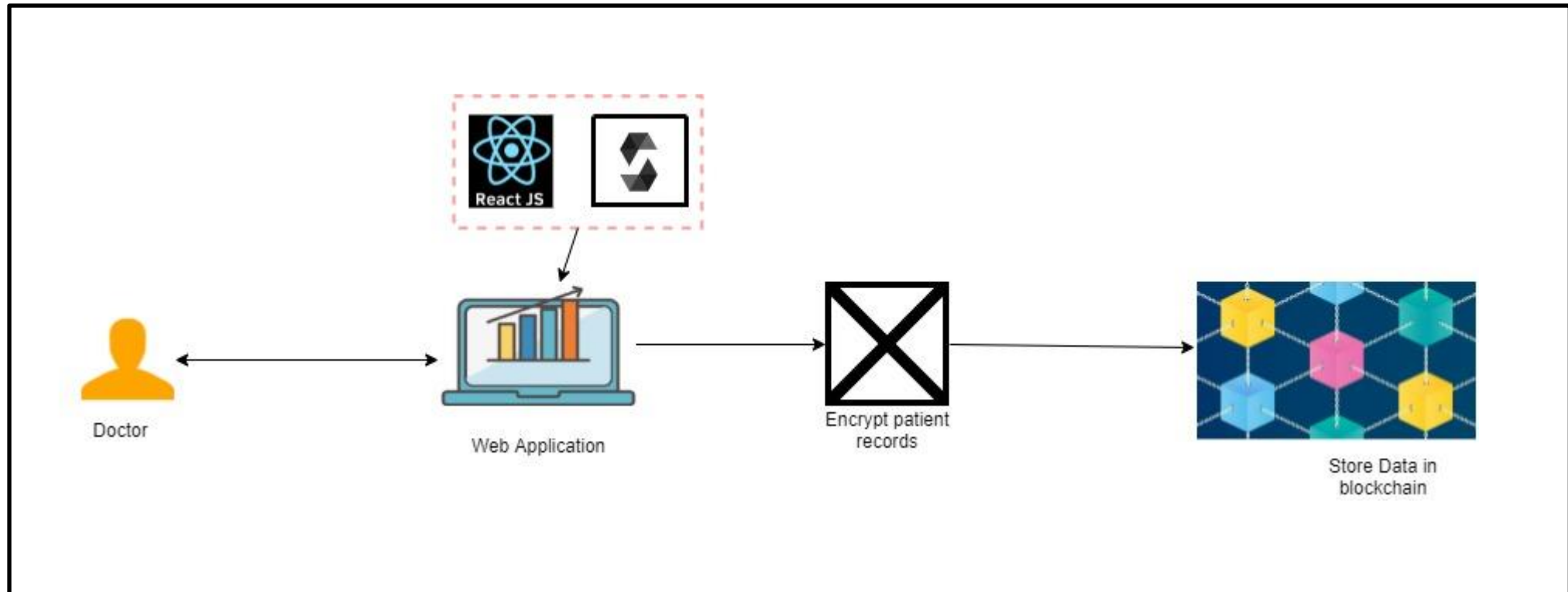


Access relevant patient details from Blockchain



Share patient details among authorized professionals

System Diagram



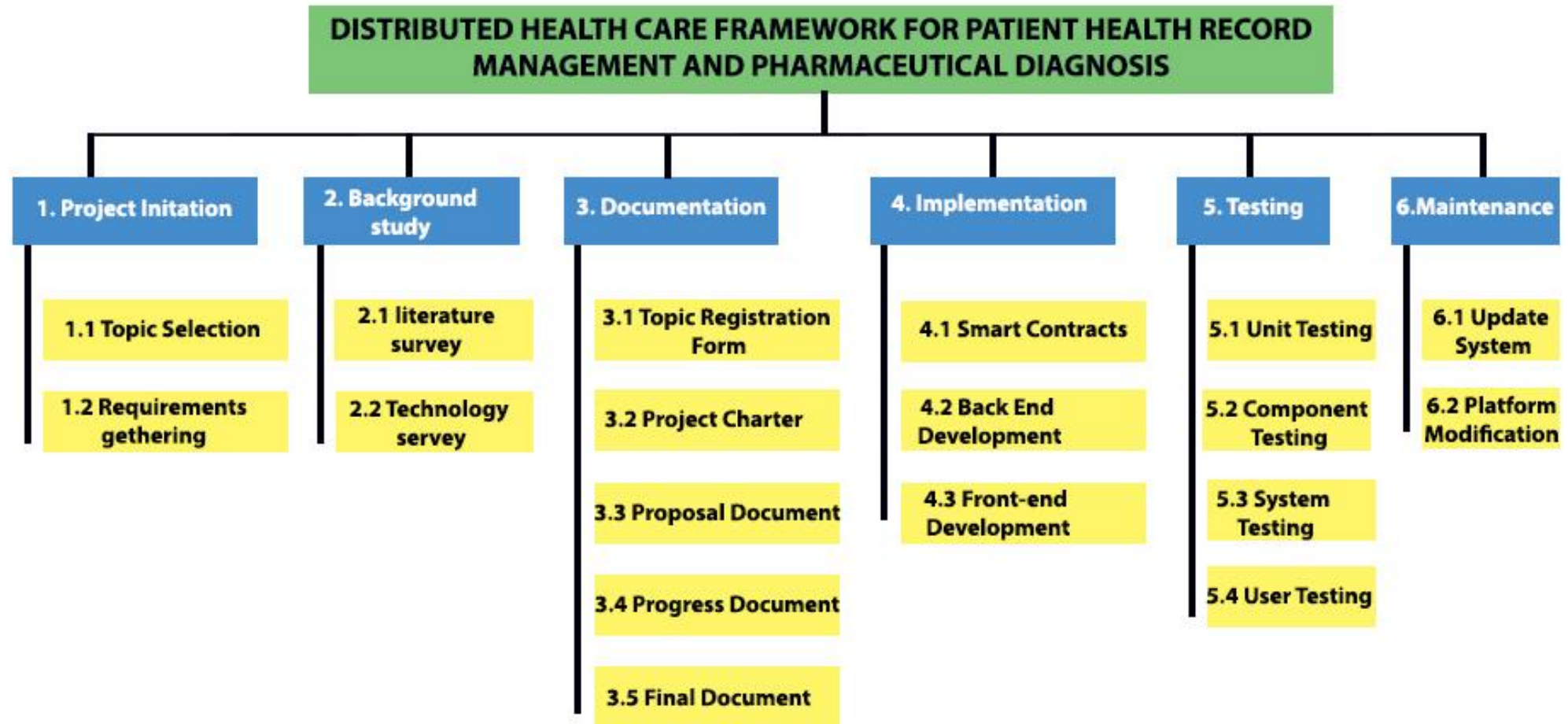
Tools and Technologies



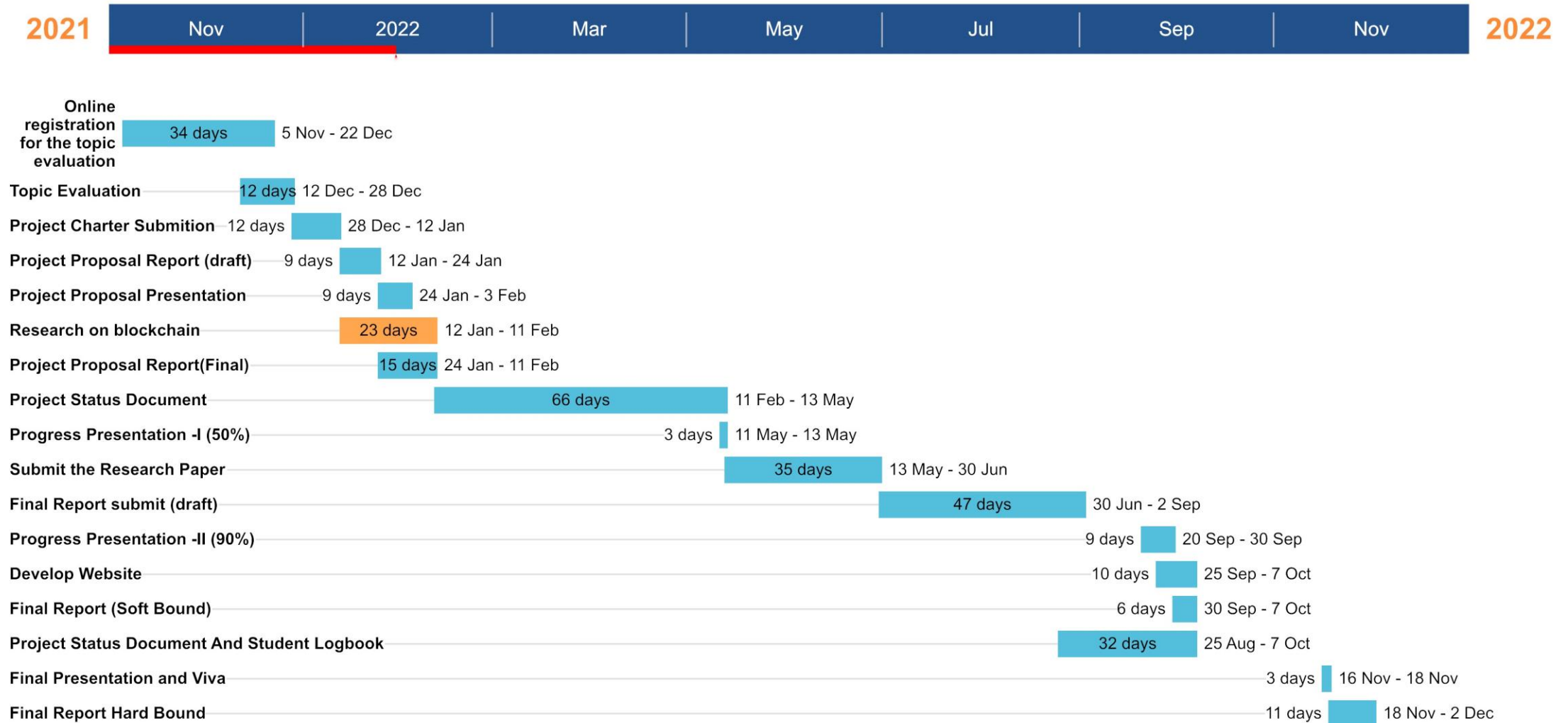
- Solidity
- Ethereum Network
- React JS



Work Breakdown Structure



Gantt Chart



Project Requirements



Functional Requirements

- Store / Access patient details
- Share patient details among authorized people

Non-Functional Requirements

- Accuracy
- Accessibility
- Speed
- Reliability
- Usability

Budget Justification



Resource type	Amount (LKR)	Amount (USD)
Document Preparations (Hard Copy)	Rs. 500	\$2.48
Internet usage for researching	Rs. 2000	\$9.91
Hosting Charges (Server)	Rs. 3800	\$18.83
Other Expenses (Travelling)	Rs. 1500	\$7.43
Total	Rs. 7800	\$38.65

REFERENCES

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Introduction



Patient Medical Documents are an important source of information and healthcare professionals use these documents to ensure continuity of care for the patient



Most of the medical documents such as lab test reports, prescriptions from hospitals are in printed format



Converting these data into Electronic Health Records (EHR) and entering these details into blockchain often need to follow the manual data entering procedure

Research Problem



Most medical papers are in printed format and extracting information from them and transferring them to electronic health records takes a lot of time.



Manually entering these data into Blockchain is a risky task that frequently results in human errors.



As a result, an automated method for extracting textual data from printed medical records and converting them to editable and searchable formats should be introduced.

Research Gap

Reference ID	Modelled for Healthcare Domain-Specific words	Transcribe the scanned documents/images where text is skewed	Automatic word suggestions	Automatic data correction
Research [1]	✓	✗	✓	✓
Research [2]	✗	✗	✗	✗
Research [3]	✗	✓	✓	✓
Research [5]	✓	✗	✗	✗
Our Solution	✓	✓	✓	✓



Main Objective

- To scan and extract relevant data from Patient Medical Documents using Deep Learning while preventing human errors that cause when manually entering data.

Sub Objectives

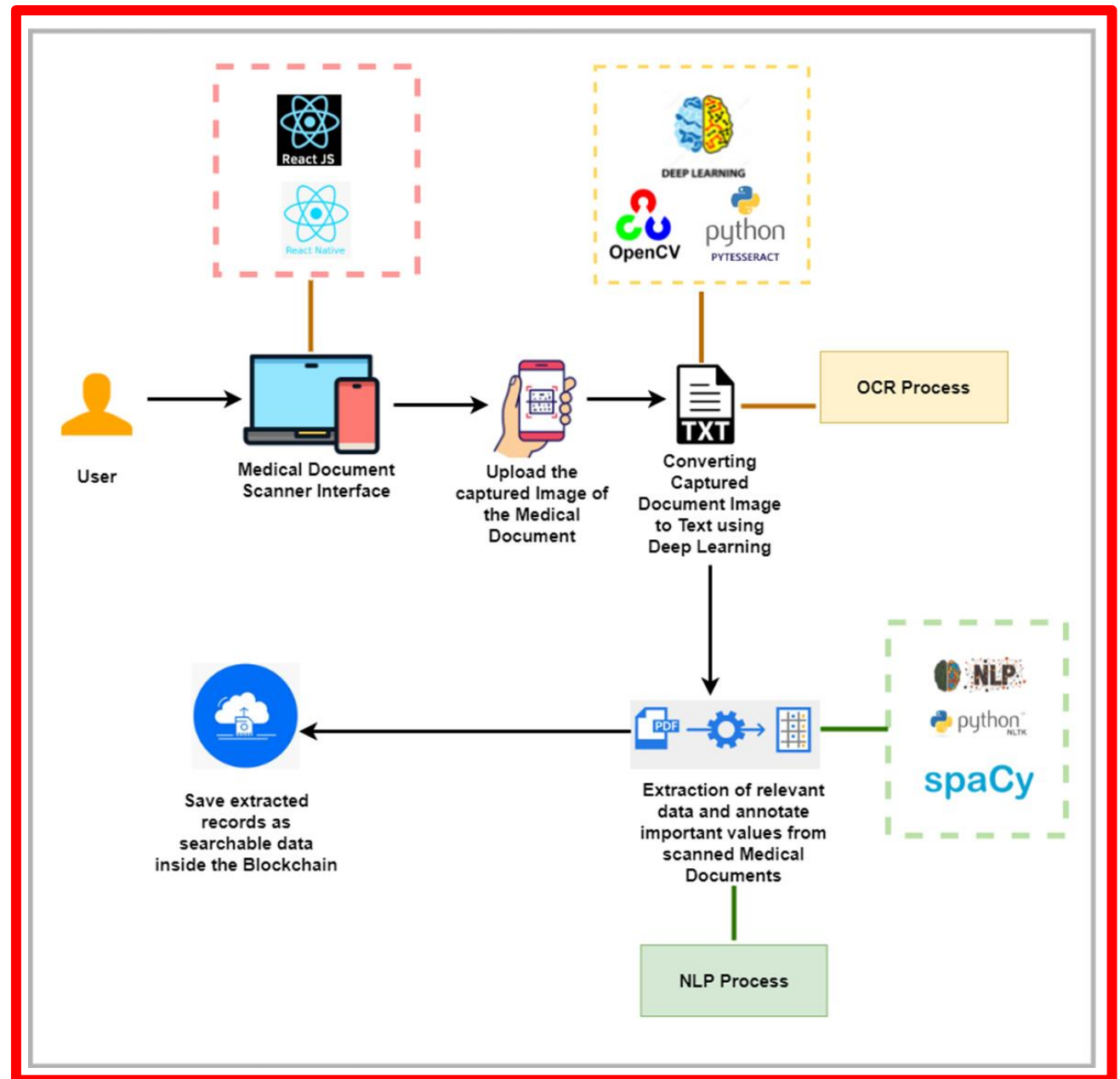
- Prevent the errors that cause when manually entering data into Blockchain
- Automatically extract structured data from the captured images of the medical documents using Text Recognition
- Annotate relevant data from the recognized text
- Correctly transcribe documents where text may be skewed or illegible

Methodology

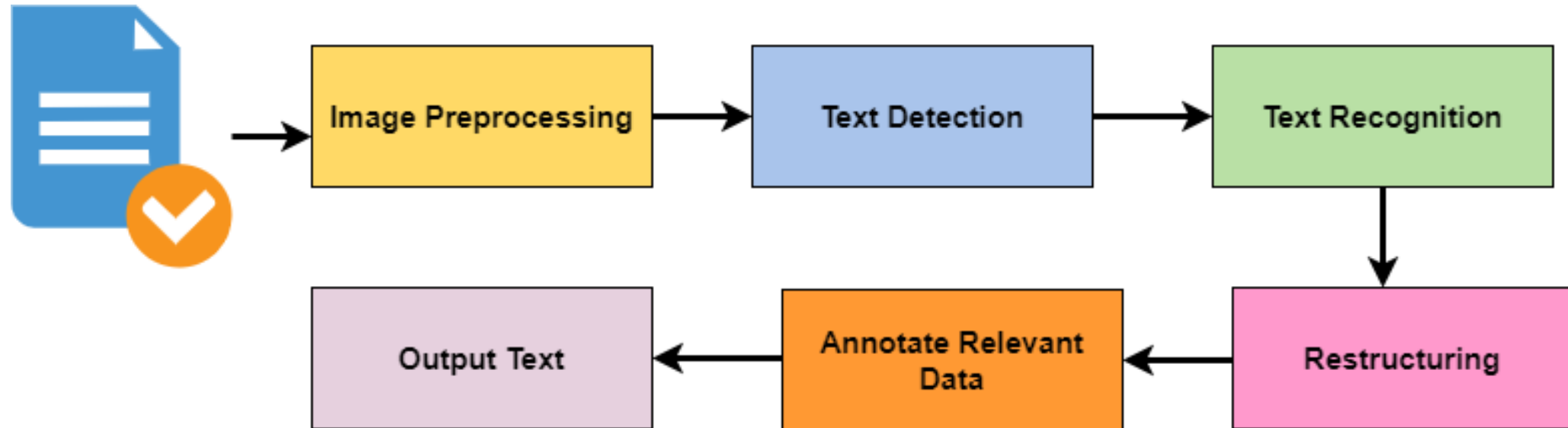
1. First upload an Image of the Medical Document through the Medical Document Scanner Interface
2. Convert the text in the captured image using techniques in Deep Learning
3. Extract relevant values and annotate important data



System Diagram



Text Extraction from Medical Documents



Tools and Technologies

1. Text Recognition

➤ Optical Character Recognition using Deep Learning

- ✓ OpenCV
- ✓ Pytesseract



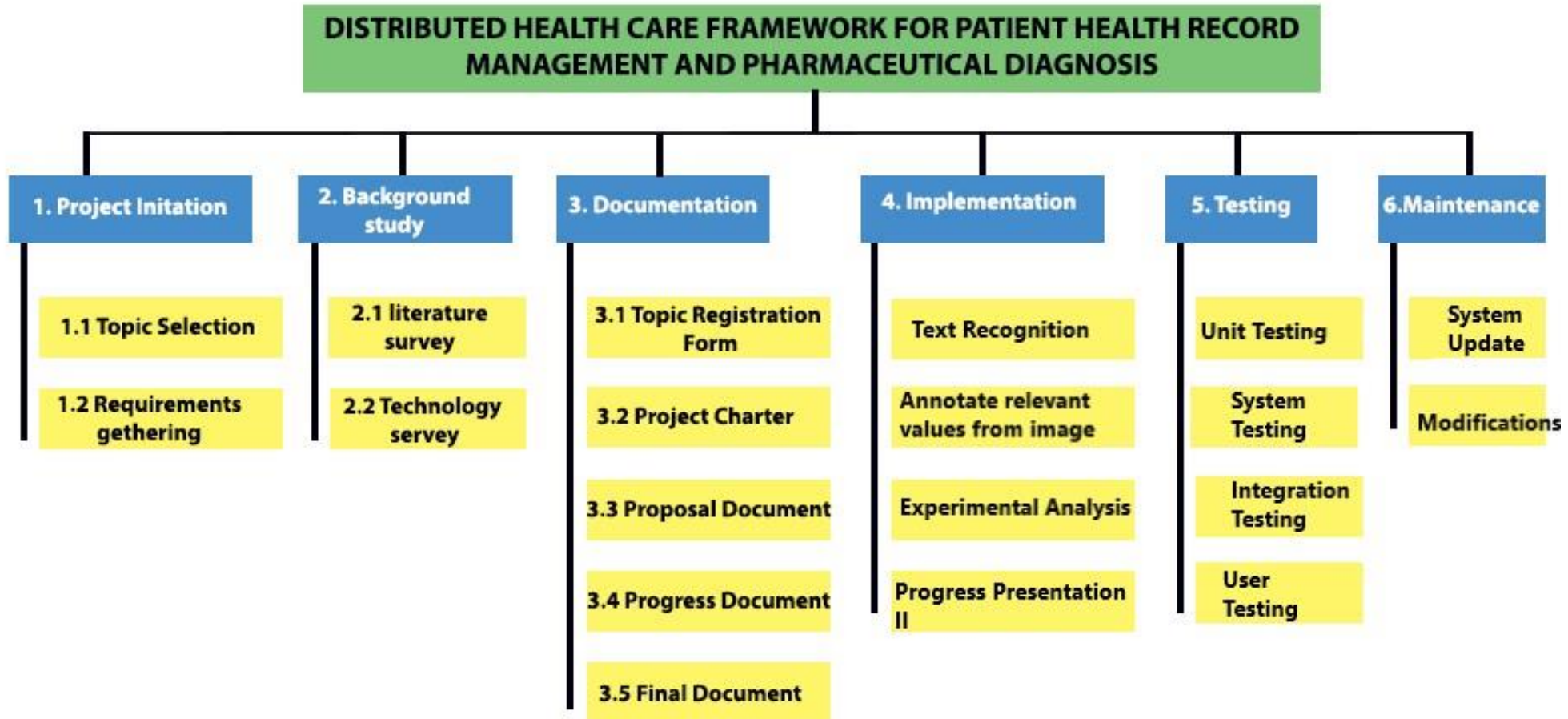
2. Annotate relevant data from the recognized text

➤ Natural Language Processing (if needed)

- ✓ Spacy Technology



Work Breakdown Structure



Gantt Chart



Task Name	Project Timeline												
Description	Dec-21	Jan-22	Feb-22	Mar-22	Apr-22	May-22	Jun-22	Jul-22	Aug-22	Sep-22	Oct-22	Nov-22	Dec-22
Project Initiation													
Topic Evaluation													
Charter Submission													
Project Proposal Report and Presentation													
Project Status Document													
Progress Presentation I													
Project Phase													
System Planning													
Data gathering													
Implementation Phase													
Text Recognition using Deep Learning													
Experimental Analysis													
Progress Presentation II													
Testing Phase and Evaluation													
Project Status Document / Website Evaluation													
Final Presentation and Viva													
Final Report													
Final Report and Research paper													
Final Evaluation													

Project Requirements



Functional Requirements

- ✓ Extract Textual Data from Medical Documents
- ✓ Annotate the important values

Non-Functional Requirements

- ✓ Accuracy
- ✓ Speed
- ✓ Reliability
- ✓ Usability

Budget Justification



Resource type	Amount (LKR)	Amount (USD)
Document Preparations (Hard Copy)	Rs. 500	\$2.48
Internet usage for researching	Rs. 2000	\$9.91
Hosting Charges (Server)	Rs. 3800	\$18.83
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Total	Rs. 7800	\$38.65

REFERENCES






- [1] Xue, W., Li, Q. and Xue, Q., 2019. Text detection and recognition for images of medical laboratory reports with a deep learning approach. *IEEE Access*, 8, pp.407-416.
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Introduction

-  Medication are one of the most useful medical services in the world because meds help to improve wellbeing for the ages
-  People use medication in their daily routine without knowing what are the reason to consume those and what are the side effect of them.
-  Sometimes those medication can make path to loss of a human life. Therefore, it is required way to overcome problems course by the medication

Research Gap & Problem



- Current drug identification systems aren't usable for every person
- Lack of dataset for images of drugs and details relevant to them.
So, take considerable time to collect data.
- Drugs cannot be identified without the help of Doctors and Medical practitioners.
- Most of the people aren't aware about the reasons to consume the prescribed medication and what are the side effects of them.

Objective

Main Objective

- Develop a system which can identify the medication and provide Detailed summary about the relevant drug.

Sub Objective

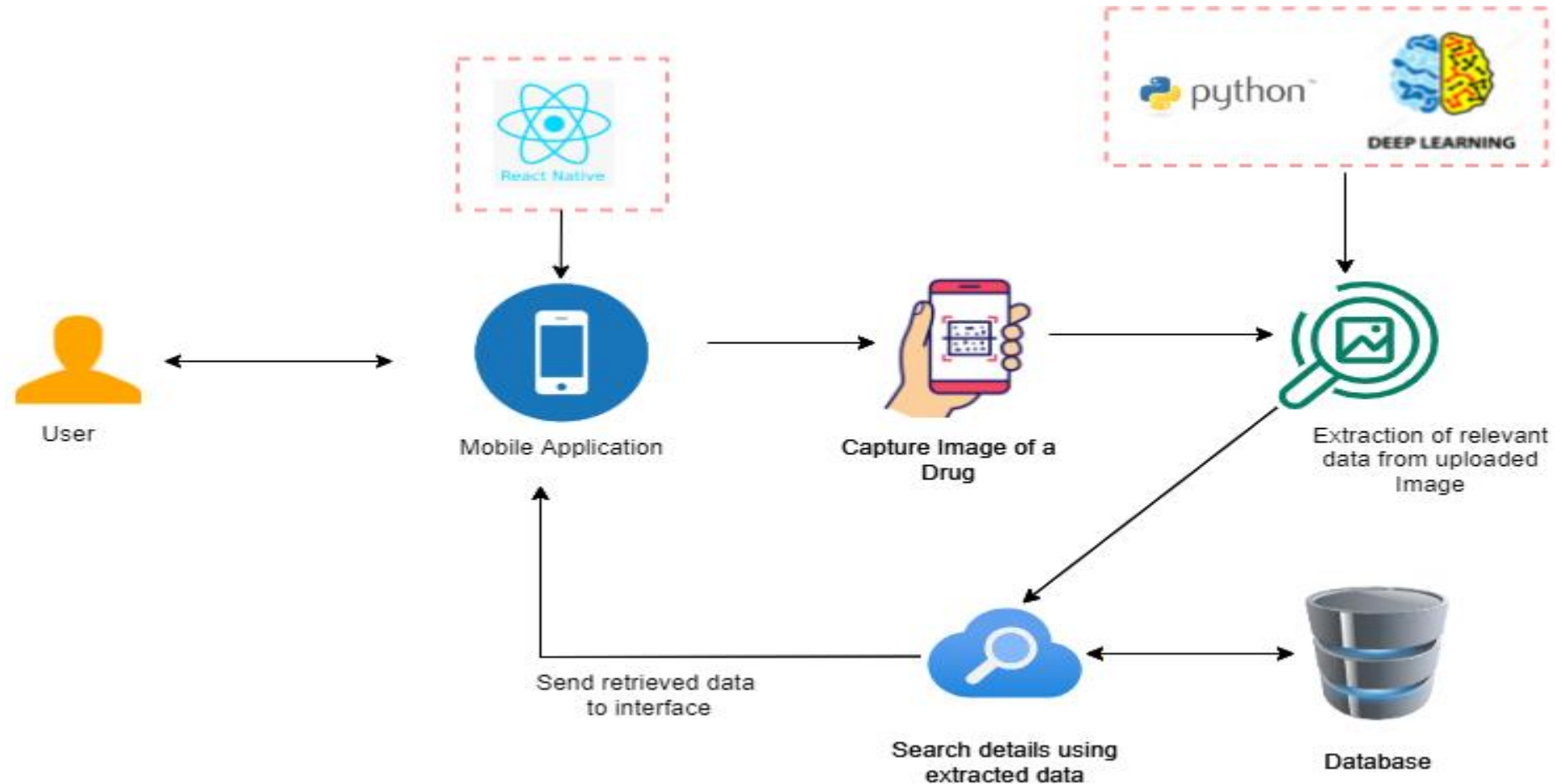
- Gathering Data set for training the image processing module
- Implement a dependable communication strategy between the application and cloud base server.
- Create A solid decision-making process in the cloud base server.
- Create an application to Carry out all the related functions.

Methodology



1. Gathering Data set for training the image processing module
 - Get various of dataset from previously perform research or related websites.
2. Implement a dependable communication strategy between the application and cloud base server.(AWS)
 - Develop REST APIs which can be compatible with any other technology or framework.
3. Create A solid decision-making process in the cloud base server.
 - Compare extracted data with database and find a which has higher similarity.
4. Create an application to Carry out all the related functions.
 - Implement a mobile application using cross-platform mobile development framework to break platform barrier.

System Diagram



Technology & Tool Selection

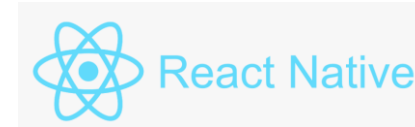
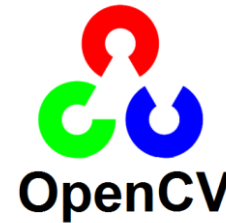


➤ Technologies

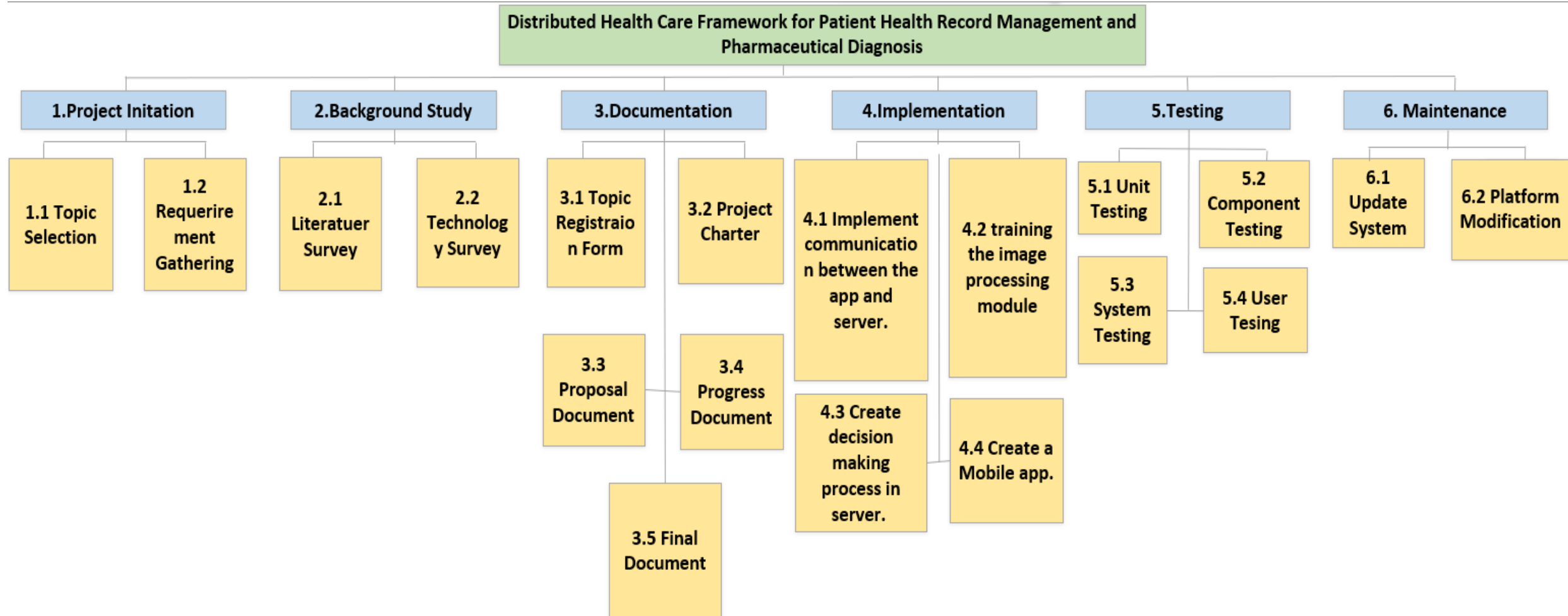
- Image Processing and machine learning

➤ Tools

- For image Processing– OpenCV
- For mobile application- React Native and Node Js
- For version controlling- GitLab
- Project Management



Work Breakdown Structure



Gantt Chart



Description	December	January	February	March	April	May	June	July	August	September	October	November	December
Project Initiation													
Evaluation													
Project Charter													
Proposal Draft													
Proposal Presentation													
Project Phase													
Collecting Required Data													
System Planning													
Selecting Technologies													
Research Paper													
Implementation Phase													
Implement communication between the app and server.													
training the image processing module													
Create an application to Carry out all the related functions.													
Create decision making process in server.													
Testing Phase and Evaluation													
Testing													
Final Report and Research paper													
Final Evaluation													

Project Requirements



➤ Functional requirements

- Extract data from uploaded drug's image and compare that data with current data set

➤ Non-Functional requirements

- Less manual work to use the overall system
- Take less time to extract data from drug's image.
- Accurate recognition.

➤ User Requirements

- Cell phone which has camera
- Internet Connection

Budget Justification



Resource type	Amount (LKR)	Amount (USD)
Document Preparations (Hard Copy)	Rs. 500	\$2.48
Internet usage for researching	Rs. 2000	\$9.91
Hosting Charges (Server)	Rs. 3800	\$18.83
Other Expenses (Travelling)	Rs. 1500	\$7.43
Total	Rs. 7800	\$38.65

REFERENCES



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Introduction



The importance of taking medication on time.



Reasons to forget to take medication on time.



Therefore, a way is needed to avoid problems by not taking medication on time.

Research Problems



People are uniquely engaged in their current daily routine.



They tend to focus more on their work rather than their personal lives.



As a result, they often forget to get their medication on time and often have no one to remind them of it.

Research Gap

- Many healthcare virtual assistants use channeling to make necessary appointments to patients' relevant physicians and to diagnose their ailments diseases.
- Use to Smart Virtual Assistant for giving the medication time.



Objectives

Main Objective

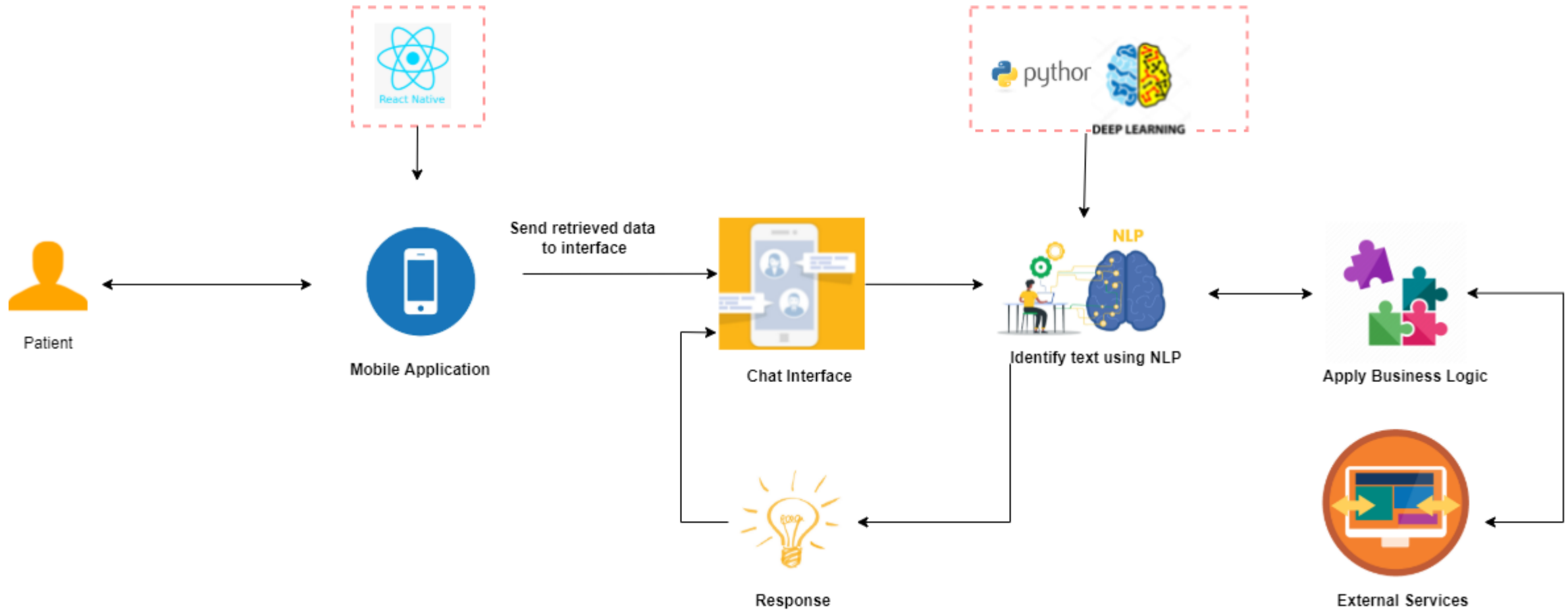
- To assist patients with a smart chatbot based on Machine learning and Natural Language Processing for health care assistance.

Sub Objective

- Manage Medication time system.
- User friendly interface.



System Diagram



Methodology



Get input from the patient.



Identify input using natural language processing and machine learning



Give an appropriate response to the relevant input



Tools and Technologies

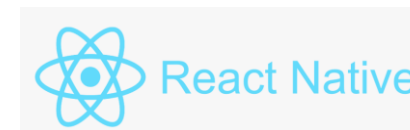


➤ Technologies

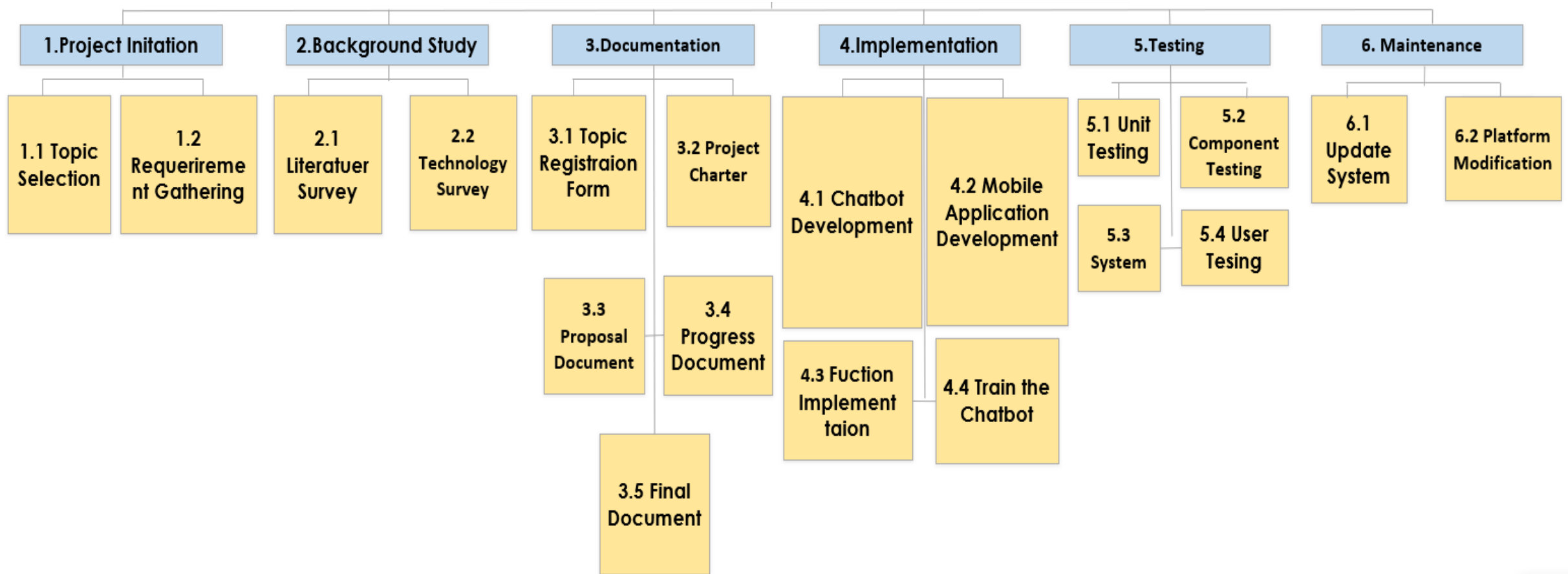
- Natural Language and machine learning

➤ Tools

- Chatbot Development (Rasa/Wit.Ai)
- For mobile application- React Native & Node Js
- For version controlling- GIT



Work Breakdown Structure



Gantt Chart

Task Name	Timeline													
Description	November	December	January	February	March	April	May	June	July	August	September	October	November	December
Project Initiation														
Evaluation														
Topic Assessment form														
Charter														
Proposal Draft														
Proposal Presentation														
Project Phase														
System Planning														
Collecting Required Data														
Selecting Algorithm technologies														
Implementation Phase														
Implement mobile application														
chatbot implementation														
Function Implementation														
Train the chatbot														
Testing Phase and Evaluation														
Testing														
Final Report and Research paper														
Final Evaluation														

Project Requirements



➤ Functional Requirements

- Identify the message and respond appropriately to the patient, identify the patient's prescription.

➤ Non-Functional requirements

- Accuracy
- Speed.
- Reliability.

➤ User Requirements

- Smart Mobile Phone
- Internet Connection

Budget Justification



Resource type	Amount (LKR)	Amount (USD)
Document Preparations (Hard Copy)	Rs. 500	\$2.48
Internet usage for researching	Rs. 2000	\$9.91
Hosting Charges (Server)	Rs. 3800	\$18.83
Other Expenses (Travelling)	Rs. 1500	\$7.43
Total	Rs. 7800	\$38.65

REFERENCES



- [1] Borah, B., Pathak, D., Sarmah, P., Som, B. and Nandi, S., 2018, July. Survey of Textbased Chatbot in Perspective of Recent Technologies. In *International Conference on Computational Intelligence, Communications, and Business Analytics* (pp. 84-96). Springer, Singapore.

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Business Potential



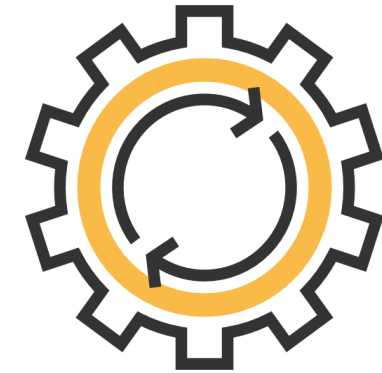
Supports any Hospital Chain across the world



24/7 support with no downtime



High Data Security



100% Automatic Solution



Free Drug Identification



Medical Document Scanning from anywhere



24/7 Virtual Assistant



THANK YOU