Sri Lanka Institute of Information Technology

PROJECT REGISTRATION FORM

(This form should be completed and uploaded to the Cloud space on or before XXXXXXXXX)

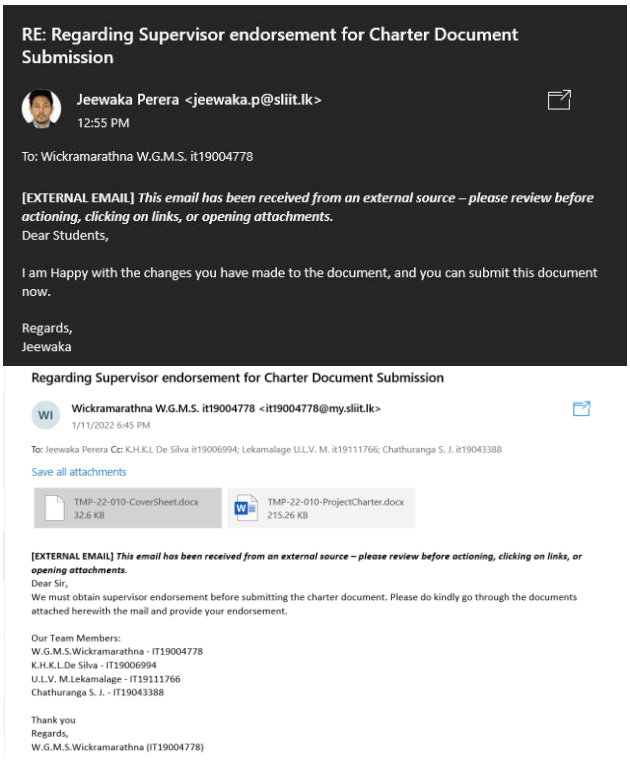
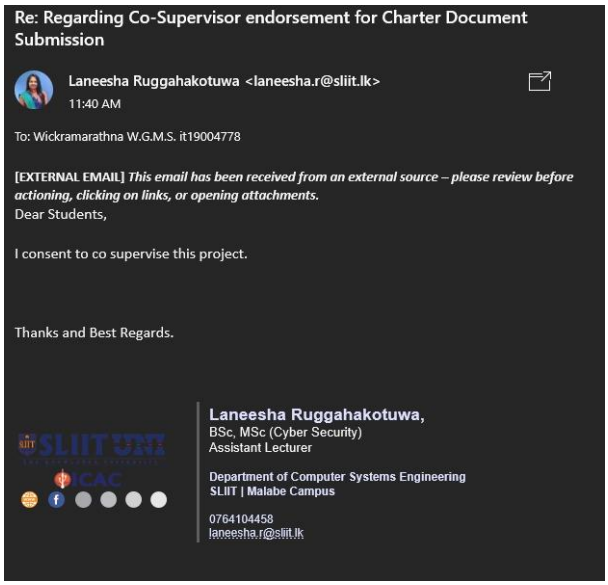
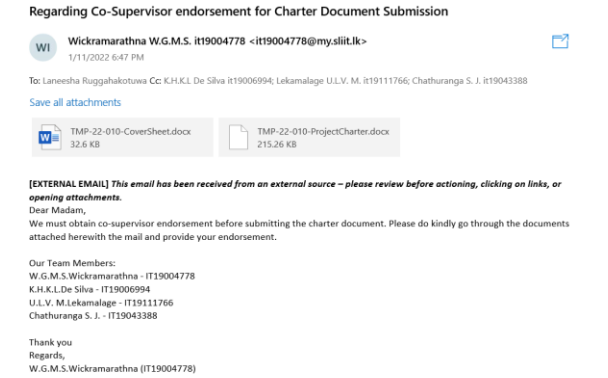
The purpose of this form is to allow final year students of the B.Sc. (Hon) degree program to enlist in the final year project group. Enlisting in a project entails specifying the project title and the details of four members in the group, the internal supervisor (compulsory), external supervisor (may be from the industry) and indicating a brief description of the project. The description of the project entered on this form will not be considered as the formal project proposal. It should however indicate the scope of the project and provide the main potential outcome.

PROJECT TITLE (As per the accepted topic assessment form)	Distributed Health Care Framework for Patient Health Record Management and Pharmaceutical Diagnosis.
RESEARCH GROUP **(as per the Topic assessment Form)**	Machine Learning (ML)
PROJECT NUMBER	TMP-22-010 (will be assigned by the lecture in charge)

PROJECT GROUP MEMBER DETAILS: (Please start with group leader's details)

	STUDENT NAME	STUDENT NO.	CONTACT NO.	EMAIL ADDRESS
1	Wickramarathna W.G.M.S.	IT19004778	0775099995	it19004778@my.sliit.lk
2	De Silva K.H.K.L	IT19006994	0768754063	it19006994@my.sliit.lk
3	Lekamalage U.L.V.M.	IT19111766	0778060679	it19111766@my.sliit.lk
4	Chathuranga S.J	IT19043388	0752744904	it19043388@my.sliit.lk

SUPERVISOR, CO_ SUPERVISOR Details

SUPERVISOR Name	CO-SUPERVISOR Name
Mr. Jeewaka Perera	**Ms. Laneesha Rukgahakotuwa**
Signature	**Signature**
 	 
12th of January 2022	**12th of January 2022**
Date	**Date**

EXTERNAL SUPERVISOR Details (if any, may be from the industry)

				Attach the email as Appendix 3
Name	Affiliation	Contact Address	Contact Numbers	Signature/Date

ACCEPTANCE BY CDAP MEMBER (This part will be filled by the RP team)

Name	Signature	Date

PROJECT DETAILS

Brief Description of your Research Problem: (extract from the topic assessment form)

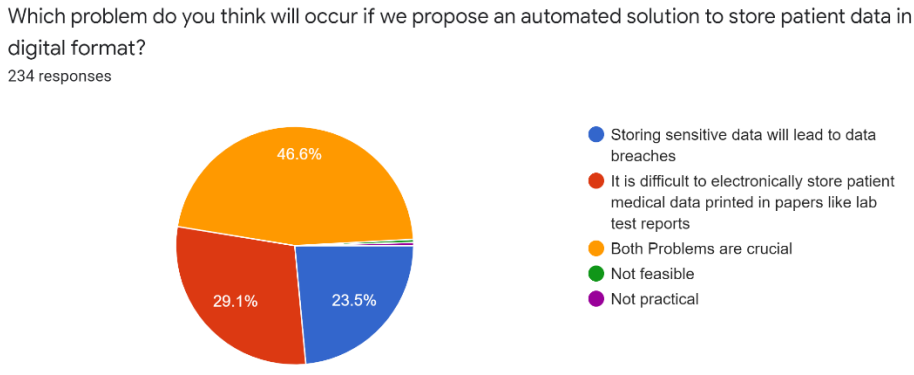
As a result of the COVID-19 situation, research institutes and governments have been obliged to reconsider healthcare delivery solutions to maintain service continuity when people stay at home and practice social distancing. [1] Sri Lanka has 555 government hospitals and roughly 141 private hospitals. However, no health-care institution in Sri Lanka has a registered population, and the patient's medical records are kept by the health service or doctor who is treating the patient for a specific disease, as it is in most care settings. As a result, many caregivers are unable to communicate effectively, resulting in poor care coordination.

Many research institutes are working on finding solutions for healthcare issues that occur during a pandemic and EHR (Electronic Health Record) systems are becoming more popular. Accessing scattered patient data across several EHRs, however, remains a challenge. In the healthcare field, electronic medical records are highly sensitive private information that must be exchanged frequently. One of the most difficult aspects of a centralized method to storing health records is safeguarding patient privacy and system transparency. Illegitimate access to sensitive patient information, such as identification details, as well as misuse of patient information and clinical records, leads to data breaches. [2]

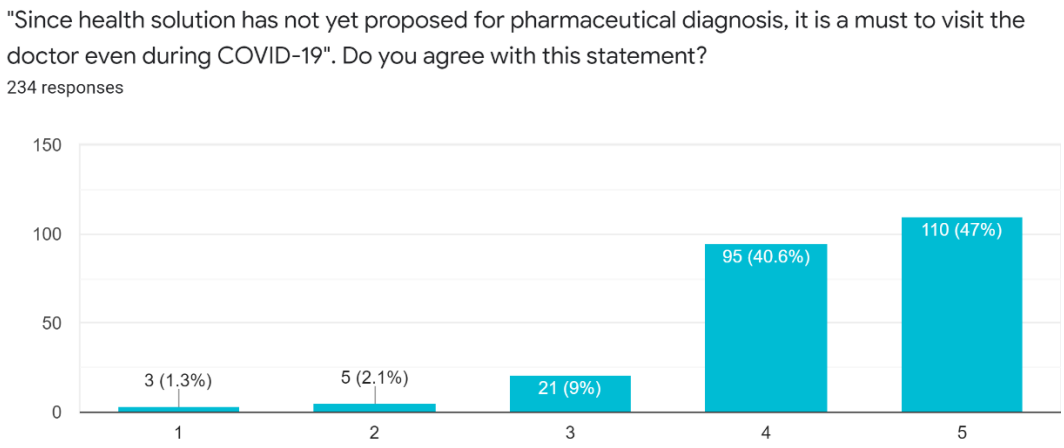
In most countries, it is very difficult for individuals to access electronic health records since most of the medical documents such as lab test reports, prescriptions from hospitals are in printed format and it's time-consuming and error-prone when manually entering data and converting them to EHR. Therefore, the practical approach to extracting structured data from printed medical records remains a challenge. [3]

Not only that the third most common cause of death is not the disease, but medical error. But visiting the Doctor for pharmaceutical diagnosis is riskier during a pandemic. Therefore, there should be a solution for the patient who is unknown or illiterate, to get all the information about the tablets, their usage, side effects, etc. while staying at home. So that it raises public awareness and reduces conflicts and minimizes the number of visits to doctors during the pandemic. [4] No such distributed health care service providing framework has yet been implemented to provide healthcare solutions during the COVID-19 while securely storing patient data across several EHR's.

We conducted an online short survey among the public in Sri Lanka. A total of 234 people took part in the survey. The short survey highlighted the healthcare problems that the public have during a pandemic.



Most of the people said that sensitive data breaches and extracting data from printed medical documents are problems in automating healthcare.



47% of most people think that health solutions have not yet been proposed for pharmaceutical diagnosis and it is mandatory to visit the doctor even during the pandemic.

[1] Jabarulla, M.Y. and Lee, H.N., 2021, August. A Blockchain and Artificial Intelligence-Based, Patient-Centric Hea
lthcare System for Combating the COVID-19 Pandemic: Opportunities and Applications. In *Healthcare* (Vol. 9, No. 8, p. 1019). Multidisciplinary Digital Publishing Institute.

[2] Tith, D., Lee, J.S., Suzuki, H., Wijesundara, W.M.A.B., Taira, N., Obi, T. and Ohyama, N., 2020. Application of blockchain to maintaining patient records in electronic health record for enhanced privacy, scalability, and availability. *Healthcare informatics research*, *26*(1), pp.3-12.

[3] 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.

[4] Delgado, N.L., Usuyama, N., Hall, A.K., Hazen, R.J., Ma, M., Sahu, S. and Lundin, J., 2019. Fast and accurate medication identification. NPJ digital medicine, 2(1), pp.1-9.

Description of the Solution: (extract from the topic assessment form)

In this research, we have proposed a Distributed Health Care Framework for Automatic Patient Records and Pharmaceutical Diagnosis. There are 2 main categories of users. Namely:

1. Medical Doctors
2. Patients

The proposed system is available in Web and Mobile versions, each with platform-specific functions. The web application will be reserved for healthcare professionals such as Medical Doctors, and the authority of adding and altering patient records will be given only to the Medical Doctors or equivalent professional body of the same domain. Blockchain and Access Control Mechanisms will be applied here. Latest patient records will be maintained on the Blockchain which will be accessible via the mobile application by the relevant authorized patient. Blockchain technology is a better solution to combat pandemics by enabling decentralized healthcare data sharing, accessing, and exchanging scattered patient records while protecting users' privacy, providing data empowerment, and ensuring reliable data management. Most of the medical documents such as Lab Test Reports and prescriptions are printed on paper and manually entering those data into Blockchain is error-prone and time consuming. In this proposed research, we will be extracting data from printed medical documents. Text Detection and Text Recognition parts will be covered using mechanisms in deep learning.

In the mobile application, we introduce a virtual conversational Chatbot that can assist in the pharmaceutical diagnoses in healthcare. The conversational Chatbot will be developed using Natural Language Processing and has the capability in drugs. In this research Drug Identification model is proposed to identify drugs, their side effects, dosage, and pharmaceutical data via Image Processing Techniques. Relevant pharmaceutical data will be retrieved based on the captured image of the relevant drug

Main expected outcomes of the project: (extract from the topic assessment form)

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 Objective 1: To protect patients' data privacy while tracking/sharing healthcare records with healthcare professionals.

Sub Objective 2: To scan and extract relevant data from Patient Medical Documents using Deep Learning while preventing human errors that cause when manually entering data.

Sub Objective 3: To identify Drugs using Image Processing and extracting pharmaceutical data such as its side effects, dosage, etc.

Sub Objective 4: To assist patients with a smart chatbot based on Machine learning and Natural Language Processing for health care assistance

WORKLOAD ALLOCATION (**extract from the topic assessment form after the correction suggested by the topic assessment panel.**)

(Please provide a brief description about the workload allocation)

MEMBER 1	IT19004778 - Wickramarathna W.G.M.S.

The privacy issue is one of the biggest challenges in maintaining patients' data in electronic format. In this component, blockchain will be used for storing, accessing, and sharing individual patient records. Through decentralized identification and other privacy features, blockchain provides unique mechanisms for securing user data. Using Role-Based Access Control the authority of data adding, and modification will be given only to the Doctors.

Output: Individual patient records stored on the blockchain.

References:

[1] Jabarulla, M.Y. and Lee, H.N., 2021, August. A Blockchain and Artificial Intelligence-Based, Patient-Centric Healthcare System for Combating the COVID-19 Pandemic: Opportunities and Applications. In *Healthcare* (Vol. 9, No. 8, p. 1019). Multidisciplinary Digital Publishing Institute.

[2] Hussien, H.M., Yasin, S.M., Udzir, N.I., Ninggal, M.I.H. and Salman, S., 2021. Blockchain technology in the healthcare industry: Trends and opportunities. *Journal of Industrial Information Integration*, *22*, p.100217.

MEMBER 2	IT19006994 – De Silva K.H.K.L

Manually entering patient data into blockchain is time-consuming and error-prone. In this component, Deep Learning will be used for automatic Text Detection and Recognition in Medical Documents such as lab test reports and printed prescriptions. Natural Language Processing will be used to extract relevant values from the captured data.

Input: Patient Medical Documents such as lab test reports and printed prescriptions
Output: Data captured in text format extracting relevant values

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.

[2] Esteva, A., Robicquet, A., Ramsundar, B., Kuleshov, V., DePristo, M., Chou, K., Cui, C., Corrado, G., Thrun, S. and Dean, J., 2019. A guide to deep learning in healthcare. *Nature medicine*, *25*(1), pp.24-29.

MEMBER 3	IT19111766 – Lekamalage U.L.V.M.

When patients receive medication from doctors, they are unaware of the medications' benefits and side effects. And visiting the doctors or pharmacies to get detailed receipts about medication is dangerous during a pandemic. So, this component assists patients in drug identification whenever they need to identify and learn more about medications given by the doctor. Users need merely enter the captured image of the medication and upload it to the system. The system will next utilize Image Processing and a machine learning-based trained model to extract the color of the medication, the shape, and the imprint on the drug's surface from the captured image and match those features to the labeled dataset in the database. Identification of the medication and generating a summary such as side effects and usage based on the captured data using a trained machine learning model will also be covered here. And this component doesn't recommend medication for the user but provides a basic idea about the medication provided by doctors.

Pill images used in this research are part of an open dataset that can be downloaded at:
https://www.nlm.nih.gov/databases/download/pill_image.html

The Pill Image Recognition Challenge dataset obtained from the National Library of Medicine has two main datasets as follows:

1. Reference Pill Images: Images of reference pills taken in a controlled light environment
2. Consumer-Grade Pill Images: For training pill image identification algorithms

The image size, color as well as layout, scales, and imprint of the pill, are all included in the dataset, which can be used to recognize the same drug under varied viewing situations.

Input: Image of a medication
Output: Display a summary according to the drug (side effects and usage)

References:

[1] Delgado, N.L., Usuyama, N., Hall, A.K., Hazen, R.J., Ma, M., Sahu, S. and Lundin, J., 2019. Fast and accurate medication identification. NPJ digital medicine, 2(1), pp.1-9.

[2] Cho, S.K., Kim, B., Park, E., Kim, J., Ryu, H. and Sung, Y.K., 2019. Usability Evaluation of an Image-based Pill Identification Application. Journal of Rheumatic Diseases, 26(2), pp.111-117.

[3] Cordeiro, L.S., Lima, J.S., Ribeiro, A.I.R., Bezerra, F.N., Rebouças Filho, P.P. and Neto, A.R.R., 2019, October. Pill image classification using machine learning. In 2019 8th Brazilian Conference on Intelligent Systems (BRACIS) (pp. 556-561). IEEE.

MEMBER 4	IT19043388 – Chathuranga S.J

In this component, a smart chatbot will be developed using Machine Learning and Natural Language Processing for healthcare assistance. The proposed chatbot can identify the message and respond appropriately to the patient, identify the patient's prescription, and provide a schedule for taking the medication. If the patient needs active timely indications, the chatbot will provide it according to the medication schedule.

Input: User Input
Output: Appropriate response to user input

References:

[1] Ayanouz, S., Abdelhakim, B.A. and Benhmed, M., 2020, March. A smart chatbot architecture-based NLP and machine learning for health care assistance. In Proceedings of the 3rd International Conference on Networking, Information Systems & Security (pp. 1-6).

[2] Kandpal, P., Jasnani, K., Raut, R. and Bhorge, S., 2020, July. Contextual Chatbot for healthcare purposes (using deep learning). In 2020 Fourth World Conference on Smart Trends in Systems, Security and Sustainability (WorldS4) (pp. 625-634). IEEE.

DECLARATION (Students should add the Digital Signature)

"We declare that the project would involve material prepared by the Group members and that it would not fully or partially incorporate any material prepared by other persons for a fee or free of charge or that it would include material previously submitted by a candidate for a Degree or Diploma in any other University or Institute of Higher Learning and that, to the best of our knowledge and belief, it would not incorporate any material previously published or written by another person concerning another project except with prior written approval from the supervisor and/or the coordinator of such project and that such unauthorized reproductions will construe offences punishable under the SLIIT Regulations.

We are aware, that if we are found guilty for the above mentioned offences or any project related plagiarism, the SLIIT has right to suspend the project at any time and or to suspend us from the examination and or from the Institution for minimum period of one year".

	STUDENT NAME	STUDENT NO.	SIGNATURE
1	Wickramarathna W.G.M.S.	IT19004778	
2	De Silva K.H.K.L	IT19006994	
3	Lekamalage U.L.V.M.	IT19111766	
4	Chathuranga S.J	IT19043388	

Appendix

Project Topic Assessment-Final Year Project-2021 June CDAP-01

This part will be filled by the Topic Screening Panel members

Acceptable: Mark/select as necessary

Acceptance/ Rejection	Correction State	
	Minor Correction	Major Corrections
Accepted	☐	☐
Resubmit	☐	☐
Rejected	☐	

Accepted Major corrections

Corrections (if necessary)

In project topic fix the grammar of the title "automatic patient record" (make more meaningful). Member 03 part introduce risk and check the feasibility, because the accuracy of the drug identification is very important. Explain inputs and outputs of each member's research component clearly.

Major changes proposed:

In project topic fix the grammar of the title "automatic patient record" (make more meaningful). Member 03 part introduce risk and check the feasibility, because the accuracy of the drug identification is very important. Explain inputs and outputs of each member's research component clearly.

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