**Abstract**

The rise of artificial intelligence (AI) is transforming healthcare significantly, which revolutionizes healthcare professionals' interactions with patients and documenting medical records. In this thesis project, I aim to develop an AI-based medical record summarization system for patients that will generate summarization by checking their past medical history, generally known as Electronic Health Records (EHR), which are patients' medical records saved in a digital form. The medical record summarization system known as “Patient Medical History Generation using AI (PMHG-AI) combines natural language processing and machine learning algorithms to generate short summaries that will be accurate by using the takeover quality metrics to reliably summarize patients' medical histories, which will help healthcare professionals save time and attend more patients. The PMHG-AI will be able to store patient medical history without relying on the clinician provider to insert the information manually and allow them hours of time to interact in the clinical process, focussing on communications including diagnosis, treatment, or patient suggestions, which our system inherently promotes the future need for patients to become more engaged in the healthcare delivery process.

PMHG-AI's abilities will extend further than EHR summarization, empowering the system to create new patient records by asking targeted questions, reducing the time and effort required for healthcare professionals to gather essential medical information. This method will support the productivity of healthcare providers and improve the quality of patient care by validating that critical medical records are correctly captured and readable.

**Introduction**

Over the last few years, a wide range of AI applications in healthcare have been created to increase the quality of healthcare, save time, and improve patient outcomes, using AI-powered systems for diagnostics, treatment planning, patient monitoring, etc. AI-powered chatbots for personalized healthcare advice and AI-powered imaging analysis for disease detection like cancer and Alzheimer's. The motivation for this research comes from the inherent challenges faced when creating manual EHRs and analyzing them can be time consuming and can have numerous errors and inaccuracies, the aim of this research is to develop a system powered by artificial intelligence (AI) for accurate electronic health records (EHRs) which enables healthcare professionals to summarize patient medical histories and create EHRs to support healthcare professionals in a time saving, accurate and reliable information [1]. The system will use natural language processing (NLP) and machine learning (ML) algorithms to analyze patient data and create an error free and well organized summary of their medical history, and if a patient has no medical record previously, it can create it by asking the targeting questions to save time and efforts.

The proposed research project is used to enhance the effectiveness and efficiency of EHR generation, thereby enabling physicians to focus on complex, high-value activities. EHRs are meant to record all the information and provide a detailed history of patients for healthcare workers who can use it to make decisions about patients' health and give complete medical assistance. We aim to collect and use our own dataset form hospital for training and testing of AI models, we will also be using the publicly available datasets for training and testing of the model, our aim is to helps healthcare professionals save time and improve overall accuracy while focussing on patient centred care. The current EHR system relies on manual data entry, which can be time-consuming and increases the chances of errors or inaccuracies. Physicians spend most of the time creating, reviewing, and updating medical records to understand patient diseases. However, the present EHR system is not intelligent enough and is not able to summarize the medical records by analyzing past medical history, give recommendations to healthcare professionals, and reduce the risk of human error [2].

**Literature Review**

Artificial intelligence (AI) has dramatically changed how electronic health records (EHRs) are managed, improving accuracy and efficiency in clinical settings. In well known research [3], investigated the use of retrieval-augmented generation in conjunction with generative AI approaches to extract and summarise important clinical data from electronic health records (EHRs), showing a significant increase in the time efficiency of healthcare practitioners. To create patient-centric clinical notes [4], concentrated on the use of generative AI, highlighting the technology's significance in making sure that documentation closely complies with clinical reality and patient demands.

The advancements in AI-driven clinical decision support systems emphasised that offer customised support [5], enabling precision medicine by considering unique patient attributes related to medical records. EHRs Automation may considerably lessen the amount of documentation that physicians must complete [6], since AI may expedite the creation of discharge summaries. Moreover, [7] introduced a revolutionary framework, EHR Agent, demonstrating the potential for AI to handle and analyse complicated data structures inside health records by using massive language models for advanced tabular reasoning on EHRs.

Even with these research’s, there is still many unanswered questions about using AI to generate complete patient medical histories in real time, especially in patient-centred interactive forms. Instead, then creating systems that actively seek information from patients to quickly construct EHRs, current research mostly concentrates on automating manual documentation, lesser the paperwork and save time.

**Research Gap and Research Question**

According to the literature, generative AI has been used to create clinical documentation and summarise EHRs, but all the systems are created specific to abroad hospitals and no system is available for our country based every country has its medical record in different so to summarize the system should be able to analyze medical records according the data in which it is trained also a system that can engage with patients through focused queries and dynamically generate their medical histories. This disparity emphasises the necessity for creative solutions in our country that include patient feedback in real-time creation of EHR.

**Problem Statement**

**Project Timeline**

**MS Thesis**

**2024**

**Sep**

**Oct**

**Nov**

**Feb**

**Mar**

**Apr**

% complete

100

% complete

100

% complete

50

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30

0

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0

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% complete

**2025**

**Step 1 Thesis I**

Proposal Writing

Proposal Plagiarism Checking

*Proposal Submission*

**Literature Review**

Literature Search Model Architecture

**Data Collection**

Pre-Processing and Feature Engineering

Analyzing Multiple Model for best Performance

**Thesis I Submission**

**Step 2 Thesis 2**

Model Training and Evolution

NLP Techniques for AI Summarization

**Thesis II Writing**

UI/UX design and Model Deployment

% complete

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Report Presentation

0

% complete

Plagiarism Checking

0

% complete

*Thesis I Submission*

**Figure 2.** Gantt Chart for MS Thesis I.

**Block Diagram**

**Collection of Patient Medical Records Data**

**Data Transformation and Analyzing Preliminary Data**

**Feature Engineering**

**Model For AI Summarizations of Medical Records**

**Success**

**Success**

**Failure**

**Failure**

**Build Model to Generate Medical Record by asking targeted questions**

**Performance Evaluation**

**Performance Evaluation**

**Model Deployment and User Interface Creation**

**Model Deployment and adding interface for Medical Record Creation**

**Fine Tuning of Model Performance**

**Fine Tuning of Model Performance**

**Reference**

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2. Sarella, P.N.K. and Mangam, V.T., 2024. AI-driven natural language processing in healthcare: transforming patient-provider communication. Indian Journal of Pharmacy Practice, 17(1).
3. Alkhalaf, M., Yu, P., Yin, M. and Deng, C., 2024. Applying generative AI with retrieval augmented generation to summarize and extract key clinical information from electronic health records. Journal of Biomedical Informatics, p.104662.
4. Biswas, A. and Talukdar, W., 2024. Intelligent Clinical Documentation: Harnessing Generative AI for Patient-Centric Clinical Note Generation. arXiv preprint arXiv:2405.18346.
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7. Shi, W., Xu, R., Zhuang, Y., Yu, Y., Zhang, J., Wu, H., Zhu, Y., Ho, J., Yang, C. and Wang, M.D., 2024. Ehragent: Code empowers large language models for complex tabular reasoning on electronic health records. arXiv preprint arXiv:2401.07128.

Motivation:

The motivation behind this research work is to address the challenges associated with traditional EHR systems and develop an innovative solution that leverages the power of Artificial Intelligence (AI) to improve the efficiency and effectiveness of EHRs. The primary goal of this project is to design and develop an AI-driven EHR system that can summarize and generate patient medical histories, thereby saving time for healthcare professionals and enabling them to focus on more critical tasks.

This Research work is an inspiration to solve the problems of traditional EHR systems, and design a novel approach that uses Artificial Intelligence (AI) for aiding its Job providing betterment in EHRs. The main aim of this project is to implement and design an Artificial Intelligence (AI) based Electronic Health Record (EHR) that can generate and summarize medical histories about the patient, then it will also save busy time for healthcare providers helping them do better jobs by focusing on other complex tasks.

Background:

The traditional EHR system relies heavily on manual data entry, which is time-consuming, prone to errors, and often incomplete. Healthcare professionals spend a significant amount of time reviewing and updating patient records, which takes away from the time they can devote to patient care. Moreover, the sheer volume of data in EHRs can be overwhelming, making it challenging for healthcare professionals to identify critical information and make informed decisions.

Information overload: The sheer volume of data in EHRs can be overwhelming, making it challenging for healthcare professionals to identify critical information.

Inaccuracies: Manual data entry can lead to errors and inaccuracies, which can compromise patient care.

Inefficiencies: The traditional EHR system is time-consuming, requiring healthcare professionals to spend a significant amount of time reviewing and updating patient records.

Research Objectives:

The primary objectives of this research work are:

Design and develop an AI-driven EHR system: Develop a system that can summarize and generate patient medical histories using AI algorithms and natural language processing techniques.

Improve the efficiency and effectiveness of EHRs: Reduce the time spent by healthcare professionals on reviewing and updating patient records, enabling them to focus on more critical tasks.

Enhance patient care: Provide healthcare professionals with accurate and comprehensive patient information, enabling them to make informed decisions and deliver high-quality care.

Benefits of the Research Work:

The benefits of this research work are numerous, including:

Improved patient care: Accurate and comprehensive patient information enables healthcare professionals to make informed decisions and deliver high-quality care.

Time savings: Healthcare professionals can focus on more critical tasks, such as diagnosis and treatment planning, rather than manual data entry and summarization.

Enhanced patient engagement: Patients can take an active role in their care by providing accurate and comprehensive medical histories.

Reduced errors: AI-driven summarization and generation of EHRs minimize errors and inaccuracies, ensuring that patient information is accurate and reliable.

The healthcare industry is undergoing a significant transformation, driven by the need for improved patient care, reduced healthcare costs, and enhanced efficiency. Electronic Health Records (EHRs) have become an essential tool in this transformation, allowing healthcare providers to store, manage, and share patient data electronically. However, the process of creating and updating EHRs can be time-consuming and labor-intensive, often requiring healthcare professionals to spend hours reviewing and summarizing patient medical histories.

This project aims to address this challenge by developing an Artificial Intelligence (AI) powered system that can generate patient medical histories and create EHRs in a more efficient and accurate manner. The proposed system will use natural language processing (NLP) and machine learning (ML) algorithms to analyze patient data and generate a concise and accurate summary of their medical history.

The motivation behind this research is to improve the efficiency and accuracy of EHR creation, allowing healthcare providers to focus on more complex and high-value tasks. By automating the process of EHR creation, healthcare professionals can save time and reduce the risk of errors, while also improving patient care and outcomes.

The benefits of this research are numerous:

1. Improved Efficiency: The proposed system will reduce the time spent on creating and updating EHRs, allowing healthcare professionals to focus on more complex and high-value tasks.
2. Improved Accuracy: The AI-powered system will reduce the risk of errors and inaccuracies in EHR creation, ensuring that patient data is accurate and up-to-date.
3. Enhanced Patient Care: By providing healthcare professionals with a comprehensive and accurate summary of patient medical histories, the proposed system will improve patient care and outcomes.
4. Reduced Healthcare Costs: The proposed system will reduce the cost of healthcare by reducing the time spent on creating and updating EHRs, and by improving the accuracy and efficiency of patient care.

In this project, we will develop a novel AI-powered system that can generate patient medical histories and create EHRs in a more efficient and accurate manner. The system will be designed to ask patients questions to collect data, and then use NLP and ML algorithms to analyze the data and generate a concise and accurate summary of their medical history. The system will be evaluated using a dataset of patient medical histories, and the results will be compared to those obtained using traditional methods.

Overall, this project has the potential to revolutionize the way EHRs are created and managed, and to improve patient care and outcomes in the healthcare industry.