

AI-Based Intelligent Medical Report Understanding and Personal Health Management System

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Abstract

Medical reports contain important health information, but their technical terminology and numerical results may be difficult for patients to understand. Recent studies have explored the use of large language models to simplify radiology reports, while also identifying concerns related to accuracy, omitted information, and potentially misleading explanations [1–3]. This paper proposes an AI-Based Intelligent Medical Report Understanding and Personal Health Management System designed to make medical information easier to understand and organize. The proposed framework will accept medical reports in PDF or image format, extract relevant text, and generate patient-friendly explanations while aiming to preserve important values, units, and reference ranges. A retrieval-based component is proposed to support explanations using reliable medical sources. Additional planned features include date-wise health-record organization, comparison of comparable report values, and reminders based on user-entered or clinician-provided instructions. The framework emphasizes privacy, factual consistency, and the distinction between educational information and professional medical advice. Its evaluation will examine text-extraction accuracy, preservation of medical information, factual consistency, readability, and usability after implementation. As the system has not yet been experimentally evaluated, this paper presents the proposed design and evaluation plan rather than measured performance results.

Keywords: artificial intelligence; health information management; large language models; medical report simplification; patient education

1 Introduction

Medical reports help communicate important information about a person's health. However, patients may find it difficult to understand technical medical terminology, laboratory values, units, and reference ranges. As a result, they may need additional explanations to understand the information presented in their reports.

Artificial intelligence (AI), particularly large language models (LLMs), offers a potential approach to simplifying complex medical text. Doshi et al. [1] evaluated language models for simplifying radiology report impressions, while Jeblick et al. [2] explored the use of ChatGPT to produce simplified radiology reports. A systematic review and meta-analysis by Alabed et al. [3] further examined the use of LLMs for radiology report simplification. However, fluent simplification must preserve important information and avoid introducing unsupported statements.

This paper proposes an AI-based framework that combines medical-report simplification with personal health-record organization. The proposed system aims to extract information from uploaded reports, explain it in patient-friendly language, and support the organization of records over time. Where implemented, reliable medical sources will be used to support educational explana-

tions. The system is intended to improve access to understandable health information; it will not replace a qualified healthcare professional.

The main contribution of this work is the proposed integration of report-specific explanations, preservation of medical information, evidence-supported health education, and basic personal health-record management within a single framework. Implementation and evaluation are required to determine its actual accuracy, usability, and limitations.

2 Background and motivation

Digital health tools increasingly help people access and organize health information. However, a medical report often presents results in technical language and may require context to interpret correctly. General-purpose language models can produce fluent explanations, but they may also generate unsupported statements [2]. A patient-facing system should therefore preserve key report values, distinguish report content from general educational information, and use reliable sources for explanations [2].

The motivation for this proposed work is to bring report explanation and basic personal health record management into one accessible interface. The main research question is: Can an evidence-grounded AI framework simplify medical reports into patient-friendly language while preserving important information from the original report? This question will be investigated through implementation and evaluation; no performance result is claimed at this stage.

3 Proposed methodology

The proposed system follows a sequence of stages, beginning with medical-report upload and text extraction and ending with patient-friendly explanation and personal health-record management. The framework is designed to preserve information from the original report and provide clear, understandable explanations.

3.1 Report input and text extraction

The system will allow users to upload medical reports in PDF or image format. Text-based PDF files will be processed using document-extraction tools. For scanned reports and images, Optical Character Recognition (OCR) may be used to extract text. The extracted content will be checked for missing, unclear, or incorrectly recognized information before further processing.

3.2 Medical information processing

The extracted text will be processed to identify relevant details, including test names, measured values, units, reference ranges, and report dates. These details will be retained during the simplification process wherever possible. If a value or unit cannot be identified reliably, the system should flag the uncertainty instead of generating an unsupported interpretation.

3.3 AI-based report simplification

A large language model will be used to convert technical medical text into simple, patient-friendly language. The explanation should retain the original report's important information and avoid adding unsupported medical claims. A retrieval-based component may retrieve relevant information from

reliable medical sources to support general educational explanations. The generated explanation will be presented as educational assistance rather than a medical diagnosis.

3.4 Personal health record management

The proposed system will organize uploaded medical reports by date and category. Where the same test has comparable units and reference conditions, the system may display values from different dates to help users review their records. It may also provide reminders based on instructions entered by the user or provided by a healthcare professional.

3.5 Privacy, safety and evaluation

The framework will consider secure storage, access control, and responsible handling of personal health information. After implementation, evaluation will examine text-extraction accuracy, preservation of medical values and units, factual consistency with supporting sources, readability, and usability. Any limitations or performance results will be documented only after testing.

The methodology describes the planned workflow. Its effectiveness remains to be established through implementation and systematic evaluation.

4 System design and evaluation plan

4.1 System architecture

The proposed system consists of multiple interconnected modules that work together to simplify medical reports and organize personal health information. The process begins when a user uploads a medical report in PDF or image format. Text extraction techniques are used to obtain the report content. The extracted information is then processed by an AI-based component to generate a simplified explanation. A reliable medical knowledge source is proposed to support the explanation and reduce unsupported information. Finally, the system organizes the report and its explanation for future reference.

4.2 Main functional modules

The proposed system includes the following functional modules:

1. *Report Upload and Text Extraction*: Allows users to upload medical reports and extract text using suitable text-processing or OCR techniques.
2. *Medical Report Simplification*: Converts complex medical terminology into simple, patient-friendly language while preserving important values, units, and reference ranges.
3. *Evidence-Based Health Education*: Uses reliable medical sources to support general explanations of medical terms and test results.
4. *Personal Health Record Management*: Organizes uploaded reports by date and category so users can access previous records easily.
5. *Report Comparison*: Supports comparison of similar medical tests across different dates when the test names, units, and other relevant details are comparable.
6. *Reminder Management*: Provides reminders based on instructions entered by the user or provided by a healthcare professional.

4.3 Comparison with existing approaches

Traditional medical report viewers mainly display the information provided by laboratories but may not explain technical terminology in simple language. General-purpose AI chatbots can generate explanations, but their outputs may not always preserve all report-specific information or provide reliable supporting evidence.

The proposed framework aims to combine report-specific simplification, evidence-supported educational explanations, and personal health record management in one system. However, its advantages over existing approaches must be established through implementation and systematic evaluation.

4.4 Evaluation plan

After prototype development, the system will be evaluated using a collection of medical reports and expected explanations reviewed by suitable experts. The evaluation will focus on text-extraction accuracy, preservation of medical values and units, factual consistency, readability, and usability.

The system's outputs will be checked for missing information, unsupported statements, and incorrect interpretations. Quantitative results will be reported only after testing has been completed. At the current proposal stage, no experimental performance results are claimed.

5 Future improvements

In the future, the proposed system can be enhanced by integrating more advanced artificial intelligence techniques and reliable medical knowledge sources. Optical Character Recognition (OCR) can be improved to extract information accurately from scanned medical reports and images. The system can also support multiple Indian languages, including English, Hindi, and Marathi, to make medical information accessible to more patients.

Further improvements may include secure cloud-based storage, graphical visualization of changes in medical test values over time, and customizable reminders based on instructions provided by healthcare professionals. The system can also be evaluated with a larger collection of medical reports and reviewed by qualified healthcare professionals to assess its accuracy, readability, and usability.

These enhancements will be considered after the initial prototype is developed and evaluated. The system will remain an educational and health-record management tool and will not replace professional medical advice.

6 Conclusion

The proposed AI-Based Intelligent Medical Report Understanding and Personal Health Management System aims to make medical information easier for patients to understand and manage. By combining medical report text extraction, AI-based simplification, evidence-supported explanations, and personal health record management, the system is designed to improve access to understandable health information.

The proposed framework emphasizes the preservation of important medical values, units, and reference ranges while reducing the complexity of medical terminology. It also aims to support organized health records and comparisons of similar test results over time. However, the reliability and usefulness of the system must be established through implementation and systematic evaluation.

In conclusion, the proposed system has the potential to support patient education and health information management. It is intended to complement, not replace, consultation with qualified healthcare professionals. Future implementation and testing will help determine its accuracy, usability, and practical value.

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