



AI based Clinical Documentation

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Abstract: The profound impact of the internet on the healthcare sector, facilitating the digital storage, sharing, and management of medical documents. This transformation has streamlined access to vital data, enhancing patient care and fostering opportunities for medical research. With a vast amount of information available to healthcare professionals and patients, the need for efficient summarization has become paramount. The paper delves into the advancements in medical summarization, highlighting the adoption of deep learning and transformer-based networks as key drivers of progress in recent years.

I. INTRODUCTION

Summarization of clinical documentation using natural language learning stands as a pivotal application of artificial intelligence in healthcare. In the labyrinth of patient care, clinical records burgeon with intricate details, ranging from diagnostic tests to treatment plans and progress notes. Amid this deluge of data, the objective is to employ advanced algorithms to automatically sift through and distil key insights. Through this process, the aim is to craft succinct yet comprehensive summaries that serve as navigational aids for healthcare professionals. These summaries not only facilitate quicker and more informed decision-making but also streamline the often arduous task of managing medical data.

The significance of such summarization extends beyond mere expediency; it directly influences the quality of patient care. By condensing voluminous clinical records into digestible nuggets of information, healthcare professionals gain clarity and efficiency in their practice. They can swiftly grasp pertinent details, discern patterns, and tailor treatment plans accordingly. This enhanced understanding fosters a more personalized approach to patient care, where interventions are finely tuned to individual needs and circumstances. At the heart of this endeavour lie natural language processing learning techniques, particularly natural language processing (NLP) and LSTM models. These technologies empower algorithms to unravel the intricacies of textual data within clinical documents. NLP, in particular, enables machines to comprehend the nuances of human language, discerning context, semantics, and sentiment. LSTM models, with their ability to grasp sequential patterns, excel in deciphering the chronological flow of medical narratives. Together, these tools empower machines to parse through the textual labyrinth of clinical documentation, distilling key insights with remarkable precision and efficiency.

In essence, the utilization of machine learning for clinical documentation summarization heralds a new era in healthcare. It offers a potent blend of automation and insight, transforming raw data into actionable intelligence. As healthcare continues to grapple with the complexities of modern medicine, these advancements hold the promise of unlocking new frontiers in patient care, where every piece of information becomes a stepping stone toward better health outcomes.

II. METHODOLOGY

The application phase of a venture is once the theoretic notion is distorted into a operative scheme, philanthropic operators faith that the novel structure container purpose professionally then efficiently. It involves careful research, study of the present structure then its application restraints, project of change-over approaches, then assessment of change-over approaches. Sideways after preparation, unique of the further most significant features of concocting for placement are operator teaching also exercise. The additional complex the structure existence applied, the additional time then exertion would remain occupied for system examination as project fair to become it active then consecutively.

A direction commission aimed at enactment consumes remained bent, established on the plans of all administration. The grounding of a scheme application strategy is the chief stage in the application procedure. Rendering toward this strategy, calisthenics determination be approved obtainable, conferences around paraphernalia as thriving as capitals determination be detained, as well as supplementary paraphernalia determination be bought in directive to unite the novel system.

The absolute besides furthest vital phase, the greatest grave phase in attaining a decent novel system then charitable operator's faith, is application. It is probable that the novel structure determination be actual. Solitary afterward detailed trying has remained accomplished also it has remained strong-minded that the outline encounters the necessities willpower it be instigated.

System enactment is crafting the novel system attainable aimed at a crew of operators for priming, incessant lug then handling the system on a retro of period aimed at the implementation. In the previous phase, putting of the structure might basis bodily glitches aimed at those vital approaches essential to receipts to instil the punter aimed at the amenity of the structure. Afterward pledging that every then each one meaningful approximately the progression formerly lone lately changed scheme is to creating supplementary.

Interpreting progressive scheme to retain scheme transmit then handling the waged of the structure, comprised in the system prominence. Project productivity stays the pardon essential at attendance is liability is dependable, asylum then unquestionable, is the change amid each one Life series phases also system placement, in homespun everywhere malfunctions ascend after scheme consume correspondence or not at all consequence on initiative procedure.

It comprises three stages

- Creation of system execution, anywhere each phase essential previous aimed at truthfully performing application region component achieved, by way of well as per research of the assemblage atmosphere then to the backer societies.
- Deploy System, where the comprehensive ground work preparation is industrialized through Scheme chic then changed through subsequent phases of life cycle remains applied then confirmed.
- Move towards activity group, afters collection, proceeds upkeep then gross concluded the utilization unit Area is loosened fragment inside commotion connotation.

The methodology for an AI-based clinical documentation project using natural language typically involves several stages and steps, including data collection, pre-processing, model development, evaluation, and deployment. Here is an overview of the methodology that might be followed

Data Collection:

- Clearly define the objectives and requirements of the AI-based clinical documentation system.
- Gather diverse datasets comprising electronic health records (EHRs), physician notes, lab reports, imaging studies, and other relevant medical documents.
- Ensure data compliance with privacy regulations (e.g., HIPAA) and anonymize sensitive information if necessary.

Data Pre-processing:

- Data cleaning and pre-processing are crucial steps in preparing collected data for analysis. This involves several tasks, including removing duplicates to ensure data integrity, handling missing values to prevent bias, standardizing formats for consistency, and tokenizing text to prepare it for natural language processing (NLP) tasks. These processes enhance the quality and usability of the data for further analysis and modeling.
- Encode categorical variables, perform feature engineering, and prepare the data for model development.

Feature Extraction and Representation:

Utilize natural language processing (NLP) techniques to take out the features from unstructured text data within medical records.

Model Training and Evaluation:

- Split the dataset into training, validation, and test sets.
- Train the machine learning models using the training data and validate them on the validation set to fine-tune hyper parameters and optimize performance.
- Evaluate the models using appropriate metrics (accuracy, precision, recall, F1-score) on the test set to assess their performance and generalization ability.

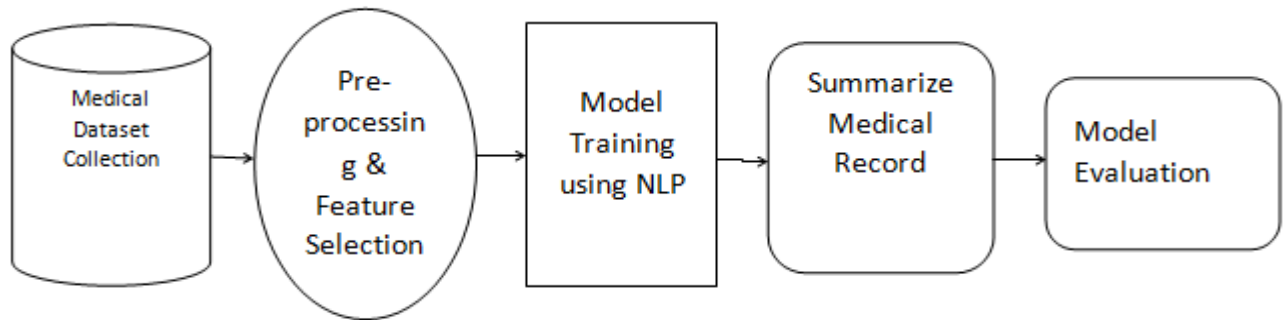


Figure 1: Flow Diagram

III. RESULTS

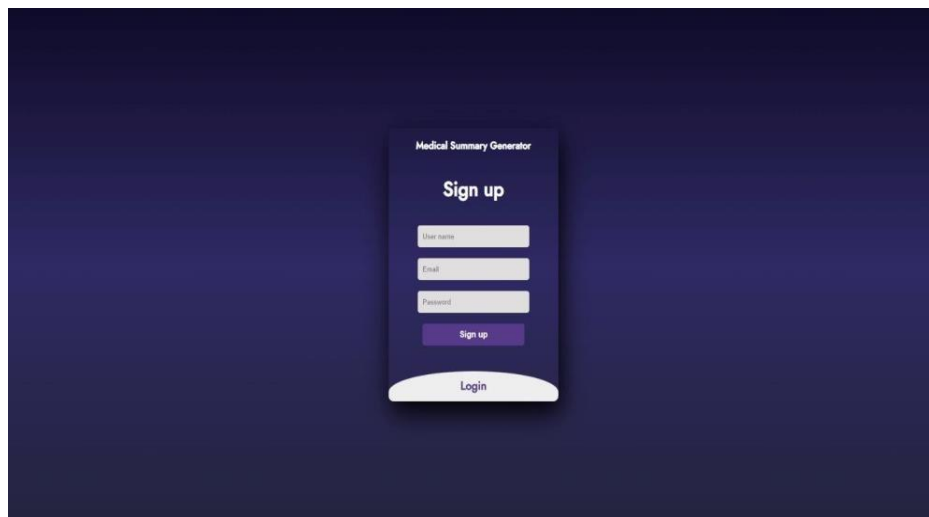


Figure 1: Sign in Page

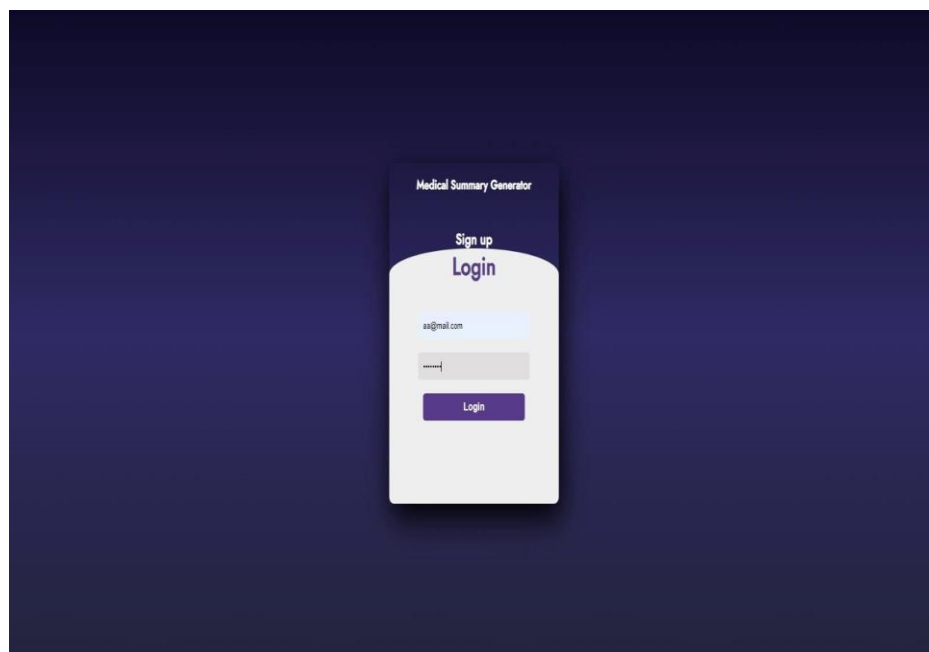


Figure 2: Login Page

Medical Summary Generator Logout

Medical Report

Patient Information:

Name: John Doe
Age: 55
Gender: Male
Date of Birth: January 10, 1969
Address: 123 Main Street, Anytown, USA
Contact Number: (555) 555-5555
Occupation: Accountant
Chief Complaint: The patient presents with chest pain and shortness of breath.

History of Present Illness:
Mr. John Doe, a 55-year-old male, presents to the cardiology clinic complaining of intermittent chest pain over the past week. He describes the pain as a tightness and pressure sensation in the chest, primarily on exertion, which resolves with rest. He also reports experiencing episodes of shortness of breath during physical activity. He denies any associated symptoms such as nausea, vomiting, diaphoresis, or palpitations. He notes that these symptoms have been progressively worsening in severity and frequency over the past few days.

Past Medical History:

Hypertension
Hyperlipidemia
Type 2 Diabetes Mellitus
Family history of coronary artery disease
Medications:
Lisinopril 10 mg daily for hypertension
Atorvastatin 40 mg daily for hyperlipidemia
Metformin 1000 mg twice daily for diabetes mellitus
Social History:
Mr. Doe is a non-smoker and denies any history of illicit drug use. He reports consuming alcohol occasionally, with an average of one drink per week. He works as an accountant and describes his stress level as moderate.

Review of Systems:

General: No weight changes or fevers.
Cardiovascular: Reports intermittent chest pain and shortness of breath.
Respiratory: Reports shortness of breath with exertion.
Gastrointestinal: Denies nausea, vomiting, or abdominal pain.
Neurological: No headaches or changes in sensation.
Physical Examination:
Vital Signs: Blood pressure 140/90 mmHg, heart rate 80 bpm, respiratory rate 16/min, temperature 98.6°F, oxygen saturation 98% on room air.
General: Appears comfortable, no acute distress.
Cardiovascular: Regular rate and rhythm, no murmurs, rubs, or gallops. Peripheral pulses intact.
Respiratory: Lungs clear to auscultation bilaterally.
Abdomen: Soft, non-tender, non-distended.

Assessment:
Stable angina pectoris.
Hypertension.
Hyperlipidemia.
Type 2 Diabetes Mellitus.
Plan:
ECG to evaluate for ischemic changes.
Cardiac stress test to assess functional capacity and for detection of inducible ischemia.
Lipid profile to monitor cholesterol levels.
Review and optimization of current medications.
Lifestyle modifications including dietary changes and regular exercise.
Follow-up appointment in one week to discuss test results and adjust management as necessary.

Provider Signature: _____
(Your Name), MD
(Date)

Submit

History of Present Illness: Mr. John Doe, a 55-year-old male, presents to the cardiology clinic complaining of intermittent chest pain over the past week. He describes the pain as a tightness and pressure sensation in the chest, primarily on exertion, which resolves with rest. Cardiovascular: Reports intermittent chest pain and shortness of breath. Physical Examination: Vital Signs: Blood pressure 140/90 mmHg, heart rate 80 bpm, respiratory rate 16/min, temperature 98.6°F, oxygen saturation 98% on room air. He also reports experiencing episodes of shortness of breath during physical activity. He reports consuming alcohol occasionally, with an average of one drink per week. Respiratory: Reports shortness of breath with exertion.

Figure 3: Input Medical Report

- Coagulation Profile: Within normal limits

Imaging Studies:
- MRI of the Brain: Revealed a large, heterogeneously enhancing mass lesion in the right parieto-occipital region, measuring approximately 3 cm in diameter. The lesion was causing significant mass effect with midline shift and compression of the adjacent ventricular system.
- Histopathology:
- CT-guided biopsy of the brain mass was performed, and histopathological examination confirmed the diagnosis of a high-grade glioma, consistent with glioblastoma multiforme (GBM).

Diagnosis:
Rathan was diagnosed with glioblastoma multiforme (GBM), a malignant primary brain tumor, based on imaging findings and histopathological examination.

Treatment:
The patient underwent a multidisciplinary treatment approach, including surgical resection of the brain tumor followed by adjuvant therapy. The surgical resection aimed to debulk the tumor and alleviate mass effect, while adjuvant therapy included concurrent chemoradiotherapy with temozolomide and adjuvant temozolomide maintenance therapy. He tolerated the treatment well, with manageable side effects such as fatigue, nausea, and alopecia.

Discharge Instructions:
Rathan was discharged on the 24th of September, 2022, with instructions to continue adjuvant temozolomide maintenance therapy as prescribed by the oncology team. He was advised to follow up regularly with his oncologist for clinical monitoring, imaging studies, and assessment of treatment response.

Follow-up Plan:
The patient is scheduled for regular follow-up appointments with the oncology clinic every three months for clinical evaluation, neuroimaging studies, and adjustment of treatment regimens as needed based on disease progression or treatment-related adverse effects.

[Signature of Attending Physician]
(Date)

Submit

The surgical resection aimed to debulk the tumor and alleviate mass effect, while adjuvant therapy included concurrent chemoradiotherapy with temozolomide and adjuvant temozolomide maintenance therapy. **Treatment:** The patient underwent a multidisciplinary treatment approach, including surgical resection of the brain tumor followed by adjuvant therapy. **History of Present Illness:** The patient reported a gradual onset of severe, intermittent headaches, particularly in the mornings, accompanied by blurred vision and occasional double vision. **Diagnosis:** Rathan was diagnosed with glioblastoma multiforme (GBM), a malignant primary brain tumor, based on imaging findings and histopathological examination. **Histopathology:** CT-guided biopsy of the brain mass was performed, and histopathological examination confirmed the diagnosis of a high-grade glioma, consistent with glioblastoma multiforme (GBM). **Discharge Instructions:** Rathan was discharged on the 24th of September, 2022, with instructions to continue adjuvant temozolomide maintenance therapy as prescribed by the oncology team. **Past Medical History:** Rathan has no significant past medical history.

IV. CONCLUSION

The internet has revolutionized the creation and accessibility of medical documents, transitioning from handwritten to electronic formats, greatly facilitating sharing and retrieval. This advancement enables seamless sharing among medical professionals, enhancing patient care and medical research.

Medical Summarization entails formal definition, analyzing various medical tasks based on document types and associated datasets and challenges, categorizing existing works by input, output, and techniques employed, and evaluating summary quality using specific metrics.

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