

A SYSTEM FOR AUTOMATED EXTRACTION OF CLINICAL STANDARD CODES IN SPOKEN MEDICAL REPORTS

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ABSTRACT

Physicians, whether in hospitals or in their private practice, spend a substantial amount of their time entering information about individual patient contacts into electronic medical record (EMR) systems [1]. The emergence of medical dictation has helped to accelerate this process by removing the burden from the physician to highly specialized transcribers, often supported by medical speech recognition [2]. Very little work has been dedicated to the next manual step in the pipeline which is the extraction of standard codes from the clinical narratives, necessary for billing, structured data queries, analytics, quantitative research, performance measurement, among other purposes [3].

We demo a system which covers the entire pipeline from spoken dictation to clinical standard codes. The system transforms unstructured spoken and textual reports into structured EMR records using the following HIPAA-compliant cloud-based technologies:

- **Automatic Speech Recognition (ASR):** The speech recognizer uses state-of-the-art technologies such as deep neural networks, i-vectors, and speaker-adaptative training. The acoustic model is trained on thousands of hours of English medical speech data; the language model is based on hundreds of millions of tokens taken from medical reports. This system can operate in both batch and online modes.
- **Automatic formatting:** This NLP system takes in the ASR output and produces formatted text by post-processing numbers, dates, sentence boundaries, paragraphs, numbered/bullet lists, etc. This component can be easily customized to provide tailored experiences to individual end users (hospitals, primary care physicians, etc.)
- **NLP-based code extraction:** This knowledge extraction system analyzes the unstructured textual reports and identifies concepts and linguistic structures which are then used to prepopulate forms in the EMR system. In doing so, ICD 10, SNOMED CT, and code grouping standards are supported.

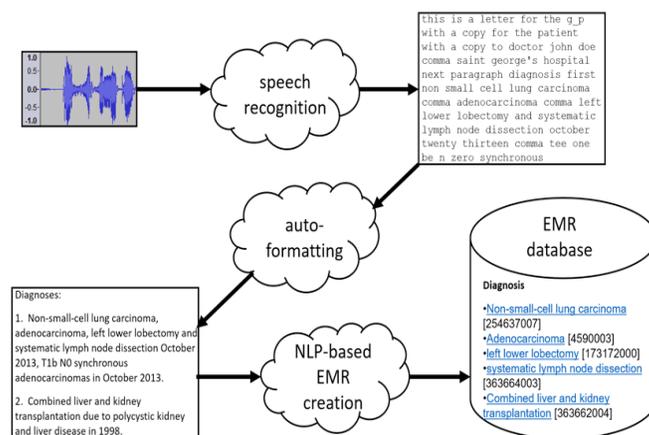


Fig. 1. Transforming unstructured spoken or textual reports into EMR records.

Index Terms— electronic medical records, EMR, medical speech recognition, SNOMED, ICD-10

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