

Patient's Continuity of Care with Unsupervised Natural Language Processing

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Abstract

Automatically highlight action items from hospital discharge notes and action items for primary care physicians using new unsupervised NLP approaches, saving them time and lowering the danger of missing vital information. Due to the manual resource required, information encoded within free-text patient experience comments linked to transitions of care is not recorded in a systematic manner. Unsupervised Natural language processing (NLP) can be used to extract useful information.

Index Terms—NLP ,Unsupervised, Discharge Notes,Machine Learning

I. INTRODUCTION

Continuity of treatment is critical for patients' good health, especially throughout the transition from acute inpatient care to outpatient primary care. However, information sharing between these settings is frequently flawed.

The average hospital discharge letter contains thousands of words and is designed with billing and compliance in mind rather than the reader, making it tough to sift through these records for critical outstanding actions. Primary care physicians (PCPs) already have a lot on their plates, with hundreds of emails, phone calls, imaging, and lab reports to deal with each day. Important efforts for improving patient care get lost in the sea of hospital documents and time restrictions. Both patients and primary care providers may experience errors and complications as a result of this.

Our ultimate goal is to make physicians' jobs easier by removing the administrative load of reviewing lengthy hospital notes, allowing them to devote their time and attention to the patient. Our approaches may compress notes down to just what a PCP needs to know, cutting note size by at least 80% while keeping key action items close at hand. This reduction in "information overload" can minimise physicians' chances of overlooking crucial information (Singh et al., 2013), enhancing their accuracy and patients' well-being. These models could allow a telemedicine specialist to more quickly and effectively assist a patient who has recently visited the hospital thanks to a simple user interface.

Unsupervised machine learning (ML) techniques seek out previously undetected patterns in datasets, for instance by clustering related observations. It employ information that has not been "labelled" by a human administrator .

Unsupervised machine learning can be used in text analysis to group words or thoughts that commonly occur together in order to find common themes in texts. Topic modelling is a technique that is comparable to inductive thematic analysis . This method has been used to analyse social media posts in order to detect themes related to drug non-compliance, themes related to abusive relationships and health components that are significant to patients but may not always be included in patient-reported outcome measures .

II. RELATED WORK

AI Chatbots and AI Virtual Assistants using Supervised Learning are trained using data that is well-labeled (or tagged). During training, those systems learn the best mapping function between a known data input and expected known output. Supervised NLP models then use the best approximating mapping learned during training to analyze unforeseen input data (never seen before) to accurately predict the corresponding output. The input-output mapping of Supervised Learning models typically needs to be adjusted across a number of iterative optimization cycles before they settle to a level of performance that is expected and widely acknowledged. This sort of learning retains the term "supervised" because the way it learns from training data resembles the end-to-end supervision of learning by a teacher. When there is a sufficient amount of labelled data available, supervised learning models may often perform at outstanding levels. Furthermore, it takes time and technical skills from a team of highly qualified data scientists to design, scale, deploy, and maintain accurate supervised learning models. For instance, a typical activity carried out by an AI chatbot or virtual assistant using supervised learning is classification (using a range of different algorithms including (Support Vector Machine, Random Forest, Classification Trees, etc.)

III. PROPOSED SOLUTION

Unsupervised Learning, which promises effective learning utilising unlabeled data (no labelled data is necessary for training), has become increasingly popular in academia and industry as a way to overcome the shortcomings of Supervised Learning (no data scientist or high-technical expertise is required). Unlabeled text in digital form is widely available, which is a significant benefit over supervised learning. However, labelled datasets are typically expensive to create or acquire, especially for standard NLP tasks like PoS tagging or Syntactic Parsing.

Unsupervised learning models have all the automation and intelligence required to operate independently and automatically identify information, structure, and patterns in the data. This makes it possible for Unsupervised NLP to excel. Clustering (such as K-mean, Mean-Shift, Density-based, Spectral clustering, etc.) and association rules approaches are the most widely used uses of unsupervised learning in sophisticated AI chatbots and virtual assistants. In order to quickly derive and validate an underlying common user intent, clustering is frequently used to automatically group semantically related user utterances together (notice derivation of a new class, not classification into an existing class). Association rules mining, which seeks to determine links between features directly from data, also use unsupervised learning. This method is typically used to automatically extract pre-existing dependencies between named entities from user input, dependencies of intents across a set of user input that is a part of the same user/system session, or dependencies of questions and answers from conversational logs

that record user interactions with live agents during the problem-solving process. Unsupervised Learning offers considerable advantages and a high degree of automation, but compared to supervised learning, it generally performs less accurately and with less reliability. In fact, the most cutting-edge AI chatbot and virtual assistant technologies on the market work to strike the ideal balance between the two, which, when properly tapped into, can deliver the accuracy and precision of supervised learning (tasks for which labelled data is available) combined with the self-automation of unsupervised learning (tasks for which no labelled data is available).

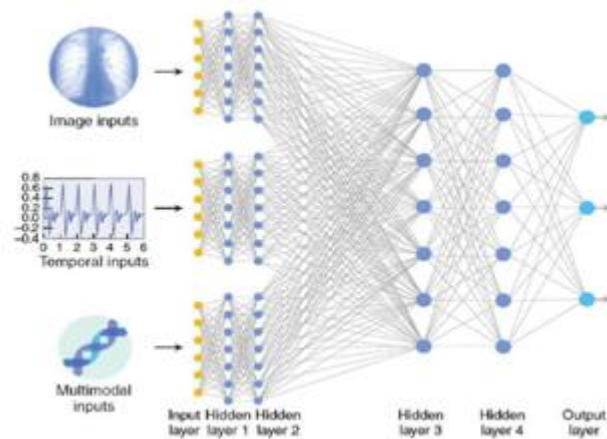


Figure 1: Detecting features with deep learning

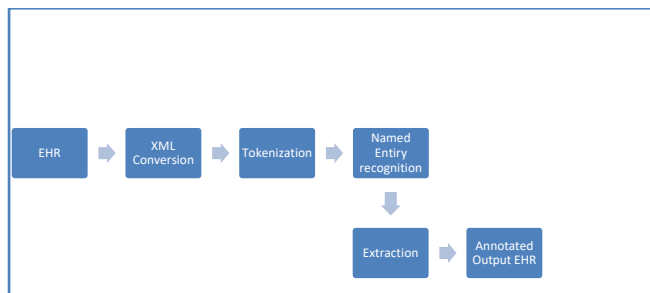


Figure 2 : Flow process

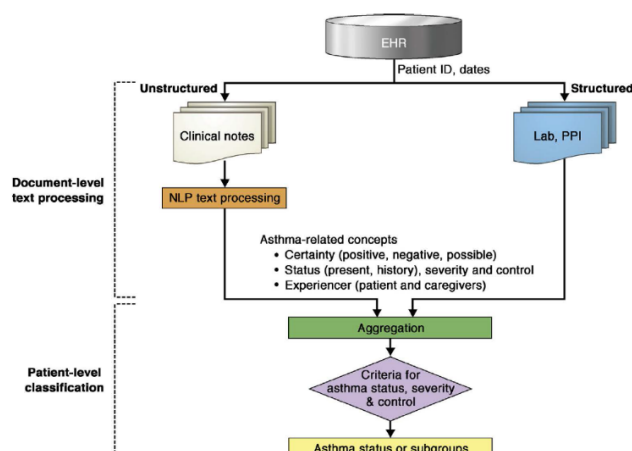


Figure 3: NLP Algo for Classification

A statistical modelling method known as topic modelling uses an unsupervised learning approach to scan a collection of documents and identify word and phrase patterns. To find cluster terms for a group of documents, it automatically examines text data. In order to infer subjects from unstructured data, topic modelling involves counting words and grouping words with similar word patterns. A topic model groups comparable feedback as well as phrases and expressions that are used frequently by identifying patterns like word frequency and word distance. As a result, it is simpler to determine what each group of texts is discussing.

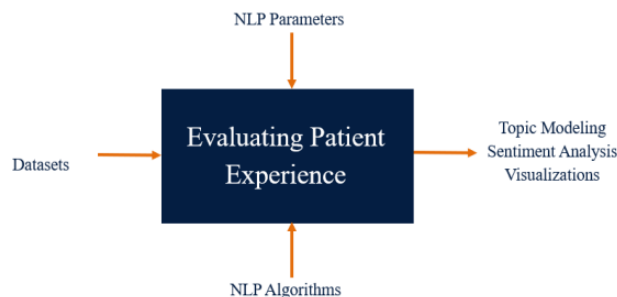


Figure 4 : Evaluating Patient Experience

IV. CONCLUSIONS

The decision-making process in the healthcare industry will be sped up significantly by NLP Unsupervised learning . The quality of the data that they collect and retain will be a major factor in determining the true benefits of creating effective algorithms. Physicians will be able to concentrate on providing patients with more value thanks to the quicker decision-making process. A variety of data can be processed simultaneously by Topic modeling with Deep Learning and Computer Vision to make accurate conclusions. A greater standard of care in healthcare can result from collaborative research. In order to improve healthcare for society, these systems need to be properly developed and constructed in a larger socio-ecological framework of clinical care settings.

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