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# Special issue of BMC medical informatics and decision making on health natural language processing



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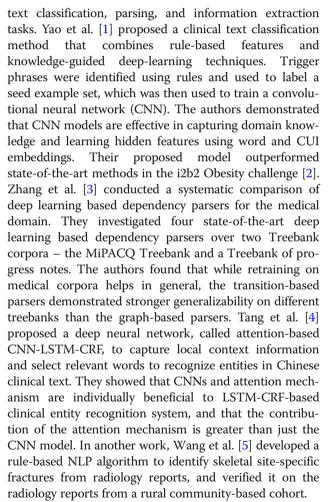
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Natural Language Processing (NLP) technologies have received significant attention in the medical domain and have demonstrated numerous successful uses in healthcare applications. The first international workshop on Health Natural Language Processing (HealthNLP 2018) provided a dedicated platform for close interactions among scholars, students, and industry professionals who are interested in NLP over health data such as clinical notes, social media, and biomedical literature. The workshop was organized in conjunction with IEEE International Conference on Healthcare Informatics (ICHI), and attracted submissions in the form of research papers, poster abstracts, and demonstration papers. All submissions were subjected to rigorous peer-review, with at least two peer reviews and at least one review by a senior member of the program committee. Selected papers and abstracts were featured as oral / poster presentations at the workshop. High quality research submissions were invited to expand their submitted works for a special issue of BMC Medical Informatics and Decision Making. The special issue on Health Natural Language Processing consists of twelve high quality papers, focusing on novel methods and applications of NLP over heath data. In the rest of this editorial, we highlight the key problems, approaches, and results from the papers included in this issue.

One of the major themes emerging from the papers is to develop novel machine learning algorithms and NLP approaches to process clinical notes for specific tasks. Three papers propose deep learning models for clinical

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Another focus area for papers in this issue revolves around challenges introduced by inefficient recording and management of clinical metadata in EHR systems. Hanauer et al. [6] took a closer look at the variations and complexities in the way numbers and numerical



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concepts are mentioned in clinical notes and their impact on information extraction systems. Using number-based keyword gueries on a clinical text search engine, the authors highlighted the data quality issues in clinical notes and potential impact on subsequent tasks such as cohort identification. Cook et al. [7] developed text-based approaches to maintain accurate provider directories based on the Healthcare Provider Taxonomy code, location, name, and address information to match the state and federal records. Wang et al. [8] investigated the associations between problem list and practice setting using NLP and topic modeling techniques. Their method generated prioritized and meaningful problem lists corresponding to specific practice settings. Kreuzthaler et al. [9] proposed a clustering approach to compress redundant problem lists in electronic health records and create semantic topic spaces.

Availability of shareable clinical corpora is critical for advancing clinical NLP research. Weng et al. [10] assessed the willingness to share clinical data among a large cohort of proxy-for-consented individuals from two sites. They found that a substantial fraction of consented patients would be willing to donate de-identified clinical data to a shared research repository, and that individuals were most reluctant in sharing mental health, substance abuse, and domestic violence data. Sharma et al. [11] proposed a phenotyping system that could facilitate portability across different institutions and data systems. The prototyping system integrates rule-based and statistical machine learning approaches to extract clinically relevant features from the unstructured text. Portability is achieved by storing components in OMOP CDM (Common Data Model) formats, thus enabling the reuse, adaptation, and extension of rule-based clinical NLP systems.

Finally, acknowledging the current trend of availability and popularity of health information online, there were two papers that studied challenges introduced by the advent of health-related social media as a mechanism for patients to communicate with each other. Vydiswaran and Reddy [12] introduced the notion of peer expertise in online health forums and studied approaches to identify peer experts based on the communication patterns in forums. They postulated that patients and other caregivers often take on the roles of experts in online forums and are willing to share their experience with other users. Identifying them in health forums can help better develop stronger communities and patient support groups. In another work, Doan et al. [13] studied the issue of causality extraction from Twitter messages. They develop lexico-syntactic patterns based on dependency parser outputs to extract health-related causal relations in three health-related topics. Manual analysis on extracted casualties in tweets revealed interesting insights into health-related discussion on Twitter.

In conclusion, these papers highlight the plethora of research in health-related natural language processing. While advancements are being made in meaningful use of electronic health records for clinical decision support, these papers represent a snapshot of the broad spectrum of challenges where natural language processing can help advance the methodologies, tools, and applications in healthcare.

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