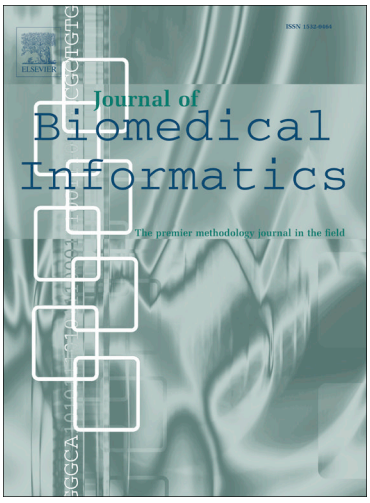

Drug-Drug Interaction Extraction from Biomedical Texts Using Long Short-Term Memory Network

Sunil Kumar Sahu, Ashish Anand

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Drug-Drug Interaction Extraction from Biomedical Texts Using Long Short-Term Memory Network

Sunil Kumar Sahu, Ashish Anand

Department of Computer Science and Engineering
Indian Institute of Technology Guwahati, India
{sunil.sahu, anand.ashish}@iitg.ernet.in

Abstract

The simultaneous administration of multiple drugs increases the probability of interaction among them, as one drug may affect the activities of others. This interaction among drugs may have a positive or negative impact on the therapeutic outcomes. Thus, identification of unknown drug-drug interactions (DDIs) is of significant concern for improving the safety and efficacy of drug consumption. Although multiple DDI resources exist, it is becoming infeasible to maintain these up-to-date manually with the number of biomedical texts growing at a fast pace. Most existing methods model DDI extraction as a classification problem and rely mainly on handcrafted features, and certain features further depend on domain-specific tools. Recently, neural network models using latent features have been demonstrated to yield similar or superior performance compared to existing models. In this study, we present three long short-term memory (LSTM) network models, namely B-LSTM, AB-LSTM, and Joint AB-LSTM. All three models use word and position embedding as latent features; thus, they do not rely on explicit feature engineering. Furthermore, the use of a bidirectional LSTM (Bi-LSTM) network allows for extraction of implicit features from an entire sentence. The two models AB-LSTM and Joint AB-LSTM also apply attentive pooling in the Bi-LSTM layer output in order to assign weights to features. Our experimental results on the SemEval-2013 DDI extraction dataset indicate that the Joint AB-LSTM model produces reasonable performance (F-score: 69.39%) even with the simple architecture.

Keywords: DDI Extraction, Long Short-Term Memory Network, Attention Model
Availability and Implementation : The source code is available for academic use at
https://github.com/sunilitggu/DDI-extraction-through-LSTM

1. Introduction

Significant growth has occurred in the number of people taking multiple drugs simultaneously. According to statistics released by the US Centers for Disease Control and Prevention in 2010, one in 10 Americans is on five or more medications [1], and similar figures can be expected from other countries. When multiple drugs are administered simultaneously, the probability of interaction among them increases, where one drug may affect the activities of others. Drug-drug interaction (DDI) may lead to a positive or negative impact on expected therapeutic outcomes. A negative consequence may worsen a patient's condition or lead to increased healthcare costs. With an increase in the number of people taking multiple drugs, it is essential that DDI information be available in a structured form. DrugBank[1] and Stockley[2] are examples of knowledge bases (KBs) that maintain DDI information in a structured form. However, with the exponential growth in biomedical literature, maintaining KBs up-to-date is a challenging task [2, 3]. PubMed, a

[1] https://www.drugbank.ca/
[2] https://www.medicinescomplete.com/mc/alerts/current/drug-interactions.htm