A Novel Deep Learning-Based Symptom Recognition System for Effective Physician Decision-Making

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Extracting patient symptoms from electronic health records (EHRs) is a daily task that physicians face with each patient. Physicians nowadays experience increased burnout due to the rising number of EHRs they need to analyze. This is true, especially during the pandemic period. In fact, time spent on analyzing EHRs increased 157% compared to the pre-pandemic average. Therefore, it is critical to create a system that can automatically identify patient symptom information from EHRs so that physicians can use this system to increase their productivity and reduce burnout rate. In this research, I propose a novel deep learning-based framework that combines customized word embedding techniques and deep neural networks for symptom extraction. Using a unique medical dataset from Harvard, I created various experiments/models with different combinations of word embeddings plus a biLSTM neural network. The best-performing model achieves a F1 score of 0.956 using a pre-trained GLoVe embedding concatenated with a self-trained FastText embedding plus a biLSTM neural network classifier. This model outperforms the current state-of-the-art symptom extraction model by more than 10% and is able to efficiently and effectively extract symptom data. Finally, I developed a web-based symptom recognition system that utilizes predictions from my best model to highlight symptom words in a given EHR file.

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