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Fall Risk Prediction in Older Adults from EHR Nursing Notes

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Electronic health records (EHR) are complex and contain both structured (e.g. physiological measures) and unstructured (e.g. nursing notes) health data. Studies show that EHR nursing notes contain critical health information, including fall risk factors in older adults. Older adults age 65 and above are at higher risk of fall. Predicting fall risk early could provide caregivers enough time to provide interventions. Several fall risk prediction models have been proposed in the literature; however, an exploration of fall risk prediction using nursing notes is missing. In this study, we explore deep learning architectures to predict fall risk in older adults using nursing notes in the EHR. In this IRB-approved study, we used EHR data obtained from 162 older adults at TigerPlace, a senior living facility located in Columbia, Missouri. The data included de-identified free-text nursing notes and medications. We pre-processed the data by keeping clinically relevant words. We used pre-trained word embedding models, specifically BioWordVec, and GloVe to train the models. We explored several deep neural architectures and evaluated them to test the effectiveness of each model in predicting future falls. Preliminary experiments show that the LSTM-based deep neural models were most effective in predicting future falls with a sensitivity of 0.72, specificity of 0.67, and a prediction accuracy of 0.75. The model used six months of nursing note data to predict future falls in the next two months. We observed that deep learning models performed better in predicting future falls in a shorter time range as compared to falls in distant future. In addition, the BioWordVec word embedding model was able to capture 17% more clinically relevant words in the text data when compared to GloVe. This exploratory analysis provides groundwork on the use of word embeddings in predicting fall risk from nursing notes.

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