순환 신경망 앙상블 모델을 사용한 EMR 데이터 예측
Ensemble Model-Based Prediction Using Recurrent Neural Networks for Electronic Medical Record

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Abstract:
EMR (Electronic Medical Record) is a computerized chart of a patient, which includes various personal information, examination and treatment results, operation records and medical history. In medical industries, EMR is often used for recording purposes and has different data formats for different hospitals. Recently, deep learning models using recurrent architectures have been shown good performance in data prediction such as stock prices and power consumptions. We developed a recurrent neural network model that can predict diseases using EMR history, and implemented an algorithm that predicts disease inferred by the patient's previous history and disease types and severity. We also constructed an ensemble of many different neural networks to generate more accurate results by fusing each learned model with data from different hospitals. The experimental data were collected from 11692 patients from years 2002 to 2013 without missing information. The NRMSE (normalized root mean squared error) result, predicted by a LSTM (long short-term memory), is 0.316. Using the proposed deep learning ensemble model, we could get better results at 0.305. Furthermore, continuous improvement of performance can be expected by developing an algorithm that utilizes newly added EMR information for re-learning (adaptation) of already learned models.

Keyword: Neural Network, Recurrent Neural Network, Long Short-term Memory, Electronic Medical Record, Ensemble Model