

Utilization of LSTM neural networks for Computing in Cardiology 2019 Challenge

Nejedly Petr, Plesinger Filip, Viscor Ivo, Halamek Josef, Jurak Pavel

Institute of Scientific Instruments of the Czech Academy of Science

Background: Sepsis is a life-threatening medical emergency condition resulting from body's response to infection and, consequently, leading to multi-organ failure. Forecasting of such event is potentially life-saving and could be addressed with machine learning methods. According to the PhysioNet Challenge 2019, we propose deep-learning technique based on recurrent neural networks to forecast sepsis in ICU patients.

Method: Input of presented method is complex description of patient's health state acquired per hour from multiple sources – heart rhythm, breathing, laboratory values etc. accompanied by demographics. Output of the method is prediction of sepsis for each hour in patient's record. Presented method utilizes Long Short Term Memory (LSTM) neural network and hyperparameter optimization technique (L2 regularization, dropout, learning rate, number of layers) based on genetic algorithm. Cross-Validation (5-fold) was used during training in order to estimate unbiased utility score and for selection of the best performing model. The model was trained using Challenge public training set (40,336 patients) where each patient was assessed based on Sequential Organ Failure Assessment (SOFA) score.

Results: Method performance was measured as utility function showing 0.71 for public training (cross-validation) and 0.XX (scores not available) for hidden testing dataset. Presented method consumed 0.76% of quota on remote PhysioNet servers for processing of hidden test set.