

Digital ICU : Interpretable Time-Series Neural Network with Attention Mechanism for Highly Imbalanced Multivariate Patient Data

General Info

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Project Abstract

ICU patients are continuously monitored by medical devices and caregivers to prevent potential clinical deterioration. This yields massive multivariate data, where machine learning approaches can be applied to analyze patients' health.

The multivariate patient data is however not in optimal format for machine learning models. Firstly, while vital signs can be recorded at high frequency (e.g. every 5 minutes), measurements such as lab tests are usually done once or twice per day. The decision making of the model can be dominated by the dense data in this case. Secondly, the proportion of missing values can be very high in the patient data and several modals (specific lab tests) can be completely missing for certain patients.

Beside the detection of deterioration, this project also aims to interpret the model's decision making, i.e., which input is abnormal and contributes more to the prediction result.

Tasks Description

- Develop a framework for patient deterioration prediction with integrated feature importance estimation
- Improve time-series model for highly imbalanced data
- Investigate correlations and missing data patterns in patient data to improve the model performance
- Visualize the model's decision making process

Technical Prerequisites

- Python3
- Advanced pytorch skills, e.g., custom neural network modules