Machine learning model for ICU management

A machine learning model that uses doctor's notes for improved prediction of patient condition in ICU settings.

IP Status: US Patent Pending; Application No. 17/330,908

Applications

- Hospital resource management
- Automated ICU patient condition monitoring

Key Benefits & Differentiators

- **Multimodal model design** - use of recurrent and convolutional units enables novel inclusion of doctor's notes with time-lapse data for improved prediction of benchmark ICU tasks
- **Predict in-hospital mortality** - to predict patient death before being discharged from the first two days of ICU data admission.
- **Model patient decompensation** - to detect patients who are physiologically declining. Decompensation is defined as a sequential prediction task where the model has to predict at each hour after ICU admission.
- Forecast length of stay in ICU

ICU management is challenging

Identifying and monitoring patient conditions in an ICU is a challenging and high-cost task. Hence, predicting the condition of patients during their ICU stay can help improve resource allocation for patients that need it most in a cost-effective way. There has been continuous progress in machine learning research for ICU management; however, most of this work has focused on using time series signals recorded by ICU instruments, ignoring expert knowledge available in doctor's notes.

Doctor's notes improve prediction of patient condition

An innovative machine learning model, developed in Prof. Srivastava's group at the University of Minnesota, implements a multimodal architecture that utilizes doctor's notes as well as time-lapse data of the patient to improve prediction performance. Specifically, this model includes a parallel recurrent unit for the time-series data and a convolution network for the clinical notes. This multimodal deep neural network model has been shown to improve prediction of in-hospital mortality, patient decompensation, and length of stay. Successful prediction of these benchmark tasks enables better management of ICU resources to improve patient care and decrease costs.

Phase of Development

TRL: 3-4

Technology ID

2020-138

Category

Software & IT/Algorithms
Software & IT/Artificial Intelligence
Software & IT/End User Software
Software & IT/Health IT
Software & IT/Simulation & Modeling

Learn more

Machine learning model is currently being tested/validated in a hospital.

Desired Partnerships

This technology is now available for:

- License
- Sponsored research
- Co-development

Please contact our office to share your business' needs and learn more.

Researchers

- **Jaideep Srivastava, PhD** Professor, Data Science Director of Undergraduate Studies, Computer Science and Engineering

References

1. Khadanga, S., Aggarwal, K., Joty, S., & Srivastava, J.(2019) , https://aclanthology.org/D19-1678/, ACL Anthology

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