Tata Institute of Fundamental Research
ASET Colloquium

Fusion of fully integrated analog machine learning classifier with electronic medical records for real-time prediction of sepsis onset

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Link for YouTube live-stream: https://youtu.be/UHuFGXu2gz8

This work develops a fusion artificial intelligence (AI) model that combines patient electronic medical records (EMR) and physiological data to predict the early risk of sepsis. The proposed model has two components- an on-chip AI model that continuously analyses patient electrocardiogram (ECG) data and a cloud-AI model that combines EMR and prediction scores from the on-chip AI model. The on-chip AI model is designed using analogue circuits with high energy efficiency for integration with resource-constrained wearable devices. A combination of EMR and sensor physiological data improves prediction performance compared to EMR or physiological data alone, and the proposed model has an accuracy of 93% in predicting sepsis 4h before onset. The key differentiation of this work over state-of-the-art is the use of single-modal patient vital (ECG) and simple demographic information, instead of comprehensive laboratory test results and multiple vital signs. Such a simple configuration makes it a solution favourable for real-time, at-home use for self-monitoring.

Sudarsan Sadasivuni is a doctoral candidate from the University at Buffalo, State University of New York (SUNY) in the school of Engineering and Applied Sciences. He is advised by Dr. Arindam Sanyal, an assistant professor in the School of Electrical, Computer and Energy Engineering at Arizona State University. He received double Masters from the University at Buffalo, SUNY (2019), and the University of Houston, Houston (2017), in the Department of Electrical Engineering. During Masters at Houston, he worked on building machine learning models that determine the best parameters that affect myopia using infrared distance measuring sensors and predict the risk of myopia at an early onset. His research interests include 1) machine-learning enabled continuous health monitoring systems for personalized at-home healthcare 2) Analog/ Mixed-Signal circuit design for in-memory computations 3) machine learning algorithms for health monitoring applications.