Title: COVID-19 Prognosis with Interpretable Deep Learning Methods

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Summary:

One major challenge with COVID-19 is the variability in outcome trajectory of patients. While a majority of patients recover naturally, 5-10% of them deteriorate and require intensive care (13% in Stony Brook cohort) [4]. It is important to predict the future deterioration of a patient based on their initial conditions, especially with the over-stressed hospital system. Meanwhile, finding the most relevant prognostic risk factors is crucial in the deployment of a prognosis tool. First, a small set of factors are much easier to collect, alleviating burden on medical staff. Secondly, a targeted set of factors makes it possible to develop efficient and light-weight prediction models that can be readily deployed on edge devices. This makes an efficient prognosis tool possible in areas with limited medical resources.

We propose an **interpretable** deep neural network for prognosis based on patients' initial conditions. Using state-of-the-art deep learning feature selection methods, we will train deep neural networks which can identify a sparse set of factors that are most critical for determining patient outcome. We will investigate the significance of the selected factors and how they affect prognosis related to different other conditions such as comorbidity (diabetes, hypertension, cardia-cerebrovascular disease), different treatment plans, time-varying measurements, etc.