

## **"CVD in NAFLD: Personalizing Diagnosis and Treatment using Machine learning"**

Non-alcoholic fatty liver disease (NAFLD) has become the most prevalent liver disease worldwide, affecting approximately 25% of the population globally. It is predicted to soon become the leading indication for liver transplantation. Cardiovascular disease (CVD) is the most important cause of morbidity and mortality among NAFLD patients. CVD dictates outcomes to a greater extent than does the progression of liver disease, resulting in ~ 40–45% of the total deaths in this population.

NAFLD and CVD share metabolic risk factors such as hypertension, dyslipidemia, insulin resistance. NAFLD is an independent risk factor for CVD through secretion of proinflammatory markers, atherogenic lipoproteins and procoagulant factors. NAFLD accelerates the progression of subclinical atherosclerosis and promotes premature CVD events and mortality. There are various other factors that contribute to CVD risk including genetic polymorphisms and aspects of lifestyle.

Given the complexity of patterns and hidden relationships among factors that contribute to CVD risk, we leveraged our expertise in machine learning to develop a novel integrative machine learning algorithm that classifies NAFLD patients at high risk of CVD. Our Random Forest machine learning model integrating clinical, genetic and lifestyle factors is able to predict risk of CVD in patients with NAFLD with an AUC of 0.849. It is also able to identify which specific risk factors are most predictive of risk in an individual patient. Overall, such an approach has the potential to personalize prevention and treatment of CVD in patients with NAFLD.

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