



Application number/Title: 18274 - Developing a diagnostic tool for non-alcoholic fatty liver disease and inferring causal relationships with type 2 diabetes

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Keywords provided by the Applicant PI to describe the research project:
bayesian-network, nafld, imaging, machine-learning, mendelian-randomisation, type-2-diabetes

Application Lay Summary:

Non-alcoholic fatty liver disease (NAFLD) and Type 2 diabetes (T2D) are two pervasive and globally prevalent diseases that cause serious health complications. Utilizing UKBB rich dataset we aim to investigate two key questions regarding these diseases. In "Question 1", we aim to derive a prediction tool for the diagnosis of NAFLD and in "Question 2" our aim is to assess the causal pathways between NAFLD and T2D.

With respect to "Question 1", the diagnosis of NAFLD at an early stage is of great importance as this can help us to go with interventions and prevent further damages to the liver. Liver biopsy, MRI scans, ultrasounds and liver enzyme tests are often used for the diagnosis of the disease. However, the invasive nature of the liver biopsy, the high costs of the MRI scans and lack of accuracy with only relying on liver enzyme tests leave many patients with NAFLD undiagnosed. With developing a prediction tool for NAFLD, we aim to introduce a strong proxy as a safe and cheaper alternative to MRI scans and limit the number of MRI scans performed only to those most likely to have fatty liver.

In "question 2", our aim is investigating the causal relationship between NAFLD and T2D. Many studies show the association between these diseases, but whether they are causally related and if so what the direction and magnitude of this effect are is not clear. Determining the cause-effect relationships between T2D and NAFLD may help us with the design of interventions for their prevention and treatment. Within the project we will build a structural graph including these disease and several other clinical factors to further explore the causal pathways that connect them together.

These two questions are implicitly related to each other. Using the prediction model from "question 1" people at risk of NAFLD can be identified, who might subsequently be intervened upon. However, one would not want to intervene unless the relationship between liver fat and disease (diabetes in this case) is causal, which we will try to address in "question 2".

Our estimated timeline for the proposed research project in total is 24 months. Which comprises of exploring data and finalizing aforementioned methods in our analysis (6months), applying methods on the data (12months) and drafting/submitting two papers from our analyses to a relevant scientific journals (6months).