Improving Cardiovascular Risk Prediction Using Machine Learning

Project Title: Improving Cardiovascular Risk Prediction Using Machine Learning
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Cardiovascular disease (CVD) is one of the leading causes of death worldwide (~30%) and is regarded as highly preventable (~90%). Diagnosis of CVD depends on recognizing acute symptoms of the disease state. Primary prevention is a high priority and requires screening for risk factors and providing suitable interventions. Heart disease generally is identified as a major public health issue in Australia and need for effective risk modification management plans and ongoing monitoring of adherence and impact for interventions is well recognize.

Predictive analytics used currently for CVD risk prediction use a small set of variables (risk factors) that are judged to be clinically relevant and easily calculated (e.g. age, gender, family history, body mass index, smoking status, blood pressure, serum lipids). This approach excludes some potentially important factors that were previously not identified as significant and so fails to identify some individuals or cohorts at risk. In addition, it suffers from generalization and lacks the ability to be updated as new information becomes available.

Machine learning is an emerging computational technique which can overcome these limitations. It enables the exploration of a range of new risk factors and can support an adaptive approach for risk predictor revisions. It can also address the issues of multiple and correlated predictors, non-linear relationships and interactions between the predictors and outcome, better than the traditional approach.

This project aims to conduct analysis of routinely collected health data for the purpose of assessment of cardiovascular risk for individuals, using both standardised risk indicators and machine learning (where ground truth is available), and to provide an estimate of the expected potential of additional risk assessments, and accuracy of those assessments, in the two different location settings (Shandong and South Australia).

The outcomes of this project could be used to prospectively identify patients missed by the traditional approach and translate into improved clinical outcomes for high-risk CVD patients. This could enable more accurate clinical prediction, timelier intervention and earlier treatment to prevent CVD-related morbidity and mortality.

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