

Predicting Gestational Diabetes Mellitus

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Principal investigator

Eran Segal

Faculty of Mathematics and Computer Science
Department of Computer Science and Applied Mathematics

Overview

diabetes mellitus (GDM) is one of the most common complications of pregnancy, increasing the risk for short and long-term adverse events for both mother and offspring. Early intervention can reduce future complications, however, GDM is currently diagnosed only at late pregnancy stages. The group of Prof. Eran Segal developed a computational method that identifies women who are at high risk to develop GDM during early pregnancy stages based on electronic health records and a questionnaire. This can be applied as an early selective screening process, exempting women at low risk from unnecessary glucose tolerance tests, thus reducing costs and inconvenience.

Background and Unmet Need

Gestational diabetes mellitus (GDM) is a common medical complication of pregnancy, in which pregnant women without a previous diagnosis of diabetes develop glucose intolerance. GDM increases the risk of short- and long-term complications for both mother and offspring. Mothers with GDM have a higher chance for operative delivery and are more likely to develop type 2 diabetes. Children of diabetic mothers are predisposed to fetal macrosomia, respiratory difficulties, and metabolic complications in the neonatal period and have a higher risk for future obesity and alteration in glucose metabolism. Previous studies have demonstrated that interventions early in pregnancy, during the first and second trimester, can considerably reduce the risk of adverse pregnancy outcomes. However, GDM is currently typically diagnosed with a glucose tolerance test (GTT) only between 24-28 weeks of gestation. Therefore, there is a need to identify women at a high risk to develop GDM at an early stage of pregnancy to enable early intervention strategies, which may prevent or reduce GDM and its associated comorbidities.

The Solution

The group of Professor Eran Segal developed a computational method that predicts women's risk to develop GDM at both pregnancy initiation and other early pregnancy stages based on electronic health records (EHRs) or a designated questionnaire.

Technology Essence

The method developed by the group includes obtaining parameters characterizing a female subject; accessing a trained machine learning procedure; feeding the procedure with the parameters, and receiving from the procedure an output indicative of a likelihood that the subject has, or is expected to develop gestational diabetes. The model significantly outperformed a baseline risk score, which was calculated according to current NIH current recommendation. A simpler model based on only 9 questions that can be answered by the patient achieved a similar prediction result (figure 1).

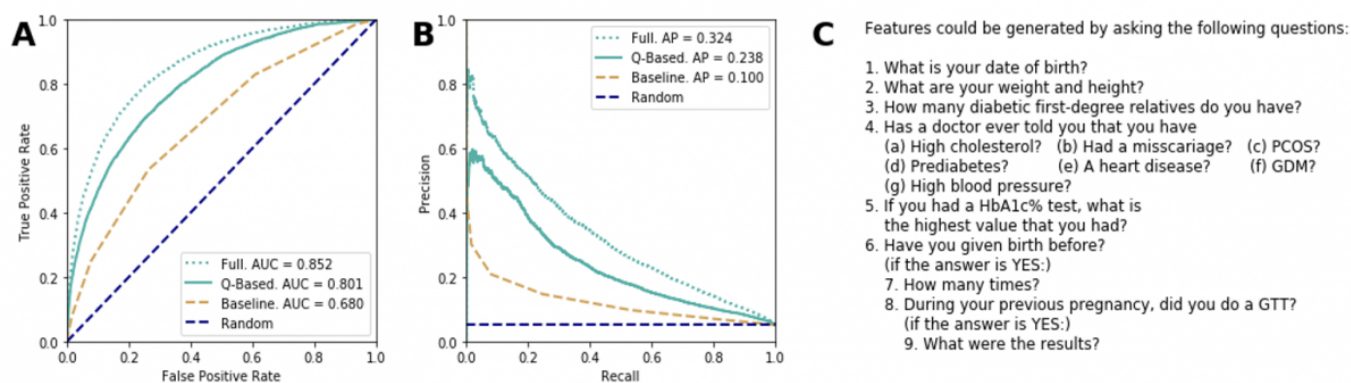


Figure 1: Predictive model evaluation. A: Receiver Operating Characteristic (ROC) curve, comparing the developed full model (dot), the questionnaire-based predictor (full) and the Baseline Risk Score (dashed). B: Precision-Recall (PR) curve, with the same properties as in A. C: The list of questions that assemble the predictor.

Applications and Advantages

A method that can predict GDM accurately at the very early stages of pregnancy, allowing early-stage interventions to prevent future complications.

The method may be used as the basis for a selective screening process for GDM diagnosis, avoiding unnecessary GTT for women at low risk for GDM development, thus reducing costs and physical inconvenience.

Development Status

The group fully developed the method based nationwide EHR data and evaluated its performance from pregnancy initiation up to 20 weeks of gestation.

Patent Status

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