Personalised Longitudinal Discriminant Analysis for Early Detection of Diabetic Retinopathy.

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Sight threatening diabetic retinopathy (STDR) is a sight threatening condition screened for every year in all patients with diabetes in the UK. Only around 4% of patients with diabetes develop STDR each year, so testing all patients is very inefficient. Our aim is to accurately identify patients at high risk of developing STDR using longitudinal models and discriminant analysis.

Recent developments have been made in discriminant analysis where longitudinal trends are modelled using multivariate generalized linear mixed models. We model longitudinal markers using mixed models and then use the parameter estimates from this in a discriminant analysis to predict the group membership of new patients.

We extend this existing discriminant analysis methodology for longitudinal data by allowing covariate information to be used as discriminators, and not just to influence the longitudinal trends.

We analyse data from a longitudinal study of over 12,000 patients diagnosed with diabetes and use our method to classify these patients into risk groups. Initial results demonstrate an advantage in using longitudinal information over classic discriminant analysis methods.

We also explore early prediction methods to see if we can correctly identify patients sooner than with current methods. We expect that this methodology will lead to better detection of STDR, and hence improved patient care, whilst also significantly reducing the screening costs for the NHS.