PROJECT SUMMARY

Autism spectrum disorder (ASD) is a developmental disability associated with significant social and behavioral challenges, and there is a distinct need for tools that help identify children with ASD as early as possible. To that effect, we introduce and propose to validate the ASD Co-morbid Risk (ACoR) score in a limited clinical study. The ACoR is computed via sophisticated pattern discovery on longitudinal history of diagnostic codes for individual patients, and potentially signals a future ASD diagnosis within 16-26 months of age. Computation of ACoR requires no new blood-work, or questionnaires, and uses data already available on patient file, with no demand for any particular test or demographic information. Thus, ACoR is positioned to be a universal screening tool, that can estimate the risk of autism for all children in a pediatric facility near-instantaneously, potentially outperforming existing tools. Despite being highly heritable, our current incomplete understanding of ASD pathogenesis and the lack of reliable biomarkers hampers early detection, intervention and patient outcomes. The currently available questionnaire based screening tools suffer from vast number of false positives which create long wait-times for diagnostic evaluations. Additionally, standardized checklists are vulnerable to socio-economic and interpretational biases that disproportionately impact diagnosis in diverse communities. Borderline cases with children with average to above average cognitive abilities might be left undiagnosed till start of school, which negatively impact effectiveness of interventions. The ACoR score is designed to address the aforementioned complicated challenges of ASD screening by distilling incipient patterns predicting elevated risk from past medical history of individual patients. Thus to compute ACoR, we operationalize a documented aspect of ASD symptomology in that it has a wide range of co-morbidities occurring at much higher rates than in the general population. In the setting of a pediatric primary care clinic at the Department of Pediatrics, University of Chicago, we plan to carry out a comparative study of ACoR with M-CHAT/F, which is the most common screening tool in current use. Via a direct comparison, we specifically aim to 1) estimate prospectively to what extent we can reduce false positives, 2) the possibility of combining the scores for significant improvements in either Positive Predictive Value or the sensitivity while not losing specificity, 3) the superior performance in ethnically and demographically diverse cohorts, and 4) shed light on the ASD pathobiology by classifying patterns of co-morbidities that map to distinct presentations. We have extensively validated our results in retrospective studies on two independent databases of patient records with over four million children. These results indicate superior performance to existing tools, achieving out-of-sample AUC exceeding 80% for either sex from just over 2 years of age. Unlike standard machine learning applications, ACoR represents a novel screening modality for ASD, functionaly independent of questionnaires, and potentially can address documented language, cultural and social barriers of the existing tools.