Precision Mental Well-Being with Digital Biomarkers: A Machine Learning Approach in Evaluating Subclinical Types Depression

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Abstract

One of the challenges in depression diagnostics is that the current medical approach rely on a checklist of symptoms, subjective self-reports, and on the physician's intuition and experience. The heterogenous nature of depression presents several difficulties in diagnosis when individuals experience subclinical levels of depressive symptoms that is not considered as a major depression by the current diagnostic standards. The rise in digitization of healthcare presents several avenues that can be used to address the significant gaps in terms of mental health diagnostics with the current symptom-based methodology established by the Diagnostic and Statistical Manual of Mental Disorders. Primarily, personal computing devices provides an opportunity towards using their measured physical data as digital biomarkers as an objective way identify the symptomatic state of individuals with regards to their well-being.

In this dissertation, we present an approach towards using Digital Biomarkers with Machine Learning in addressing key challenges within the current traditional diagnostics of depression, namely: subthreshold depressive symptoms are often misdiagnosed or underdiagnosed, and identifying and providing ahead-of-time diagnosis for patients with residual symptoms is difficult. In the first experiment we present an machine learning approach towards identifying subthreshold depressive individuals among healthy groups and identified key cognitive digital biomarkers for the condition. In the second experiment we present a modified survival model method in providing an ahead-of-time prediction of depression relapse risk for recently recovered individuals using their longitudinal lifelog activity data.