

Title: Leveraging Passive Smartphone Data for Enhanced Mental Health Screening and Monitoring using the Behavidence App: A Novel Digital Behavioral Profiling Approach

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Abstract:

Depression, a highly disabling mental health disorder, presents a significant global burden both economically and medically. The prevalence of depression is increasing, and the COVID-19 pandemic further exacerbated the problem. Existing diagnostic criteria, such as DSM-5 and ICD-11, has faced scepticism regarding validity, bias and ability to capture the heterogeneous nature of depression. Additionally, barriers to adequate diagnosis and intervention include a shortage of accessible care, inadequate recognition of depression in primary care, delayed and often incorrect therapeutic intervention, comorbidities, and the burden of stigma associated with depression.

To address these challenges, this study presents a groundbreaking approach that utilises non-invasive passive smartphone usage data to detect real-time changes in mental wellbeing, enabling improved screening and remote monitoring and timely access to care. Through tracking de-identified digital behaviour and the development of relevant statistical and machine learning models, we introduce the Mental Health Similarity Score (MHSS). The MHSS is a novel metric that is passively derived from analysing non-intrusive and non-identifiable smartphone usage data. This metric serves to identify and track depressive and anxious behaviour in a naturalistic setting.

Through successful peer-reviewed studies and field implementations, we demonstrate the effectiveness of the MHSS in profiling mental behavioural patterns associated with depression and anxiety. We found that the binary classification model (none vs severe) for depression achieved an accuracy of 87% and for anxiety it achieved 76% (1, 2). Furthermore, we showcase how this solution can be seamlessly integrated into routine mental health assessments, providing a valuable tool for enhancing depression screening and monitoring. This innovative approach holds promise for improving mental health outcomes globally, addressing the urgent need for timely intervention in the face of rising numbers and the associated enormous economic burden.

References

1. Choudhary S, Thomas N, Ellenberger J, Srinivasan G, Cohen R. A Machine Learning Approach for Detecting Digital Behavioral Patterns of Depression Using Nonintrusive Smartphone Data (Complementary Path to Patient Health Questionnaire-9 Assessment): Prospective Observational Study. JMIR Form

Res. 2022 May 16;6(5):e37736. doi: 10.2196/37736. PMID: 35420993;
PMCID: PMC9152726.

2. Choudhary S, Thomas N, Alshamrani S, Srinivasan G, Ellenberger J, Nawaz U, Cohen R. A Machine Learning Approach for Continuous Mining of Nonidentifiable Smartphone Data to Create a Novel Digital Biomarker Detecting Generalized Anxiety Disorder: Prospective Cohort Study. *JMIR Med Inform.* 2022 Aug 30;10(8):e38943. doi: 10.2196/38943. PMID: 36040777;
PMCID: PMC9472035.