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Smartwatch-Based Monitoring of Psychological Stress in Real-World Settings

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https://tau-ac-il.zoom.us/j/83251482591?pwd=eEZ27bp3nZXXvyiyht5oknrJ2w5Vye.1

Abstract:

Psychological stress is a major determinant of long-term health outcomes, influencing cardiovascular risk, immune function, mood disorders, cognitive performance, and mortality. When assessing stress, it is essential to distinguish between two complementary dimensions: *physiological stress* (objectively inferred from biosignals) and *psychological stress* (subjective perception of feeling stressed), each independently predicting adverse health outcomes. Although modern wearables can already track physiological stress continuously via heart-rate variability (HRV) and related indices, psychological stress still depends almost entirely on self-report questionnaires that demand active participation and capture only isolated moments in time.

Here, we propose a machine-learning framework for the passive and continuous assessment of psychological stress using data from off-the-shelf smartwatches. The model integrates multi-modal smartwatch biosignals—including sleep patterns, physical activity, heart rate and HRV-based stress—with ambient environmental factors and rich individual characteristics such as sociodemographics, personality traits, and health history. We trained and evaluated the framework on a large-scale real-world dataset comprising thousands of participants and hundreds of thousands of self-reported stress questionnaires collected over three years. The resulting model achieves an area under the ROC curve of 0.85 in discriminating between extreme levels of psychological stress, demonstrating robust generalization across diverse users and day-to-day contexts.

Bio:

Or Maymon is an M.Sc. student in the School of Industrial & Intelligent Systems Engineering, conducting

research in the Big Data Lab under the supervision of Prof. Erez Shmueli. His research focuses on the use of commercial smartwatches for personalized health monitoring.