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Detection of Cocaine Use with Wireless Electrocardiogram Sensors

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In recent years, the ability to continuously monitor activities, health, and lifestyles of individuals using sensor technologies has reached unprecedented levels. Such ubiquitous physiological sensing has the potential to profoundly improve our understanding of human behavior, leading to more targeted treatments for a variety of disorders. The long term goal of this work is development of novel computational tools to support the study of addiction in the context of cocaine use. The current paper takes the first step in this important direction by posing a simple, but crucial question: *Can cocaine use be reliably detected using wearable on-body sensors and current machine learning algorithms?* We select wireless ECG as the most promising sensing modality for cocaine use detection.

The main contributions in this paper include the presentation of a novel clinical study of cocaine use in which a unique set of wireless ECG data were collected, the description of a computational pipeline for inferring morphological features from noisy wireless ECG waveforms, and the evaluation of cocaine use detection algorithms based on data-driven and knowledge-based feature representations. Our results show that cocaine use can be detected with AUC levels above 0.9 in both the within-subjects and between-subjects cases at the 32mg/70kg dosage level.