Title: Rescodp: a differentially private mechanism for preserving privacy in wearable physiological data

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Abastact: In recent years, wearable devices have gained significant popularity due to their numerous benefits, including real-time health monitoring and fitness tracking. However, the sensitive nature of physiological data poses major privacy challenges. While existing mechanisms such as k-anonymity or abstraction provide partial protection, they are insufficient for continuous and multi-user data publishing. In this paper, we present ResCoDP, a novel differentially private mechanism explicitly designed for wearable physiological data. The unique contributions of ResCoDP include: (i) the introduction of w-hour differential privacy, a new definition that provides fine-grained privacy guarantees for continuous streams; (ii) a two-level privacy budget strategy that combines budget portion allocation and adaptive budget allocation to balance noise distribution dynamically across time windows; and (iii) a multi-user publishing framework that ensures privacy while maintaining utility in real-world scenarios. Experimental evaluation on a real wearable dataset demonstrates that ResCoDP significantly outperforms state-of-the-art approaches, achieving up to 47% lower MAE and 93% lower MRE, thereby offering a practical and scalable solution for privacy-preserving health data publishing.

Keywords: Wearable · Health data · Real-time health data · Differential privacy · Privacy preservation scheme · Privacy enhancing technology

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