International Journal of Multidisciplinary Conference Proceedings
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Enhancing Mental Health Risk Assessment with IoT: A GAN-Driven Explainable AI Approach

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KEYWORDS

Mental Health Risk Assessment, Internet of Things (IoT), Generative Adversarial Networks (GANs), Explainable AI (XAI), Deep Learning for Mental Health.

ARTICLE HISTORY

Date of Publication:16-04-2025

Conference Organizer(s)

Research Consultancy on Social & Management Development
&
University of Karachi
DHA Suffa University

ABSTRACT

Mental health issues such as stress, anxiety, depression, and suicidal thoughts have become increasingly prevalent, underscoring the need for proactive and accurate risk assessment methods. The widespread adoption of IoT-based wearable devices offers the opportunity to continuously monitor physiological signals—such as heart rate and skin conductance—for real-time mental health evaluation. However, real-world data collected from such devices often suffer from limitations including small sample sizes, class imbalance, and privacy concerns. To overcome these challenges, this study proposes a Generative Adversarial Network (GAN)-driven Explainable AI (XAI) framework that integrates real-time physiological data from wearable devices with synthetically generated samples. The approach also incorporates game-based stress induction mechanisms to enrich behavioral context and enhance data diversity. By combining synthetic data generation, bias-aware learning, and interpretable AI models, this research aims to advance the accuracy, fairness, and transparency of mental health risk assessments.

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Volume-Issue-Page Number	2(1) 9
Citation	Mansoor, Y., Siddique, S., & Waheed, U. (2025). Enhancing Mental Health Risk Assessment with IoT: A GAN-Driven Explainable AI Approach. *Proceedings of the 1st International Conference on Innovation and Sustainability in Management and Social Sciences, *International Journal of Multidisciplinary Conference Proceedings, 2(1).*