

AI-Enhanced Soldier Health Monitoring and Mission Readiness Prediction System

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Abstract: Military operations expose service members to extreme physical and environmental stressors that can degrade performance and threaten mission success. This paper presents an integrated, end-to-end system for continuous soldier health monitoring and mission readiness prediction. The system uses wearable sensors to collect heart rate, heart rate variability, body temperature, blood oxygen saturation, and motion data, and transmits these measurements via secure IoT gateways to an analytics platform. On the platform, signal preprocessing, feature extraction, and machine learning models detect early signs of physiological compromise and compute individual readiness scores. A commander-facing dashboard visualizes real-time status, issues prioritized alerts, and supports rapid decision making. Prototype evaluation on controlled training scenarios demonstrates that multimodal fusion of physiological and kinematic signals improves early detection of heat stress and fatigue and provides meaningful readiness estimates with low latency. The architecture emphasizes robustness to motion artifacts, low-power operation, and explainable outputs to support trust and operational use. Future work includes larger field trials, edge inference for offline resilience, and enhanced privacy-preserving model updates.

Keywords: wearable sensors; Internet of Things; soldier health monitoring; machine learning; mission readiness; real-time dashboard

