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RIoTLite Prototype for Evaluating Shariah-Compliant Rehabilitation IoT in Post-Stroke Care

MD SARIFUL ISLAM[1], NURUL HANIS MOHD DHUZUKI[1], AHMAD ANWAR ZAINUDDIN[1]*, MOHD IZUDDIN MOHD TAMRIN[1], DINI HANDAYANI[1], SAIDATUL IZYANIE KAMARUDIN[2], NAQIUDDIN JOHAR[3], NADIA FARHANA AZMAN[3]

[1]Kulliyyah of Information and Communication Technology, International Islamic University Malaysia, Gombak, Malaysia

[2]Fakulti Sains Komputer dan Matematik (FSKM), Universiti Teknologi Mara (UiTM), 40460 Shah Alam, Selangor, Malaysia

[3]Rehabilitation Unit, Hospital Putrajaya, Putrajaya, Malaysia

**Correspondence: anwarzain@iium.edu.my*

ABSTRACT

Introduction: The lack of affordable, continuous, and inclusive rehabilitation services creates disparities in patient outcomes, particularly for vulnerable groups, and raises concerns about fulfilling the ethical responsibility to ensure fair and compassionate healthcare delivery. To address these challenges within a Shariah-compliant healthcare framework, this study introduces a computational approach using the Rehabilitation Internet of Things (RIoTLite) to enable remote, ethical, and Patient-centred rehabilitation. **Methods:** Hand Gesture-based data from 200 post-stroke patients at Putrajaya Hospital were collected using the MediaPipe Pose framework for real-time skeletal and hand tracking. Features such as repetition count, and completion time were extracted and analysed through predictive models, including linear regression and ensemble methods, with validation based on tolerance-based accuracy. **Results:** Tolerance-based accuracy evaluation demonstrated clinically meaningful outcomes within a 20-30% margin of agreement with manual assessments. For hand strengthening (HS), the system achieved 71.5% accuracy at ±20% tolerance and 88.5% at ±30%, reflecting strong reliability in measuring gross motor functions. Hand opposition (HO), which relies on fine motor precision, yielded 61.5% accuracy at ±20% and 84.5% at ±30%, indicating acceptable reliability at broader thresholds despite higher variability. **Conclusion:** These results affirm that RIoTLite can be regarded as a clinically usable tool for remote rehabilitation monitoring, particularly under ±30% tolerance. Furthermore, significant correlations were observed between computational metrics and established clinical outcomes, confirming the reliability of the proposed framework. Beyond clinical utility, the framework ensures patient data privacy and aligns with the *Maqasid* al-*Shariah* in upholding *ʿAdl* (justice), *Taysīr* (facilitation of access), and preservation of *Akhlāq* (morality). Overall, the findings highlight the potential for ASEAN healthcare systems to adopt technology-driven rehabilitation strategies that enhance patient autonomy.

Keywords: Computational modelling; gesture recognition; post-stroke rehabilitation; RIoTLite; shariah-compliant-healthcare