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Assessing AI-Driven Personalization in Smart Cities Using Hybrid Machine Learning and MCDM Approach

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- Abstract

This study aims to assess AI-driven personalization strategies in smart cities, focusing on promoting digital inclusion across diverse urban populations. As artificial intelligence becomes increasingly central to urban service delivery, ensuring equitable and effective personalization is critical to preventing the amplification of digital inequality. To address this challenge, a hybrid evaluation framework is proposed, integrating Multi-Criteria Decision Making (MCDM) techniques, specifically Step-wise Weight Assessment Ratio Analysis (SWARA), Linguistic q-Rung Orthopair Fuzzy Numbers (Lq-ROFNs), and the Multi-Attributive Border Approximation Area Comparison (MABAC) with a Machine Learning (ML) classification model based on

Random Forest. The framework is applied to stakeholder input from ten Indonesian smart cities, evaluating personalization readiness across five dimensions: accessibility, affordability, user engagement, privacy, and personalization effectiveness. The results indicate that accessibility and user engagement are the most influential criteria, while affordability and privacy are areas requiring strategic policy focus. The integrated model classifies cities by readiness level and identifies sensitivity patterns relevant to inclusive digital policy-making. The novelty of this research lies in its synthesis of MCDM and ML approaches to produce a transparent, scalable, and data-driven tool for evaluating AI personalization. This contributes to inclusive smart city development by aligning AI implementation with broader social equity objectives.