A MACHINE LEARNING-BASED DECISION SUPPORT FRAMEWORK FOR IT CAREER RECOMMENDATION AMONG SRI LANKAN UNDERGRADUATES

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Abstract

Sri Lanka's expanding Information and Communication Technology sector requires effective career guidance to help undergraduates align their developing competencies with potential career pathways. This study developed an explainable machine-learning decision-support framework for predicting students' self-reported preferred IT career roles from their academic and skill profiles. Following institutional ethical approval, survey data were collected from 5,000 undergraduates across Sri Lankan universities, covering 19 preferred IT roles together with academic performance, technical and emerging-technology skills, soft skills, internships, certifications, English proficiency, and work preferences. The target label was each participant's independently self-reported preferred career role and was not derived from the predefined skill vocabularies used to construct domain-affinity features. Thus, predictions represent preference-aligned patterns rather than independently validated occupational suitability, and associations between reported skills and preferred roles may partly reflect students' pre-existing career interests. Data were partitioned before fitted preprocessing, with transformations and SMOTE restricted to training data. Eight classifiers were evaluated using a held-out test set and five-fold cross-validation. The stacking ensemble achieved the highest held-out weighted F1-score of approximately 80.8%, while tuned LightGBM achieved comparable performance and was retained for explainability. SHAP and LIME identified profile characteristics contributing to model predictions, while errors were concentrated among related roles. The framework is intended as a supplementary tool through which career counsellors can discuss preference-aligned pathways and alternatives with students. Nevertheless, self-reported preferences and the sampled institutional context may constrain generalisability; future validation should incorporate external employment outcomes and broader student populations.

Keywords: Career recommendation, Decision-support system, Explainable AI, ICT workforce, LightGBM