ABSTRACT

Manual and fixed-schedule maintenance of computer devices at the Laboratory of the Faculty of Industrial Engineering, Telkom University, has resulted in high downtime and inefficiencies in operational performance. The absence of real-time device condition monitoring often leads to delayed repairs and repeated failures. To address these issues, this study developed a predictive maintenance scheduling model using Machine Learning. The Random Forest Regressor algorithm was employed to estimate device failure risks, while optimization algorithms such as Particle Swarm Optimization (PSO) and Improved Binary PSO (IBPSO) were applied to generate efficient and adaptive maintenance schedules. The predictive model demonstrated high accuracy based on MAE and R^2 metrics and was able to significantly reduce device downtime. Prior to the model's implementation, maintenance was reactive and irregular, resulting in substantial downtime. After applying the model, there was a notable reduction in downtime, better allocation of technician resources, and an optimized daily, weekly, and monthly maintenance plan tailored to device conditions. This model proved to enhance the laboratory's operational continuity and support the effectiveness of technology-based academic activities. The proposed approach is highly relevant for higher education institutions aiming to improve the reliability and sustainability of information technology systems.

***Keywords**: Scheduling Maintenance, Machine Learning, PSO, IBPSO, Random Forest, Downtime*