Research Proposal: AI-Driven DevOps for Embedded Systems

Embedded systems are the foundation of modern smart technologies, powering IoT devices, autonomous systems, and industrial automation. However, the software development process for embedded systems faces unique challenges due to hardware constraints, limited computational resources, and the need for real-time performance. Traditional DevOps approaches, while effective in cloud and enterprise environments, struggle to adapt to these constraints. This research proposes an AI-driven DevOps framework designed specifically for embedded systems to enhance automation, efficiency, and reliability across the software development lifecycle.

The main objective of this research is to integrate Artificial Intelligence (AI) techniques into DevOps processes for predictive analytics, intelligent testing, and automated deployment in embedded environments. Machine Learning (ML) models will be developed to predict build or deployment failures, optimize resource utilization, and detect anomalies in real-time operations. Reinforcement learning will be explored for adaptive scheduling and optimization in Continuous Integration and Continuous Deployment (CI/CD) pipelines.

The methodology involves designing a modular AI-driven DevOps architecture consisting of data collection, AI analysis, and automation layers. Experimental validation will be carried out using embedded devices such as Raspberry Pi or Arduino platforms. The expected outcomes include a validated AI-driven DevOps prototype that reduces development time, improves fault detection, and enhances the reliability of embedded software. This research will contribute to the advancement of intelligent automation in embedded systems development and serve as a foundation for future work in AI platforms.