Design and Implementation of an AI-Assisted Code Review Tool for Low-Code Platforms to Improve Quality and Security.

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I certify that I have read this thesis and that in my opinion it is fully adequate, in scope and in quality, as a thesis for the degree of Master of Science.

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DECLARATION

This is to certify that the work is entirely my own and not of any other person, unless explicitly acknowledged (including citation of published and unpublished sources). The work has not previously been submitted in any form to the Sri Lanka Institute of Information Technology or to any other institution for assessment for any other purpose.

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ABSTRACT

Design and Implementation of an AI-Assisted Code Review Tool for Low-Code Platforms to Improve Quality and Security.

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Low-code platforms like Mendix fast-tracks application development but, due to limited review mechanisms, face challenges in sustaining the code quality and security. Existing code review approaches are not optimized for visual cues, model-driven workflows, increasing the possibility of logical, security, and performance issues introduced by citizen developers. This research introduces an AI-assisted code review tool that combines GPT-4 and Claude Opus 4 for workflow analysis and defect detection in low-code environments. The approach evolved from few-shot prompting to workflow-oriented fine-tuning, resulting in improved analytical precision and reliability. The tool was further enhanced to perform business gap assessments and deliver user-friendly, structured feedback via a pluggable React-based widget integrated into the Mendix environment. The evaluation of the tool demonstrated an average precision of 84.5% and an average recall of 84.8% and an F1 score between (0.82-0.87), with workflow-based fine-tuning outperforming few-shot learning. A preliminary usability study with 25 developers demonstrated a 90% satisfaction rate and approximately 50% reduction in issue resolution time. Proxy validation using generative AI models was performed due to the limited availability of Mendix domain experts. These findings highlight the capability of AI-assisted code review to enhance workflow quality, strengthen application security, and improve developer productivity in low-code environments.

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