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# Improving Software Quality through Deep Learning: A Comprehensive Literature Study on Error Prediction in Software Development

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**Abstract:** *The paper explores the significance of error prediction in software development and discusses the use of deep learning approaches to address this task. It emphasizes the need for proactive error prevention and the limitations of reactive bug- fixing strategies. The study examines various deep learning models, including Recurrent Neural Networks (RNNs), Convolutional Neural Networks (CNNs), and Graph Convolutional Networks (GCNs), and their applicability in error prediction. The conclusions drawn from the study highlight the strengths of each model. RNNs are effective in capturing temporal dependencies and sequential patterns in error data, enabling the analysis of error progression over time. CNNs excel at extracting relevant features and local patterns from software artefacts by treating them as image-like data. GCNs leverage the graph structure of software artefacts to capture structural dependencies and interactions between code elements. To leverage the benefits of both temporal and structural information, the study proposes a hybrid model that combines RNNs with GCNs for error prediction. This hybrid model harnesses the power of deep learning to identify patterns and model relationships, offering promising results in accurate error forecasting and prevention in software development. The adoption of proactive error prediction techniques facilitated by deep learning has the potential to enhance software quality, resource efficiency, and user experience. By proactively identifying and addressing errors, development teams can reduce the impact of issues before they manifest, leading to improved software reliability and customer satisfaction. Overall, the paper highlights the importance of error prediction in software development and demonstrates the potential of deep learning approaches to enhance error prevention strategies.*

**Keywords:** error prediction, software development, deep learning, RNNs, CNNs, GCNs, proactive error prevention, software quality, temporal dependencies, sequential patterns, structural dependencies, hybrid model

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