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Quality Characteristics for Software in HPC Environments: A Systematic Literature Review

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Research outputs in general require certain qualities to facilitate reuse as described by the FAIR Principles. For research software specifically, software engineering methods can help realize these goals. However, the desired qualities may differ between commercial and research software or even software in HPC environments. The focus on performance introduces challenges such as additional complexity from parallelization and hardware-specific implementations, which influence software quality.

This work aims to analyze the current research on software quality in HPC and, in particular, identify important quality characteristics. Therefore, we conducted a systematic literature review, which resulted in 29 relevant papers.

We find that the topic has been researched, especially in the last ten years. The contributions can be categorized into three areas: the proposal of a tool or process for improving software quality in HPC, the presentation of an HPC software including a description of how software quality is approached there, and the analysis of software quality, for example, the current state or the impact of certain factors.

Analyses of the quality characteristics indicate performance, portability and correctness as the most frequently discussed quality attributes, alongside various aspects of maintainability, usability and reliability. We will further refine these findings and compare them with the established ISO/IEC 25010 SQuaRE (Systems and software Quality Requirements and Evaluation) software quality model.

The insights from this study can be used to provide research software engineers in HPC with a starting point on quality aspects to consider in their applications. Additionally, our findings identify gaps where suitable tools, practices or metrics for measuring or improving certain qualities are missing and offer directions for future research and tool development.

I want to participate in the youngRSE prize

no

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