

Exploring Entire Software Ecosystems through Dependency Updates

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Abstract ([should be within 1st page](#))

Third-party libraries provide a means for software teams to quickly build applications, avoiding the need to start from scratch. The widespread adoption of these libraries has led to the creation of large ecosystems with complex networks of interdependencies, where sustainability and security issues of a single library can have widespread network effects. Analyzing these critical issues across entire ecosystems has proven challenging without a structured framework. In this thesis, I propose a framework for comprehensive ecosystem analysis, derived from the findings of four empirical studies on contributions that are congruent with dependency updates and on unsafe dependency updates throughout the ecosystem. This framework includes a dashboard, a GitHub Action, and a set of guidelines. The dashboard presents the levels of contributions congruent with dependency updates, which are associated with the likelihood of a library becoming dormant. The GitHub Action is designed to automatically detect unsafe dependency updates in library repositories. Finally, the guidelines suggest that employing a combined qualitative and quantitative approach could yield actionable recommendations for all tiers of the ecosystem, underscoring the importance of sharing this data with comprehensive documentation for future research.