SOFTWARE COMPOSITION ANALYSIS AND SUPPLY CHAIN SECURITY IN APACHE PROJECTS: AN EMPIRICAL STUDY

11/18/25

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Motivation

- Modern software relies heavily on third-party components.
- These components may include known or unknown vulnerabilities.
- Attacks increasingly target the software supply chain (e.g., via dependencies).
- Developers often ignore or delay updates due to lack of awareness or perceived effort.

Research Gap

- Prior work focused on *detection capability* of SCA tools
- No causal studies on *effectiveness over time*

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To what extent does the adoption of SCA tool impact software supply chain security?

Methodology: Cohort Study Design

Environment

- 298 Apache Java Maven projects on GitHub
- OWASP Dependency-Check (OWASP DC)
- 264-day follow-up period

Controlled for:

- Project age
- Number of dependencies
- Activity status

Methodology: Cohort Study Design

Content

Controlled for:

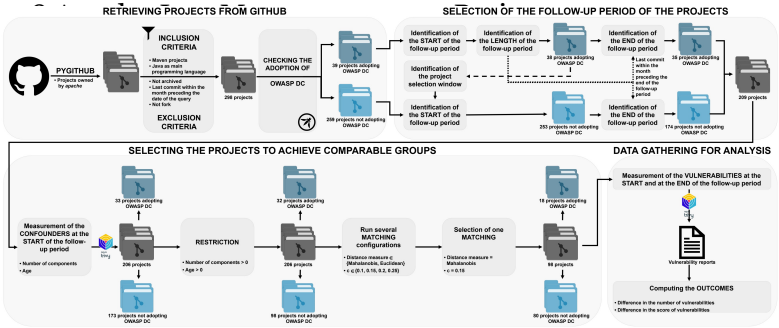

Fig. 1: Process describing the selection of projects.

Metrics & Analysis

Measured

- Change in vulnerability **count**
- Change in vulnerability **CVSS score**

Severity levels:

- Info, low, medium, high, critical

Used Generalized Linear Models (GLM)

RESULT

Severity	Info	Low	Medium	High	critical	Overall
Vulnerability After Using OWASP DC	↓	↑	↓	↓	↓↓	↓

- OWASP DC helps reduce serious vulnerabilities
- Statistically valid
- Developers may overlook **low-severity alert**

Pros & Cons

Strength

- Comprehensive methodology design
- Essential gap in software literature

Weakness

- Limited generalizability due to narrow language, ecosystem, and tool scope.
- Lack of validation in real-world development workflows.

Summary

Rating: 4/5

A methodologically rigorous and well-controlled empirical study

A timely empirical investigation into the real-world impact of SCA tools.

Despite modest effect sizes, the study provides meaningful insights for both academic research and industry practices on software supply chain security.

Future Work

Cross-language replication

Developer surveys or interviews:

Do OWASP DC alerts trigger actual remediation?

How AI tool can be integrated in SCA and further software develop workflows?

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Thank you !

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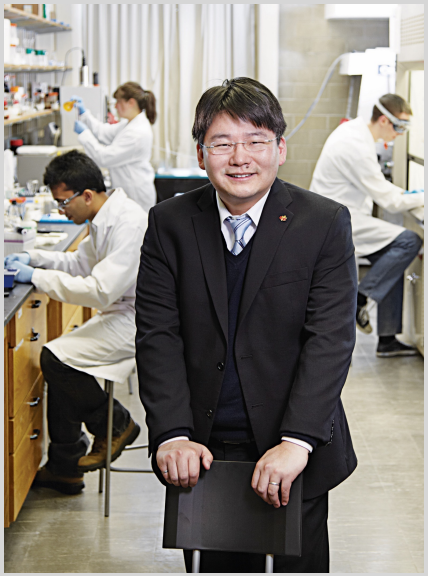

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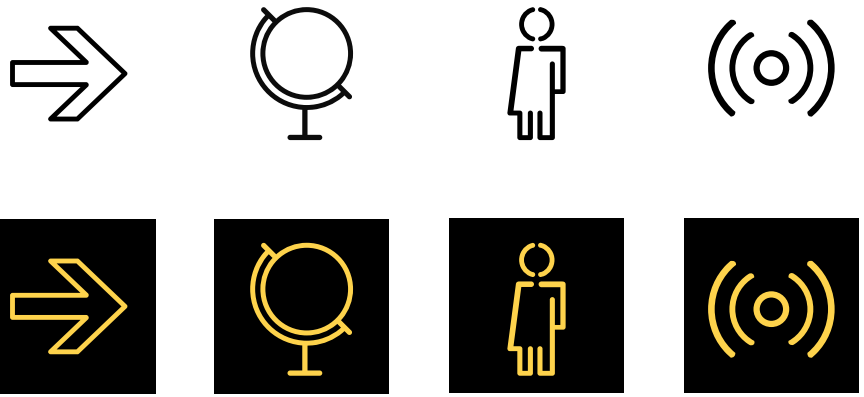

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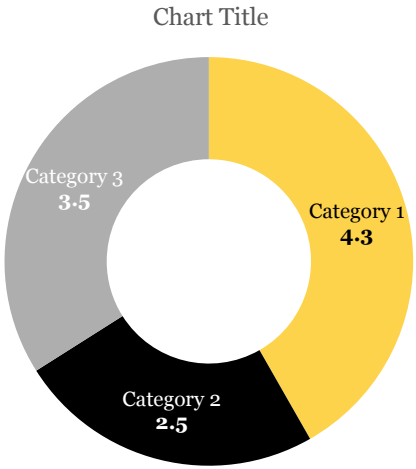
MASTER SLIDE CHART



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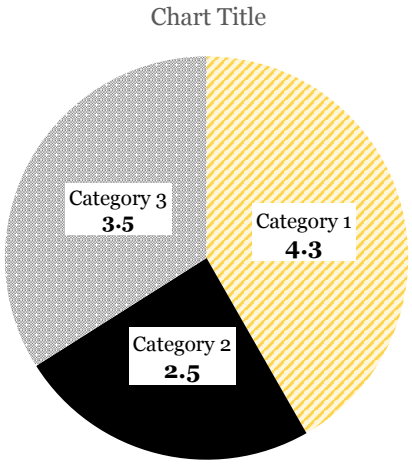

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