Empirical Analysis of Fault-Proneness in Methods by Focusing on Their Comment Lines

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Introduction

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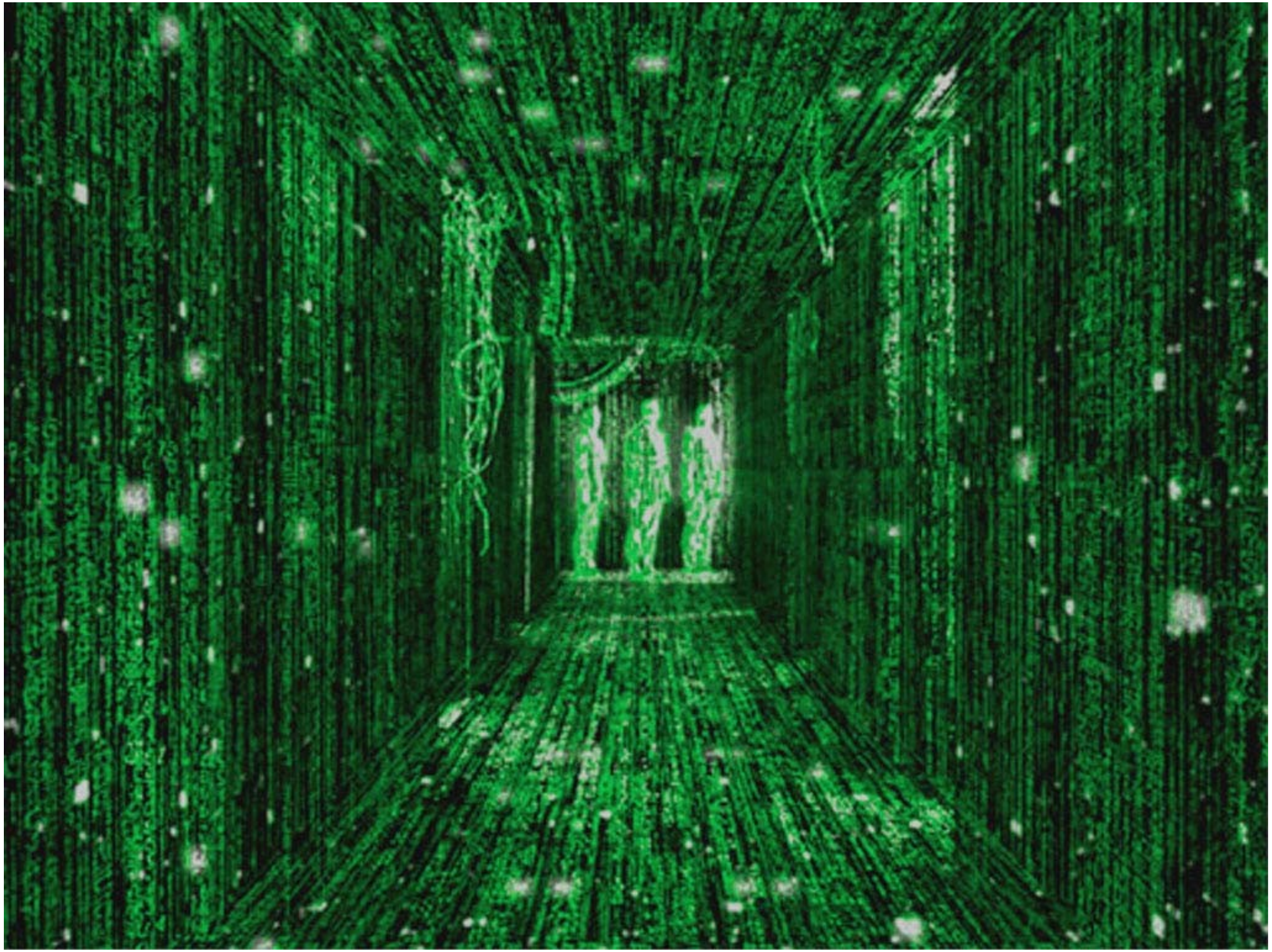

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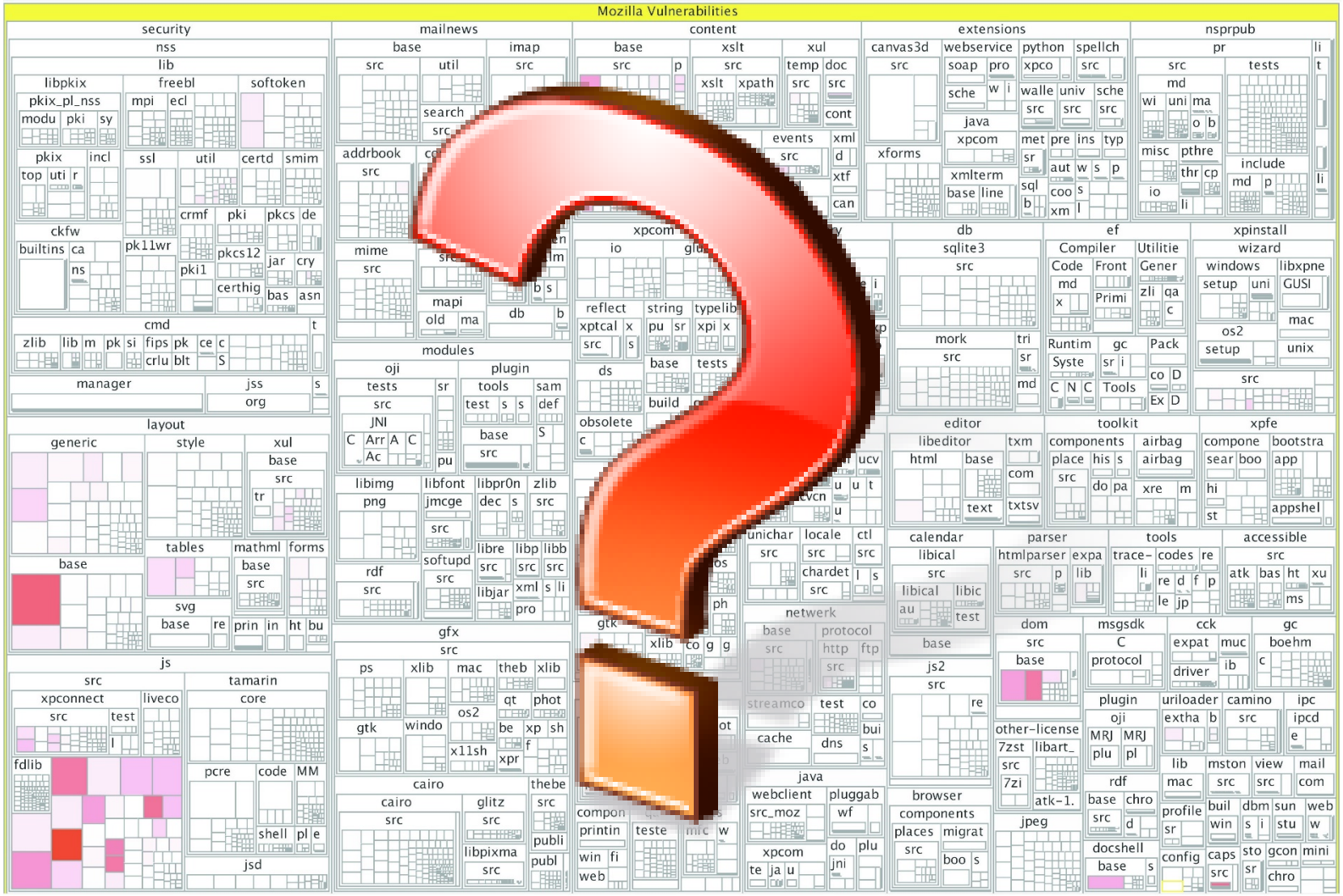

S. Neuhaus, T. Zimmermann, C. Holler, A. Zeller.
Predicting Vulnerable Software Components

Lines of comments / documentation (LOD, LOI)

```java
/**
 * This method calculates the number of risks for a given EOM and a given risk filter.
 */
public DataSeriesDTO<Double, String> getCurrentRiskCount(
        String eom, String metricName, RiskFilter riskFilter) {
    DataSeriesDTO<Double, String> result = new DataSeriesDTO<Double, String>(metricName);

    try {
        HashedMap<LocalDate, Integer> resultMap = new HashedMap<LocalDate, Integer>();

        // Get eom from persistence
        Eom eomObj = crudFacade.getEomByName(eom);

        // Iterate all the risks of the eom and count the number
        // of risks per history interval
        for (Risk risk : eomObj.getRisks()) {
        }

        // Sort List by date
        List<java.util.Map.Entry<LocalDate, Integer>> elements = new ArrayList(resultMap.entrySet());
        Collections.sort(elements, new Comparator<java.util.Map.Entry<LocalDate, Integer>>() {
        });

        // Convert HashMap to List
        for (java.util.Map.Entry<LocalDate, Integer> resultEntry : elements) {
            // Add new entry from hash set entry. During this
            // convert the LocalDate to string which become the
            // categories of the measurement values.
            result.add(new DataValueDTO<Double, String>(new Double(
                    resultEntry.getValue()), resultEntry.getKey().toString(
                    "MMM")));
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Research Questions

1) Do the fault-proneness of methods significantly differ by the commenting style?

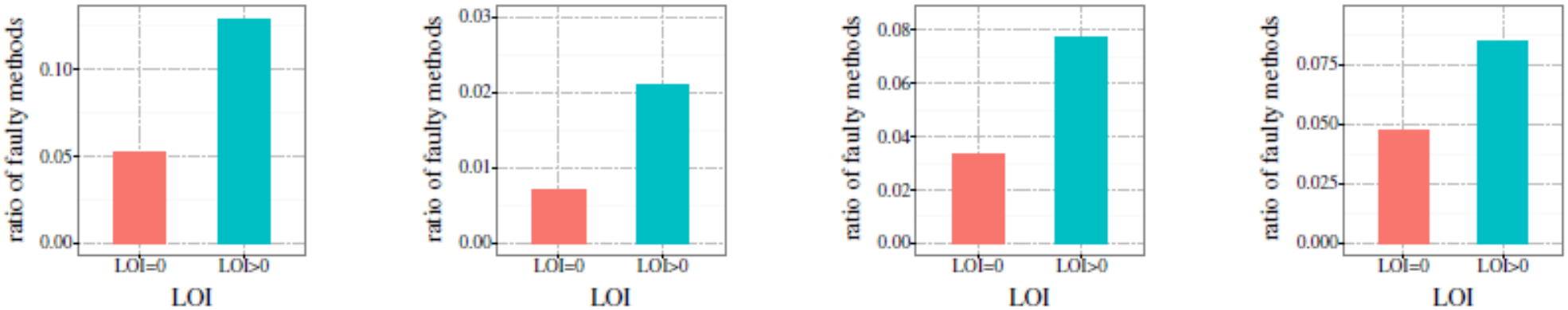
2) Does the amount of comments have any relationships on the fault-proneness?

Methodology

1. Investigate open source applications
2. Calculate LOI and LOD metrics
3. Investigate errors
   - Error = Keyword matching in commit log
4. Calculate correlation between the metrics and errors

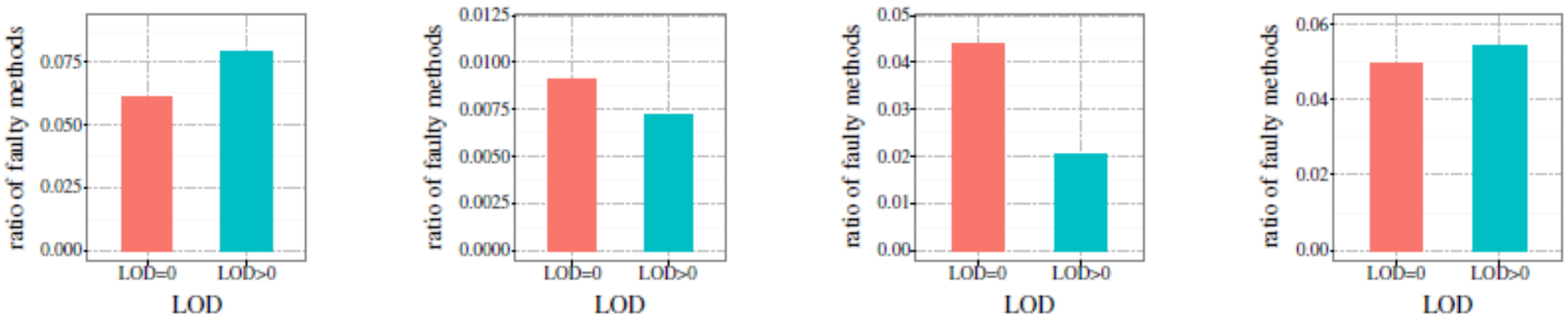
Field Study Results – ratio of faulty methods

- LOI = 0 vs. LOI > 1



(a) Eclipse CheckStyle (b) Hibernate (c) PMD (d) SQuirreL

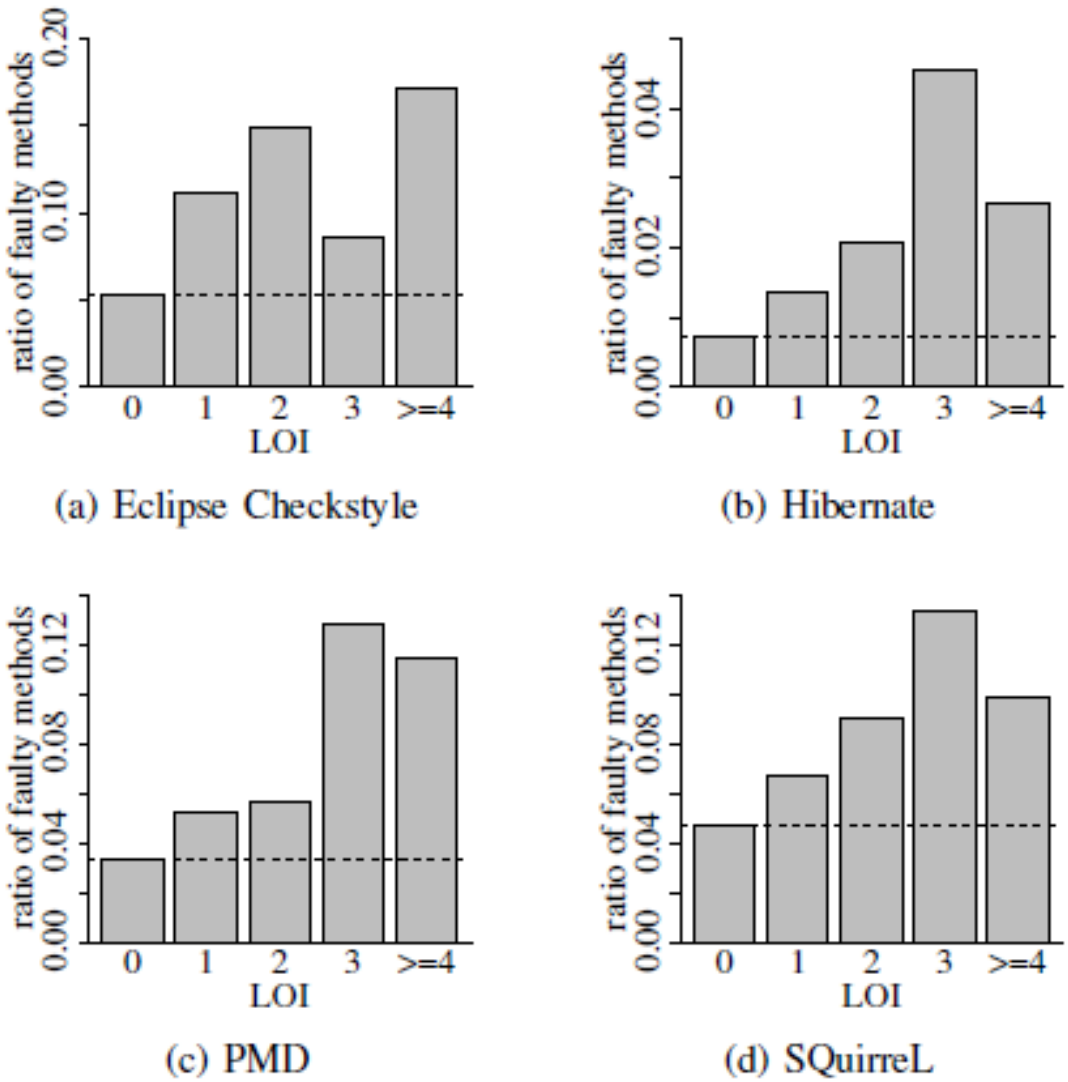
- LOD = 0 vs. LOD > 1



(a) Eclipse CheckStyle (b) Hibernate (c) PMD (d) SQuirreL

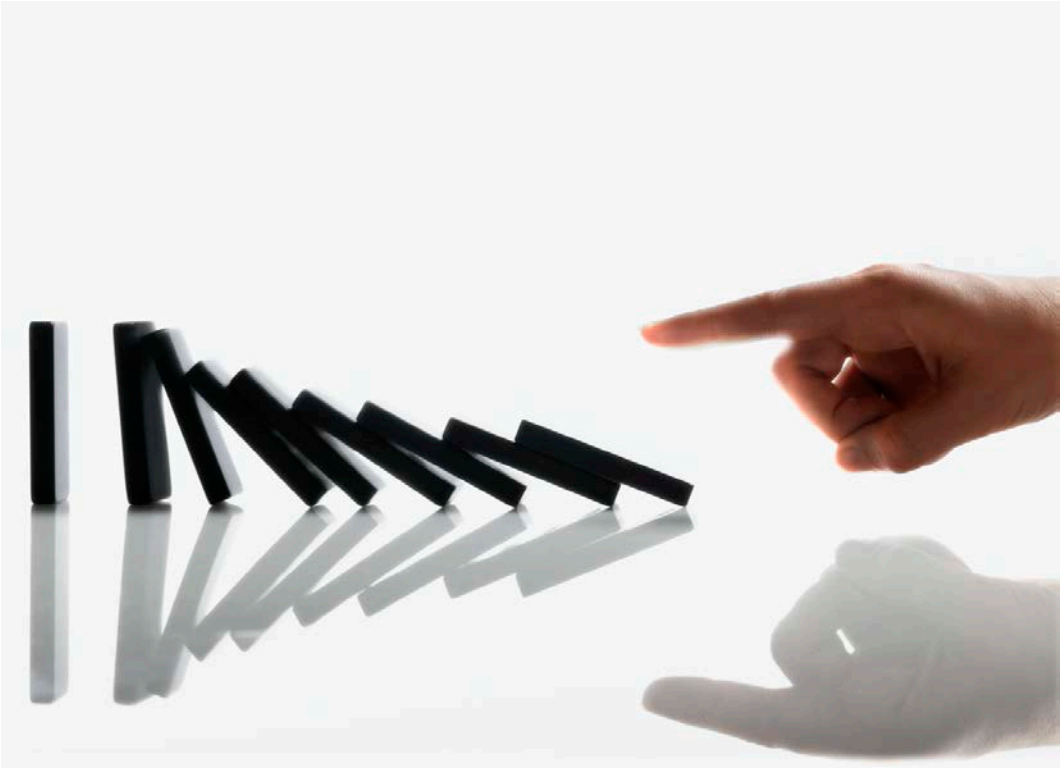
Field Study Results

- Ratio of faulty methods changes with the LOI



Discussion

- Result: Yes there is a correlation!



T. Holschuh, A. Zeller, et. Al.
Predicting Defects in SAP Java Code: An Experience Report

- How to interpret this finding?
  - How to use it (proactively)?

J. Sliwerski, T. Zimmermann, A. Zeller.
Don't Program on Fridays! How to Locate Fix-Inducing Changes