Students projects' source code changes impact on software quality through static analysis

Sivana Hamer, Christian Quesada-Lopez, Marcelo Jenkins
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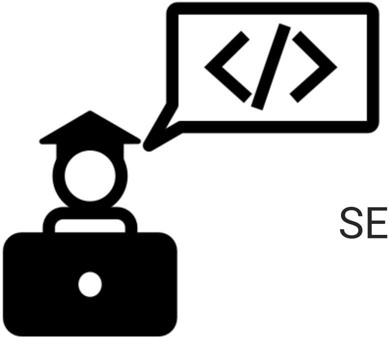
UNIVERSIDAD DE COSTA RICA

Students’ need to learn how to...

Design

Testing

Configuration management



Requirements

Soft skills

SE Process

(Garousi et al., 2019)

Students’ need to learn how to...

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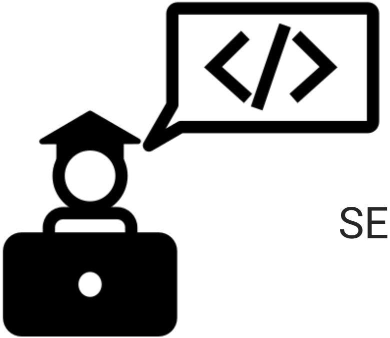
Testing

Quality

Configuration management



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Constant change

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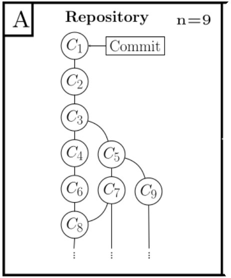

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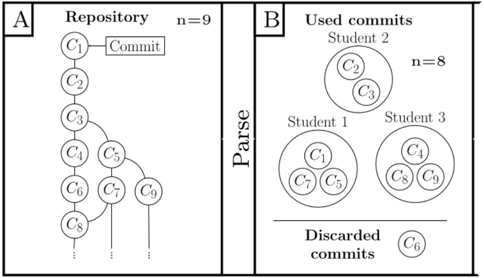

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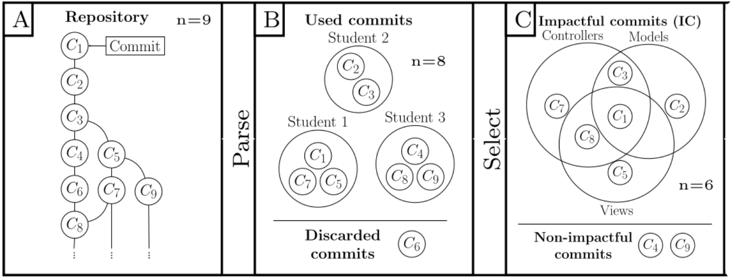

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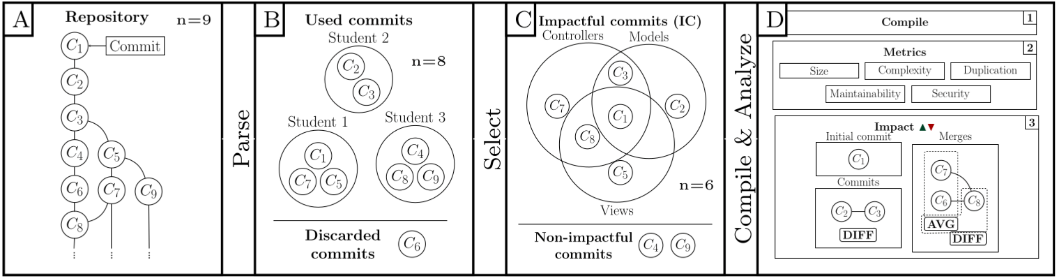

We studied...

We studied...

5
projects

We studied...

5
projects

103
students

We studied...

5
projects

103
students

20
teams

We studied...

5
projects

103
students

20
teams

12,103
changes

Goal:

Gain insights in students’ development practices and software quality trends and behaviors by analyzing the source code changes.

Not all students' gained full stack competencies (commits)

Module	Students		
	A	IMP	
			%
Controllers	21	21	100
Models		20	99
Views		21	100
All main modules		21	100
Database		20	95
U&I test		18	89
UI test		10	52

Students’ had several knowledge deficiencies

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Model was the least compilable main module (83 %)

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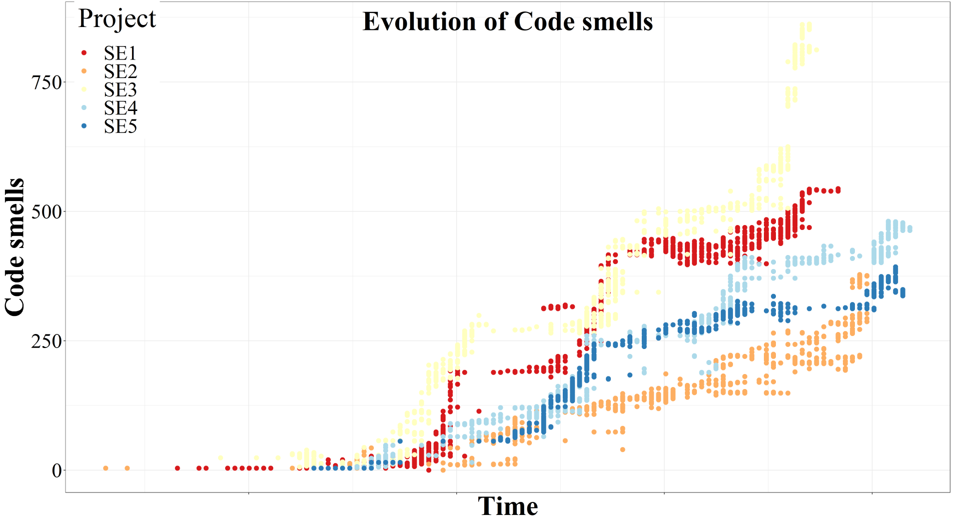
Changes may have compiled locally but not remotely

The software produced continued to degrade



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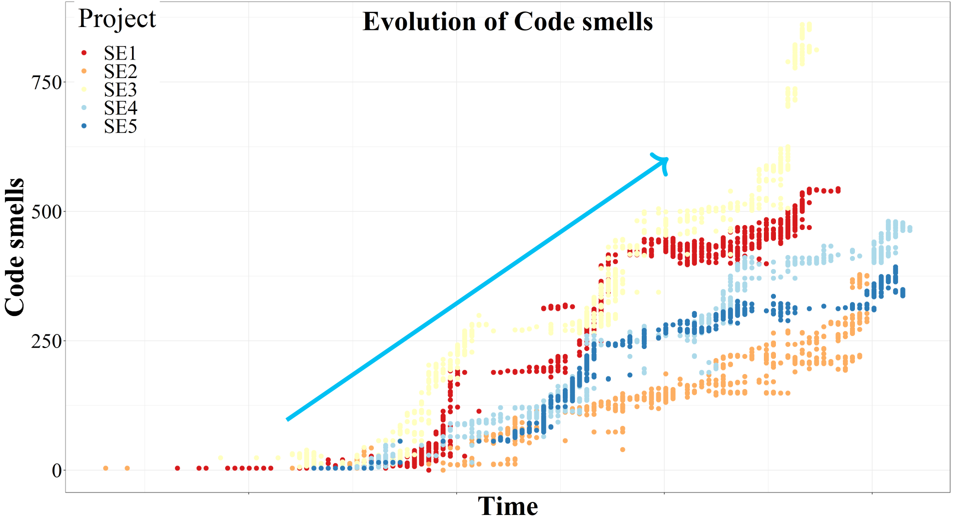
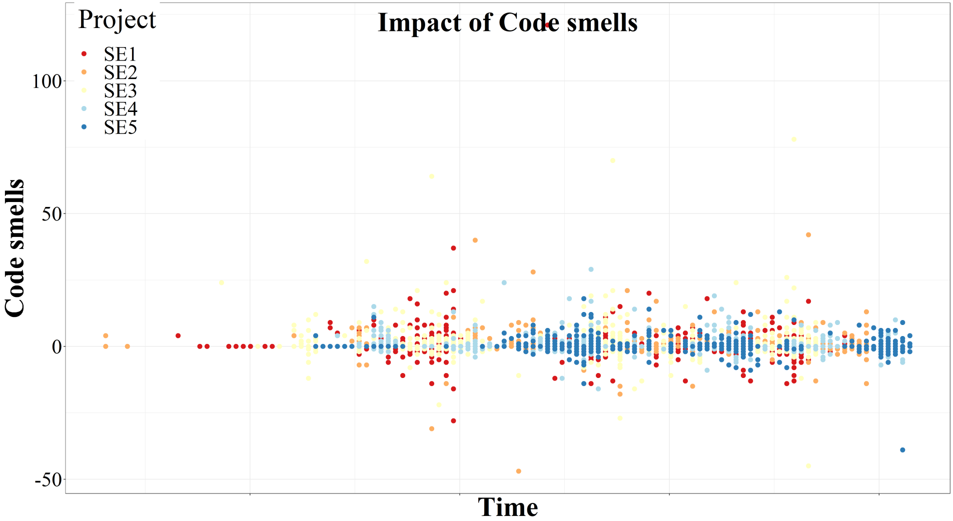


We could detect the changes that impacted considerably the quality metrics



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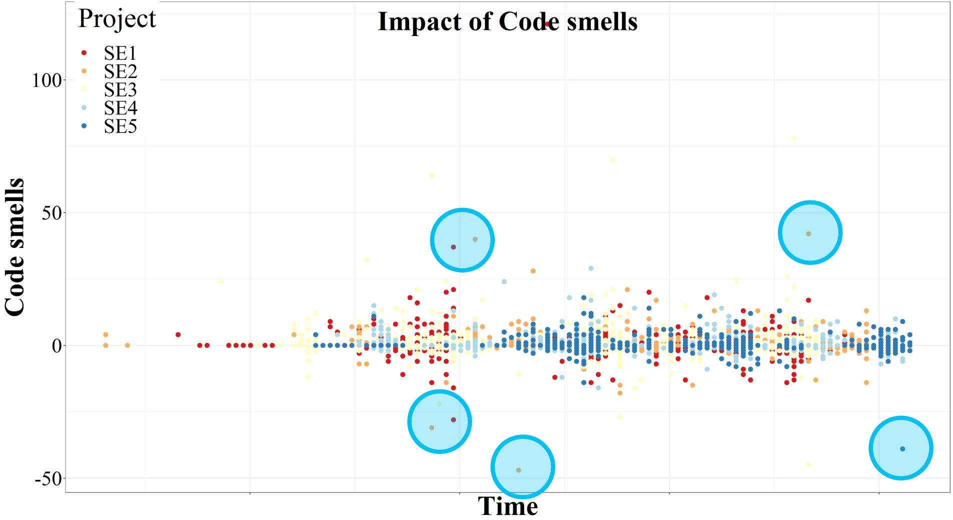

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Include
other tools

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Analyze more depth

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Analyze
more depth

Apply
in vivo

Thank you! Questions?

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Research questions:

RQ1. To what extent do students commit impactful changes?

RQ2. To what extent impactful changes affect software quality attributes?

The measures used are...

Attribute	Abbr.	Description
Size	**LOC**	Lines of code excluding white spaces, tabulations, and comments
	FN	Number of functions
	CL	Number of classes
	CLOC	Commented lines of code
Complexity	**CYCX**	Cyclomatic complexity
	COCX	Cognitive complexity, comprehension difficulty of code's control flow
Duplication	**DL**	Duplicated lines
	DF	Duplicated files
Maintainability	**CS**	Total count of code smells
	TD	Technical debt given in minutes
Security	**VUL**	Security vulnerabilities