

ICST 2019

Xi'an, China



A BENCHMARK OF JAVASCRIPT BUGS

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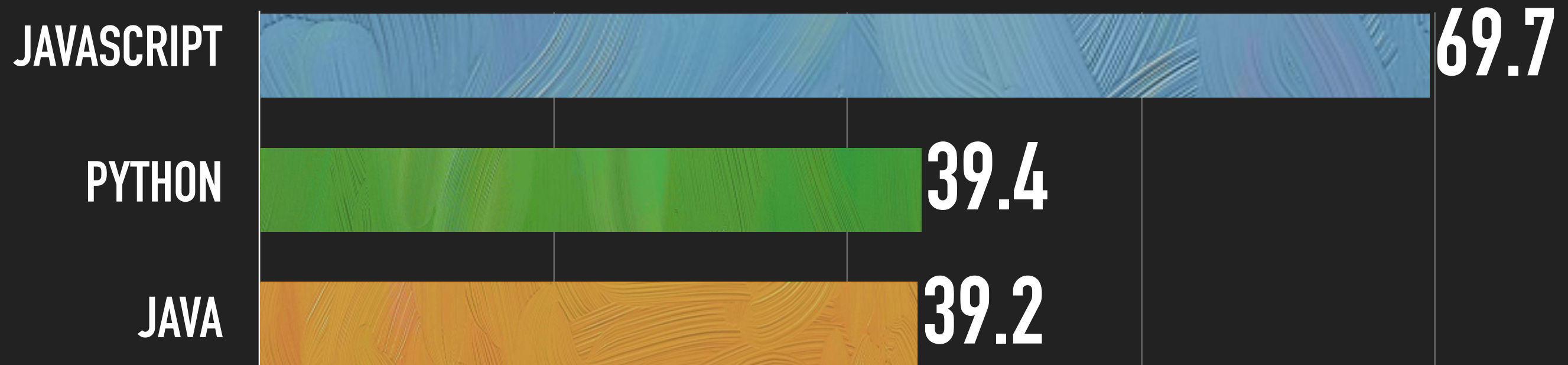
Andrea Stocco, USI

Davood Mazinianian, UBC

Árpád Beszédes, Uni. Szeged

Rudolf Ferenc, Uni. Szeged

Ali Mesbah, UBC



**Developer Survey
Results 2019**

JS

“

The **strength** of JavaScript is that
you can do anything.

The **weakness** is that *you will.*

”

- Reg Braithwaite

SIR

Java, C, C++, C#

Do, Elbaum, Rothermel. EMSE 2005

DEFECTS4J

Java

Just, Jalali, Ernst. ISSTA 2014

MANYBUGS

C

Le Goues et al. TSE 2015

?

JavaScript



ANALYSIS AND TESTING FOR JS



Coverage

Mutation

25
papers

Debugging

Regression Testing

Unit Testing

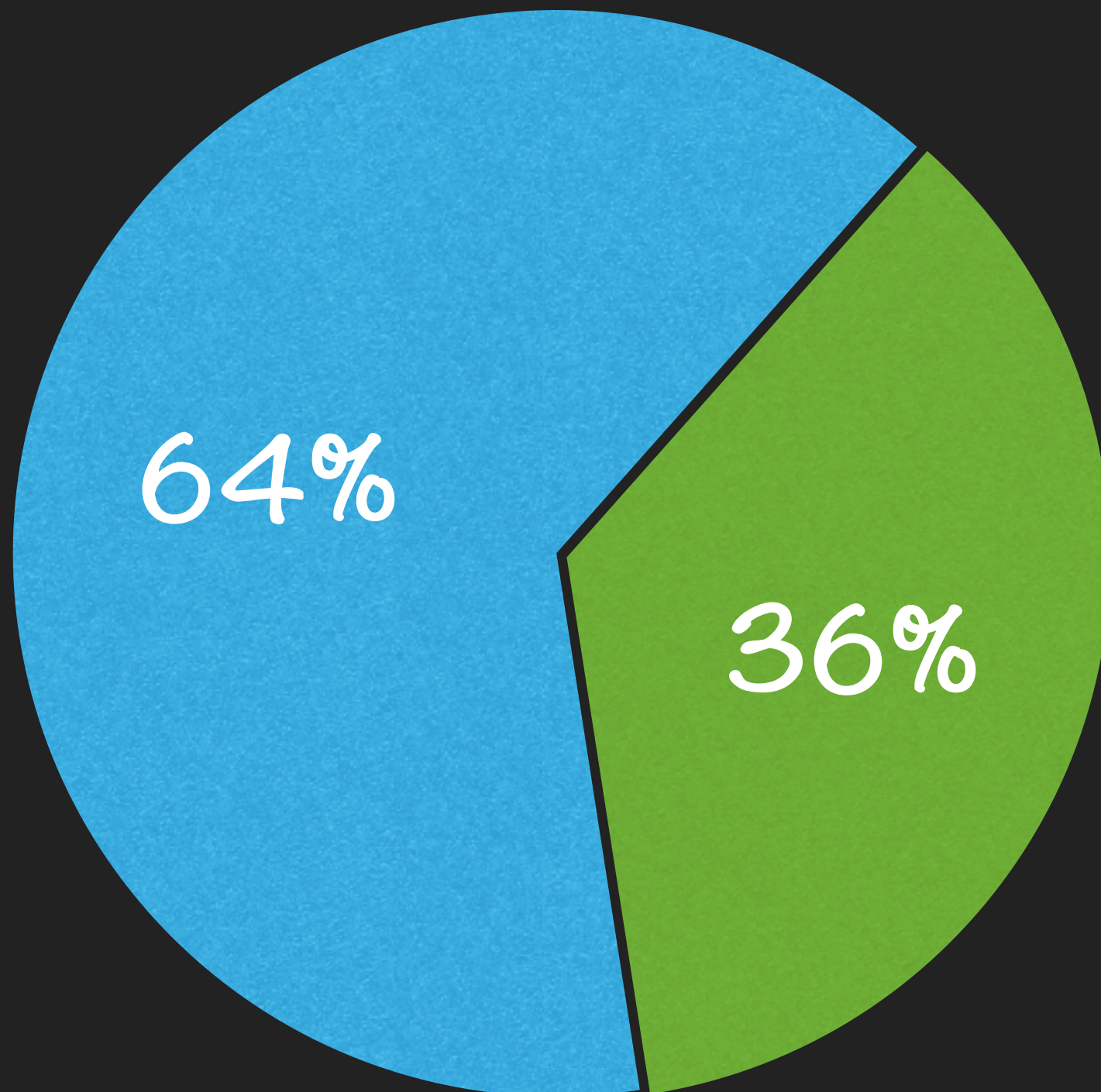
Bugs

Test Automation

Fault Localization

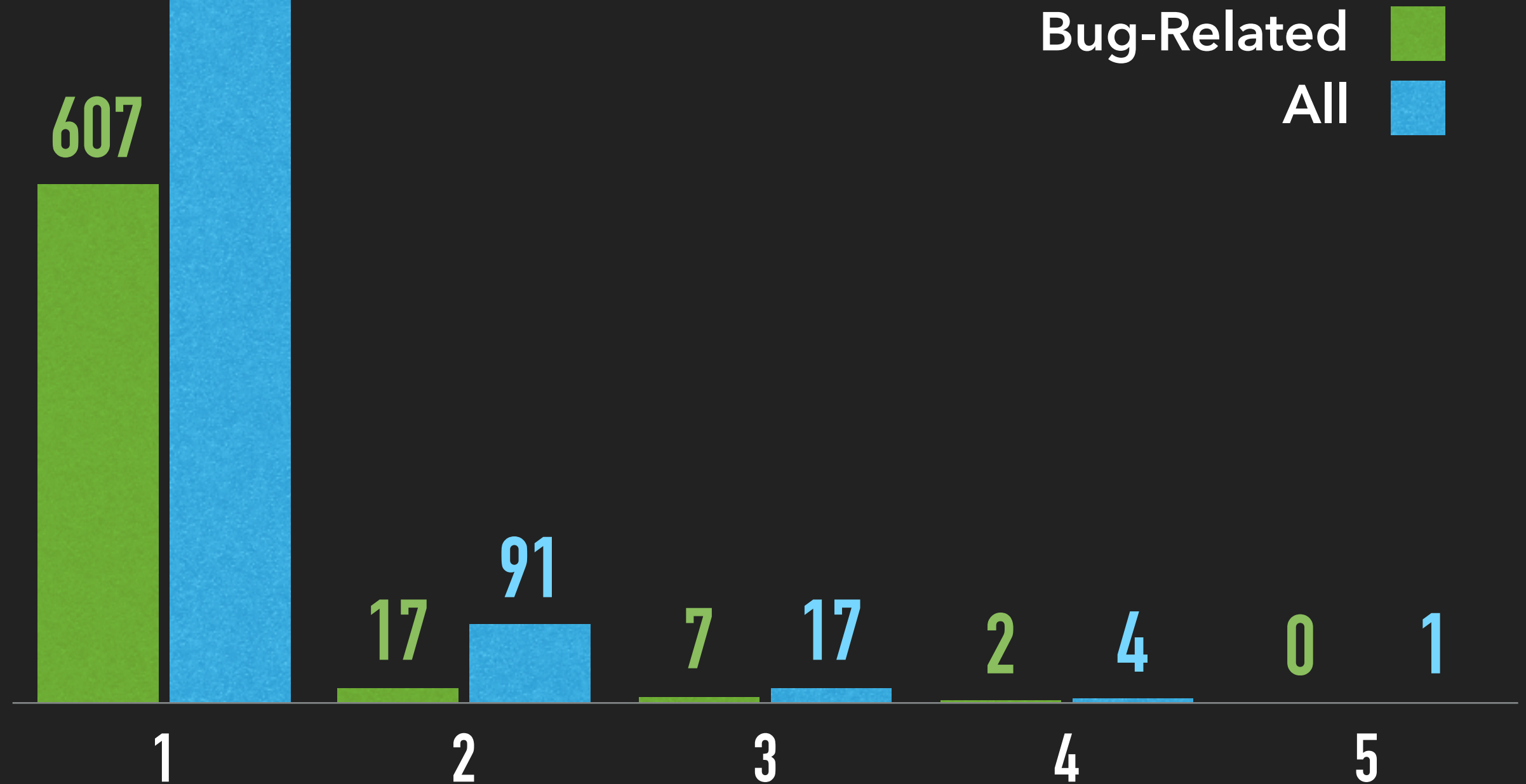
Test Generation

- Other
- Bug-Related



640
subjects

shared subjects



PROPOSED BENCHMARK OF JS BUGS

GOALS, CHALLENGES, CHARACTERISTICS



Goals

Centralized benchmark

Real bugs

Available

Characteristics

Reproducibility

Isolation

Challenges

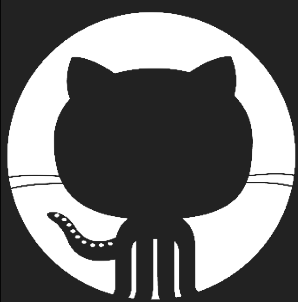
Bug Tracking

Testing Frameworks

Client vs server side

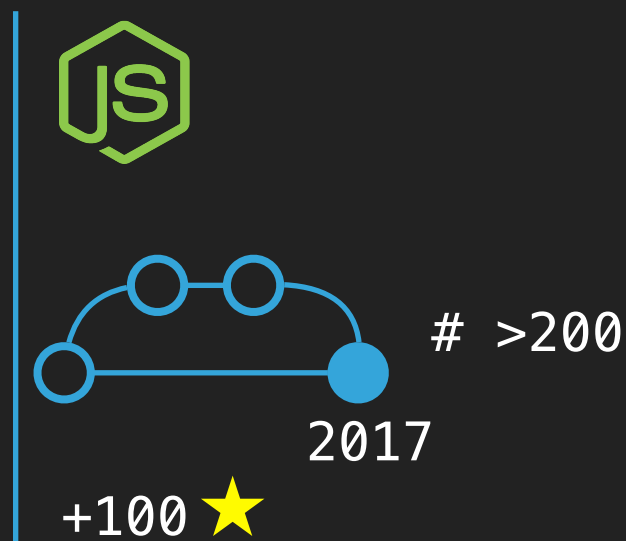
NodeJS

Dependencies



50

*initial
subjects*



795

*initial
bugs*



10

*final
subjects*

453

*final
bugs*



*complex -
refactoring -
irrelevant changes -*

BUG

CLOSED

1 COMMIT

TESTS





ARCHITECTURE, FUNCTIONALITIES, USAGE

Bug Repository

Subjects

Utility Framework

Shields

Express

Hessian

Bug Statistics

Eslint

Karma

Hexo

Test Commands

Mongoose

Bower

Bug Report Data

PencilBlue

Node-Redis

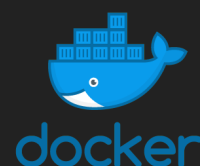
Source Code

Tests

Cleaned Patches

Tagged Bug Fixes

Docker Image



Pre-built Environment

BugsJS

Usage of BugsJS

download

```
$ git clone https://github.com/BugsJS/bug-dataset.git
```

run

```
$ git clone https://github.com/BugsJS/docker-environment.git
```

```
$ run.sh
```

artifact

```
$ python3 main.py -p Bower -b 1 -t checkout -v fixed -o output
```

coverage

```
$ python3 main.py ... -t test -v fixed-only-test-change
```

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ANALYSIS

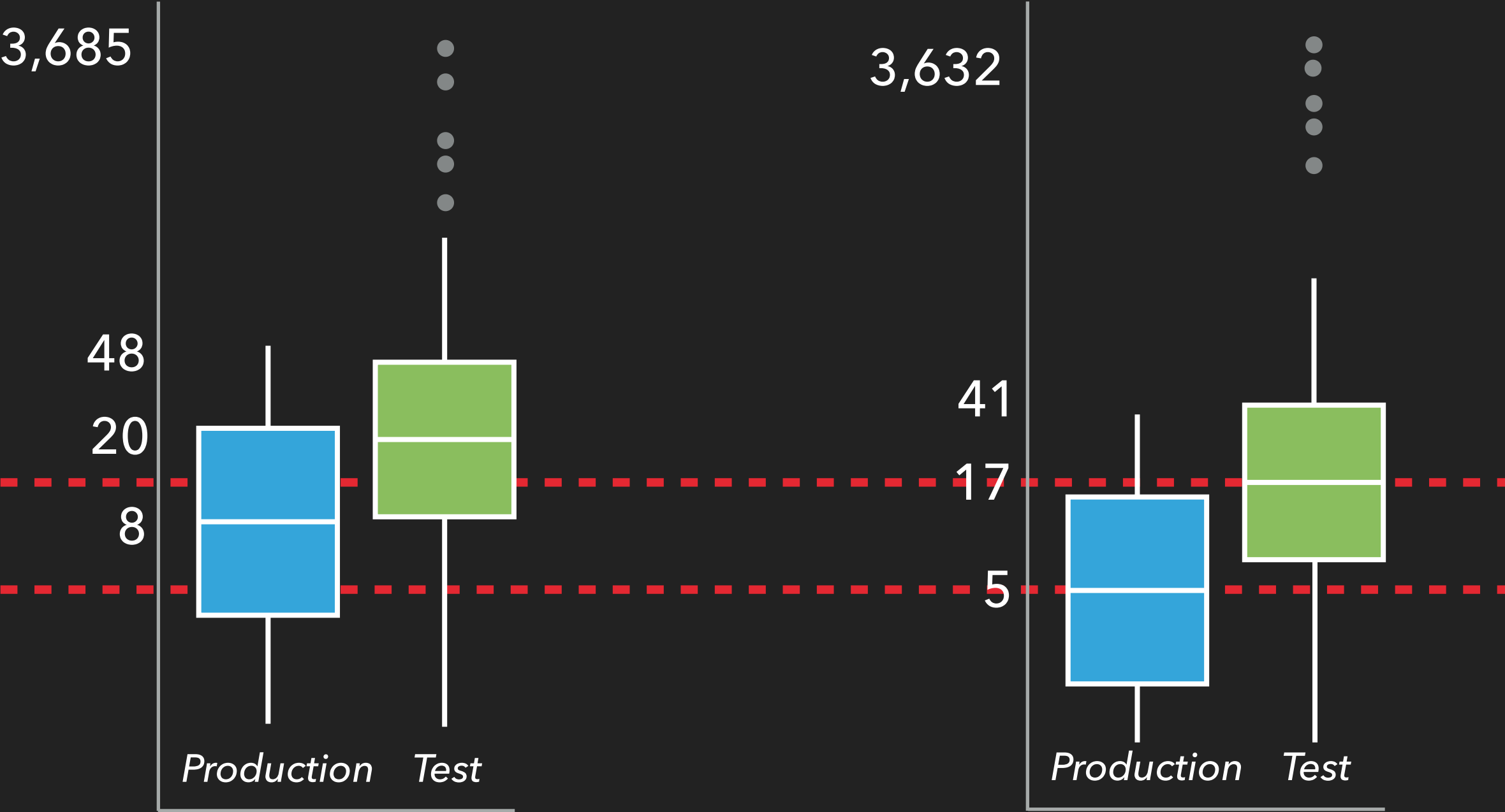
CHURN, BUG & FIX PATTERNS

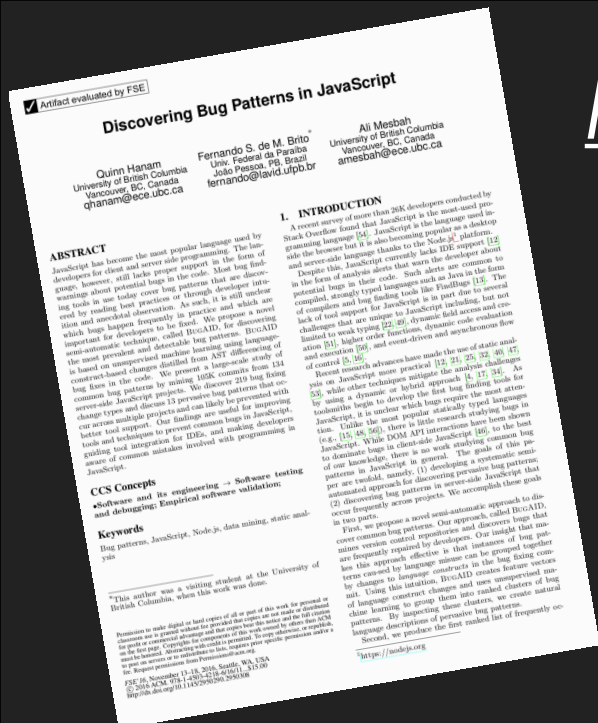


Code Churn

Before Cleaning

After Cleaning
(No wp & comments)





Hanam et al., FSE 16

bug patterns



9%

bugs

BugsJS

83%

Uninitialized variables

dereferenced non-values



Pan et al., EMSE 2009

bug-fix patterns



88%

fixes



3

novel JS-related

Bug fixes patterns

changing a return statement

initializing a variable with **empty** literal

declaring an **existing** variable

Use Cases

Bug Prediction

Program
Repair

Mutation
Testing

Fault
Localization

Use Cases

Bug Prediction

Program
Repair

Mutation
Testing

Fault
Localization

Fault Localization w/ BugsJS

 Poster Session

Test results

Test Commands

Per-test coverage

Utility Framework

Location of the bugs

Cleaned Patches

Suspiciousness

Location

1

functionAA



2

functionBB

3

functionCC

4

functionDD



5

functionEE



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JavaScript



Organization

<https://bugsjs.github.io/>

Bug Repository

Utility Framework

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Bug Report Data

Subjects

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Fault Localization w/ BugsJS

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Location of the bugs

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Location

- | | |
|---|------------|
| 1 | function_f |
| 2 | function_g |
| 3 | function_h |
| 4 | function_i |
| 5 | function_j |



A BENCHMARK OF JAVASCRIPT BUGS



<https://bugsjs.github.io/>

SZÉCHENYI 2020



MAGYARORSZÁG
KORMÁNYA

Európai Unió
Európai Szociális
Alap



BEFEKTETÉS A JÖVŐBE