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Automatic Detection of Pseudo-Tested Methods in a Test Suite Using Fault Injection

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Problem

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Fiasco

Evaluation Strategy

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How can we know if our test suites are adequate?



Coverage

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Coverage Calculation

Coverage vs

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Coverage



Def: % of a system that has been tested.

Calculation

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Calculation

Coverage vs Adequate Covera

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riategy

$$Coverage = \frac{Number of Tested Methods}{Total Number of Methods}$$

High Coverage

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%!=:6

Pseudo-tested Methods

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What is a Pseudo-tested Method?



Def: It will never fail.

Detection

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⁹roblem

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How Can We Detect Pseudo-tested Methods

It is harder than you think!

Example of a Pseudo-tested method

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```
numbers.py:
def numberOrder(n):
  numbersSorted = sorted(n)
  return numbersSorted
test_numbers.py:
def test_numbers_ordered():
  numbers = \{2,4,3,1\}
  sortedNumbers = \{1,2,3,4\}
  orderedNumbers = numberOrder(numbers)
  assert numbers == sorted Numbers
```

What is Function-Fiasco

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What is Function-Fiasco Flow

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A Pseudo-tested method detection tool



Flow to system

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What is

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C = = = 1...=! = =



Feasibility

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Truly-Tested-Meth Calculation

Metrics Produce

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$$\textit{Coverage} = \frac{\textit{NumberofTestedMethods}}{\textit{TotalNumberofMethods}}$$

Coverage Example

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| NUMM | NUMTM | Coverage |
|------|-------|----------|
| 40 | 25 | 62.5% |

Truly-Tested-Method Calculation

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- Number of Truly-Tested-Methods = NUMTTM
- Number of Tested Methods = NUMTM
- Number of Pseudo-tested Methods = NUMPTM

NUMTTM = NUMTM - NUMPTM

Truly-Tested-Method Example

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6 6

Truly-Tested-Method

Calculation

. . .

| NUMTM | NUMPTM | NUMTTM |
|-------|--------|--------|
| 25 | 3 | 22 |

Adequate-Coverage Calculation

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. . .

$$AC = \frac{Number of Truly Tested Methods}{Total Number of Methods}$$

Output

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onclusion

| NUMM | NUMTM | Coverage | NUMPTM | NUMTTM | AC |
|------|-------|----------|--------|--------|-----|
| 40 | 25 | 62.5% | 3 | 22 | 55% |

What is different?

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Conclusion

What is different?

Why

Why

Future Research

FFiasco VS Mutation VS Fuzz VS Fault Injection VS Chaos

Why is a tool like this necessary?

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What is different Why

Impact Future Research



- Nothing like this exists for Python
- Coverage does not tell enough

What is the impact of this research?

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What is different

Why

Future Research

%

Coverage with fault detection



Better Understanding of Pseudo-tested Methods



Automatic Detection Tool

Future Research

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What is different

Why

Why .

Future Research

■ Return Inferencing

Hypothesis



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Conclusion

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Future Resear

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