

# Parameter Tuning for Search-Based Test-Data Generation Revisited Support for Previous Results

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# Software Testing

Test Suites  
Automatic Generation  
Confronting Challenges  
Evaluation Strategies

# Empirical Studies

Challenges

Importance

Replication

Rarity

0101

# EvoSuite

Amazing test suite generator

Uses a genetic algorithm

*Input:* A Java class

*Output:* A JUnit test suite

<http://www.evosuite.org/>

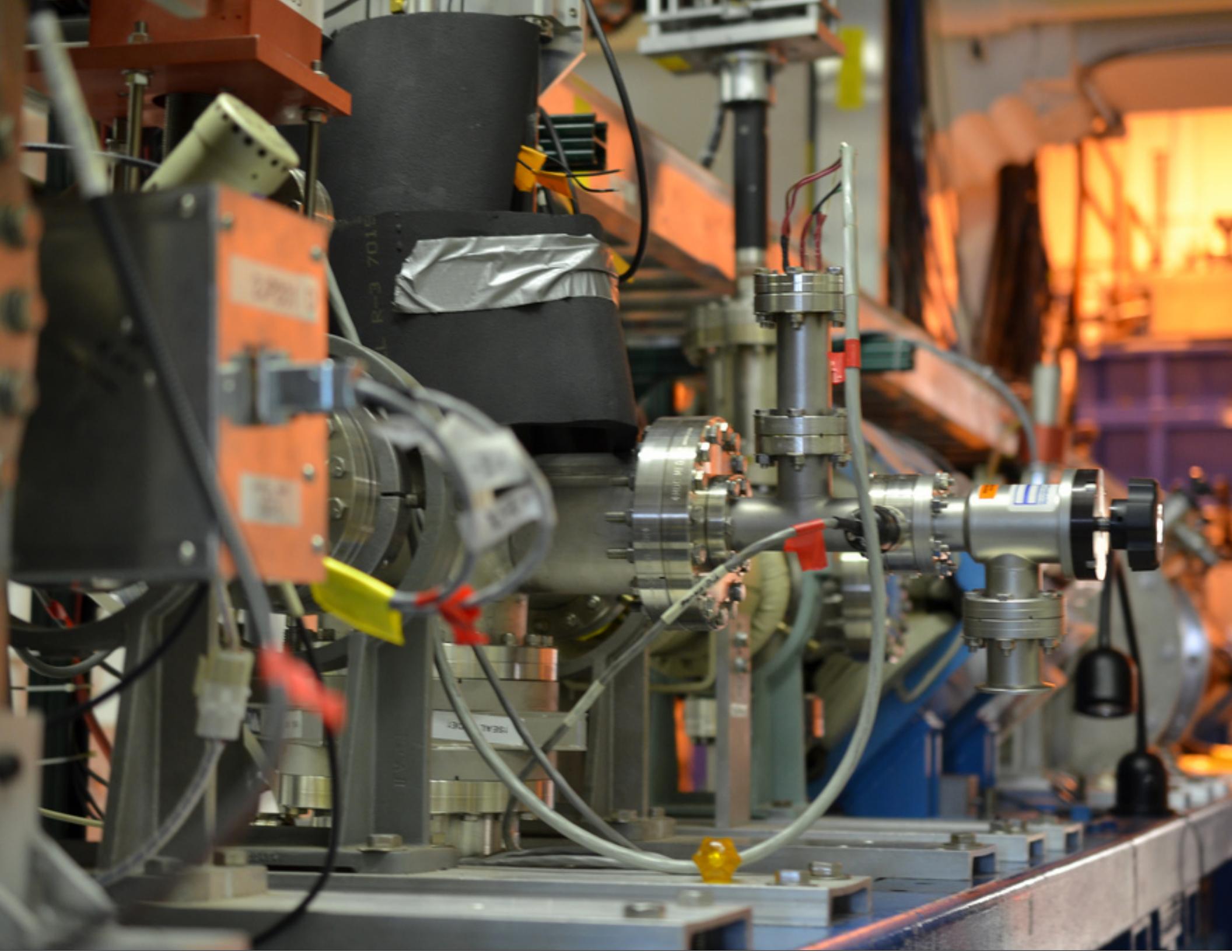
# Parameter Tuning

*RSM*: Response surface methodology

*SPOT*: Sequential parameter optimization toolbox

Successfully applied to many diverse problems!

# Defaults or Tuned Values?



# Experiment Design

Eight EvoSuite parameters

Ten projects from SF100

475 Java classes for subjects

100 trials after parameter tuning

Aiming to improve statement coverage

# Parameters

Parameter Name	Minimum	Maximum
Population Size	5	99
Chromosome Length	5	99
Rank Bias	1.01	1.99
Number of Mutations	1	10
Max Initial Test Count	1	10
Crossover Rate	0.01	0.99
Constant Pool Use Probability	0.01	0.99
Test Insertion Probability	0.01	0.99

# Experiments

184 days of computation time estimated  
Cluster of 70 computers running for weeks  
Identified 139 "easy" and 21 "hard" classes  
Mann-Whitney U-test *and*  
Vargha-Delaney effect size

# Results

Category	Effect Size	p-value
Results Across Trials and Classes	0.5029	0.1045
No "Easy" and "Hard" Classes	0.5048	0.0314

Using *lower-is-better* inverse statement coverage

Effect size *greater* than 0.5 means that tuning is *worse*

Testing shows we do not *always* reject the null hypothesis

Additional empirical results in the QSIC 2014 paper!



# Discussion

Tuning improved scores for 11 classes

Otherwise, same as or worse than defaults

A "soft floor" may exist for parameter tuning

Additional details in the QSIC 2014 paper!

# Practical Implications

Fundamental Challenges

Tremendous Confidence

Great Opportunities



# Important Contributions

Comprehensive Experiments

Conclusive Confirmation

For EvoSuite, *Defaults = Tuned*