



Formal Language Driven Data Analysis Research Group Report

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- AI-guided symbolic execution
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 - ▶ Maxim Nigmatulin
 - ▶ Anna Chistiakova
 - ▶ Semyon Grigorev
 - ▶ Collaboration with Dmitriy Mordvinov and Vadim Lomshkov
- Parsing Techniques
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 - ▶ Semyon Grigorev
 - ▶ Collaboration with Kirill Prazdnikov and Pavel Pertsev

\mathcal{AI} -Guided Symbolic Execution

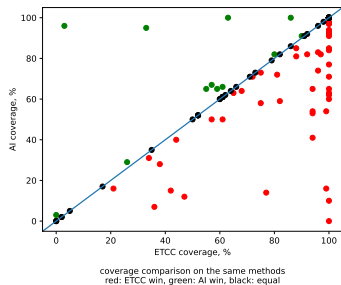
- ✓ Reusable infrastructure for training developed and implemented
 - ▶ Wrapper for SVM to convert it to server
 - ▶ Python client — \mathcal{AI} agent to training
 - ▶ Basic manipulation with neural networks
- ✓ Basic dataset for train and validation/test
- ✓ Basic performance tuning
- ✓ First version of \mathcal{AI} agent which guide SVM
 - ▶ Can be used in various engines: we use language-independent features
- ⚙ Dataset extension
- ⚙ GNN quality improvement

\mathcal{AI} -Guided Symbolic Execution: Preliminary results

- 190 methods: algorithms, data structures, real-world projects
- AI — our AI-based agent
- ETCC (ExecutionTreeContributedCoverage) — one of the best algorithmic strategies

AI-Guided Symbolic Execution: Preliminary results

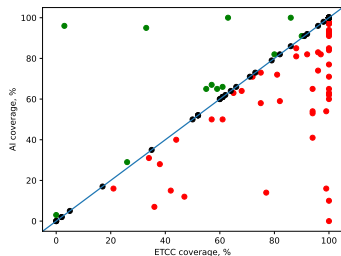
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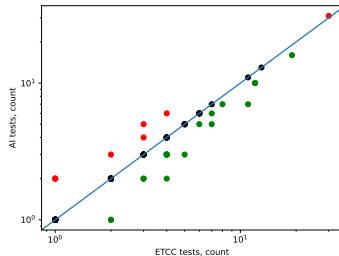
- Same coverage: 132, AI less: 46, AI more: 12

AI-Guided Symbolic Execution: Preliminary results

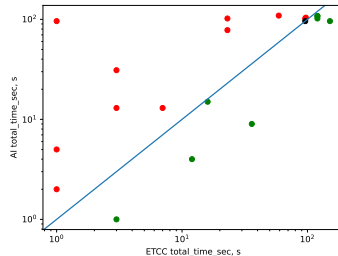
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coverage comparison on the same methods
red: ETCC win, green: AI win, black: equal



tests comparison on the same methods
red: ETCC win, green: AI win, black: equal, logscale



total_time_sec comparison on the same methods
red: ETCC win, green: AI win, black: equal, logscale

- Same coverage: 132, AI less: 46, AI more: 12
- For same coverage: less tests, comparable time

- ✓ Basic parser development tool is created
 - ✓ Preliminary performance evaluation
- ✓ Error recovery mechanism
 - ⚙ Preliminary performance evaluation
- ⌚ Advanced incremental parsing
- ⌚ Advanced scannerless mode

Parsing Techniques: Preliminary Evaluation Result

- Java grammar
- 3 real-world projects
 - ▶ junit4: 425 files, avg. size 3KB (40KB max)
 - ▶ guava: 1 416 files, avg size 8KB (198KB max)
 - ▶ elasticSearch: 14 685 files, avg size 6KB (242KB max)

