A DATASET FOR DYNAMIC DISCOVERY OF SEMANTIC CHANGES IN VERSION CONTROLLED SOFTWARE HISTORIES

MSR
MAY 21, 2017


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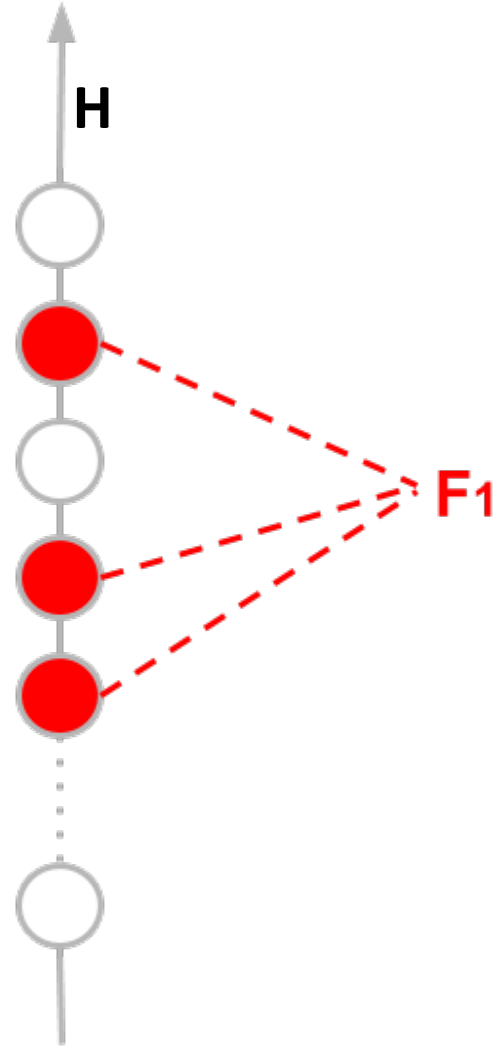
SEMANTIC HISTORY SLICING



Goal: Given a version-controlled software history,
identify code changes related to a particular high-level functionality.

Uses:

- Assist in transferring functionalities across branches
- Produce focused pull-requests
- Locate features [SPLC'17]
- Etc.

Semantic History Slice: A (minimal) sub-sequence of a change history that preserves the functionality of interest as *defined by a set of test cases.*

[ASE'15, ASE'16, TSE'17]

CHALLENGES IN EVALUATING SEMANTIC HISTORY SLICING

- Need a significant number of well-documented functionalities
- Functionalities should be accompanied by test cases
- Need ground truth

} Difficult to obtain!

Time consuming

Contribution of this work:

- 98 items of semantic change data, collected from 10 open-source Java projects.

DATASET CREATION

- Chose well-documenting projects
  - 10 Apache Java projects, using JIRA for issue tracking
- Chose projects with test cases
  - Functionalities committed together with a test suite
- Obtained ground truth
  - Ran a delta debugging-style partitioning algorithm, to produce 1-minimal slices
    - 1-minimal – removing a single commit makes the result invalid

DATA SCHEMA

Meta-data: YAML

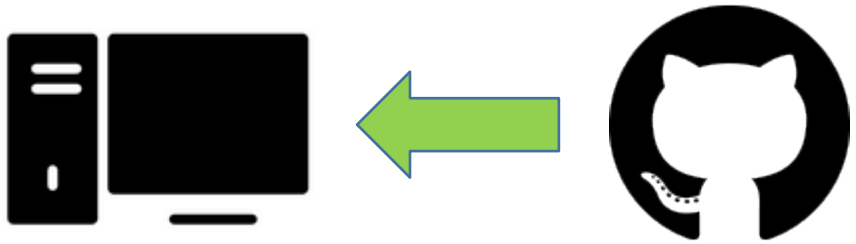
Example: CALCITE-1168

```yaml
id: CALCITE-1168
description: Add DESCRIBE SCHEMA/DATABASE/TABLE/query
project:
  name: Calcite
  project url: https://github.com/MSR-2017/calcite
issue url: https://issues.apache.org/jira/browse/CALCITE-1168
history start: 8eebfc6d
history end: aeb6bf14
test suite:
  - "SqlParserTest.testDescribeSchema"
  - "SqlParserTest.testDescribeTable"
  - "SqlParserTest.testDescribeStatement"
history slice:
  - "a065200a"
  - "da875a67"
developer labeled commits:
  - "a065200a"
  - "da875a67"
```

HOW TO USE THE DATASET

1. Pick a functionality (e.g., CALCITE-1168), view the meta-data.

2. Clone the project repository to the local machine.



3. Extract all test cases defining the functionality.

F_1 { TestA, TestB.testf(), TestC.testg(), ... }

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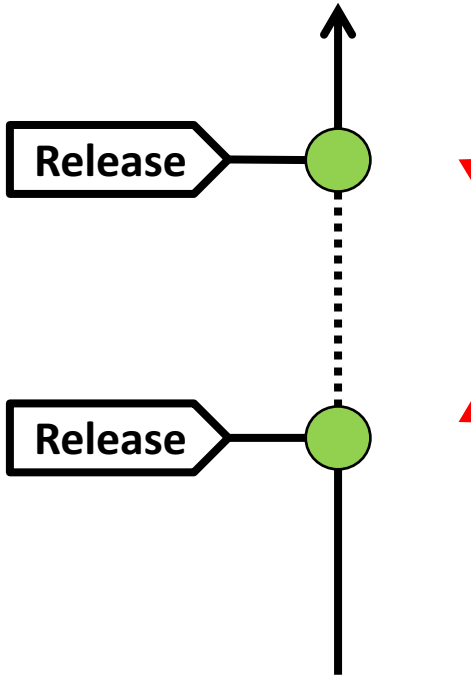
HOW TO USE THE DATASET

4. Extract the starting point and the ending point of the history segment (SHA-1-expressed commit number)

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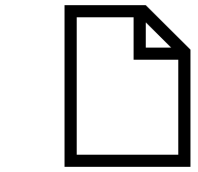
5. Using the selected test cases (Step 3) and history segment (Step 4) as input, run the history slicing/feature location tool to be evaluated

HOW TO USE THE DATASET

6. Compare the obtained result with ground truth we provide

1) Semantic History Slicing:



User's result

Compare

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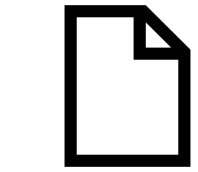
```

2) Feature location:



User's result

Compare

DATASET OVERVIEW

Project	#F	#R	Avg. Commits	Avg. Files	Avg. LOC	Avg. Tests	Avg. Slice	Avg. Reduce (%)
commons-lang	20	4	334.25	191.75	17423.95	5.55	43.1	87.11
calcite	18	7	89.83	332.67	31150.78	3.39	6.61	92.64
maven	11	6	82.09	183.09	7153.27	2.27	8.18	89.24
commons-compress	9	2	155	156.33	7172.67	5	17.33	88.82
flume	9	3	104.11	299.33	21355.56	4	20.22	79.82
pdfbox	5	3	203	188.4	10184	6.2	2	98.7
commons-configuration	3	2	117.33	254	54576	6	20.67	65.61
commons-net	3	2	205	188.33	7202.33	6.67	29	87.05
commons-csv	4	1	79	28	2353	3.75	42.5	46.2
commons-io	16	2	138.25	158.38	8047.44	9.5	24.06	82.59
Overall	98	32	163.74	212.79	16521.01	5.24	21.66	86.77

STATUS

URL: https://github.com/Chenguang-Zhu/DoSC

Contents

- Meta-data template
- 98 pieces of data
- Our tool for obtaining 1-minimal history slice

Easy to extend

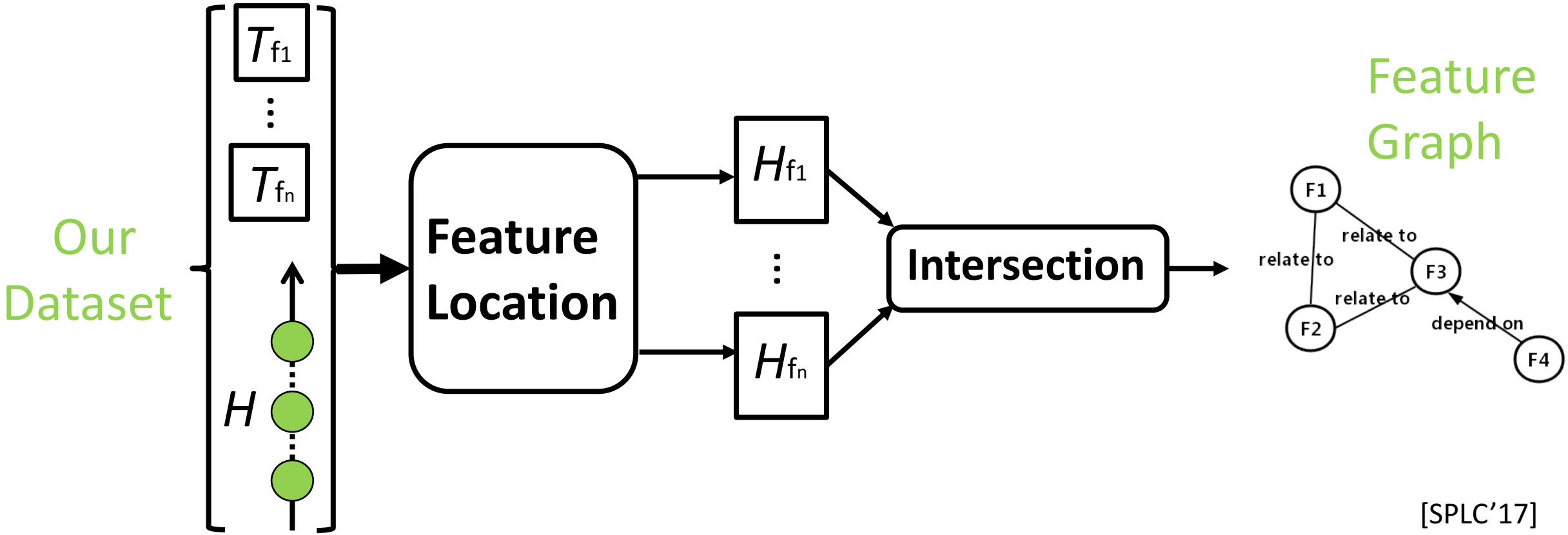
- … e.g., by including more repositories
- … or by adding histories containing bugs and failed test cases – for fault localization

WE LOOK FORWARD TO YOUR USES AND EXTENSIONS!!!!!

Thank you!

A RECENT USE CASE

FHistorian – A feature relationship analysis tool



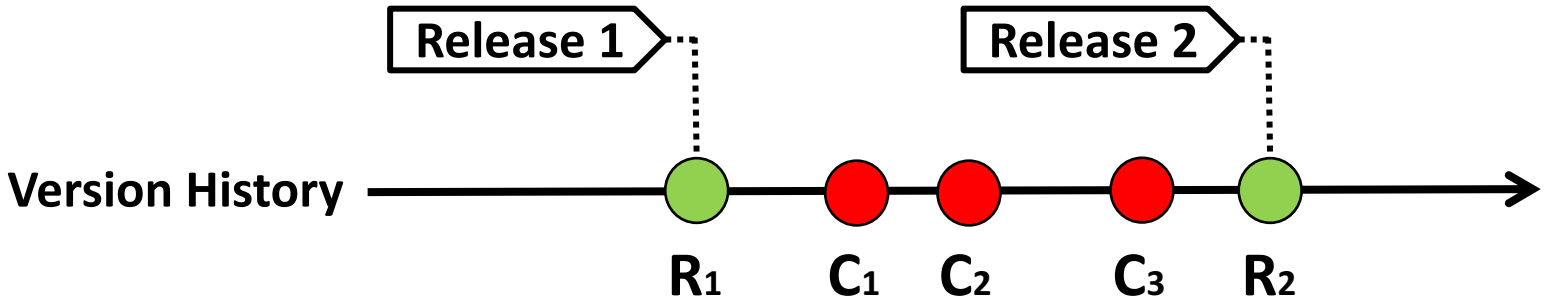
[SPLC'17]

Thank you !

Try it here!  https://github.com/Chenguang-Zhu/DoSC

DATASET CREATION

- Project selection: 10 Apache Java projects, using JIRA for issue tracking.
- Functionality selection: Functionalities accompanied by a test suite, committed together.
- History range selection: Between two release versions. (R_1 – R_2)



- Obtaining ground truth: Run a delta debugging-style partitioning algorithm, to produce the 1-minimal slice.