A TraceLab-based Solution for Creating, Conducting, and Sharing Feature Location Experiments

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Have you ever tried to reproduce a case study and you couldn't?
Case Study in SE

- In general, it is difficult to reproduce case studies
  - Some details may be missing

- Results of case studies produce contradictory results *


In Feature Location (FL)...

- Case studies are hard to reproduce**
  - Different datasets
  - Different implementations
  - Different metrics

Different Datasets

• Out of 60 papers...

5% Datasets

95% Different software systems
Different versions of the systems
Different data points from the same system
Different Implementation

- Often source code of FLTs is not available
- Configuration parameters are missing

Different Metrics

- Precision
- Recall
- F-measure
- Effectiveness measure
Other Observations

• Out of 60 papers...

Compared their technique against a limited number of existing techniques

38%

62%

No Comparison
Why is Reproducibility of Case Studies Important?

- Confirm if field is making progress
Why is Reproducibility of Case Studies Important?

- Confirm if field is making progress

- (Many requests for tools and data at ICPC’12)

Why is Reproducibility of Case Studies Important?

- Results can be checked by reviewers
- Results can verified by other researchers
- Clarify some aspects not explicitly stated in the paper
- Facilitate publishing new papers (others can use the data)
How to Publish a new FL Paper?

How to Publish a new FL Paper?
How to Publish a new FL Paper?

Datasets

New FLT

- Few available
- Hard to generate

Results
How to Publish a new FL Paper?

Datasets

Results

New FLT

How to Publish a new FL Paper?

Datasets

Results

New FLT

FLT#1  FLT#2  FLT#3  FLT#4  FLT#5  FLT#N
How to Publish a new FL Paper?

Datasets

New FLT

Results

FLT#1  FLT#2  FLT#3  FLT#4  FLT#5  FLT#N

No Implementation

Implement from scratch
How to Publish a new FL Paper?

Datasets

New FLT

Results

FLT#1  FLT#2  FLT#3  FLT#4  FLT#5  FLT#N

No Implementation  Implementation

Implement from scratch

Different metrics
Different inputs, etc.

Implement from scratch
How to Publish a new FL Paper?

Datasets

New FLT

Results

FLT#1

FLT#2

FLT#3

FLT#4

FLT#5

FLT#N

No Implementation

Implementation

Different metrics

Different inputs, etc.

Implement from scratch

Modify the tool

No Implementation

Implementation

Implementation

Different metrics

Different inputs, etc.

Implement from scratch

Modify the tool
How to Publish a new FL Paper?

Datasets → New FLT

Results

No Implementation → Implementation → Implementation

 FLT#1 → FLT#2 → FLT#3 → FLT#4 → FLT#5 → FLT#N

Different metrics
Different inputs, etc.

Details missing

Implement from scratch → Modify the tool

“guesstimate”?
How to Publish a new FL Paper?

Tedious and error prone

No Implementation → Implementation

Different metrics
Different inputs, etc.

Modify the tool

Implementation

Details missing

“guesstimate”??
How to Publish a new FL Paper?

Tedious and error prone

Is there a better way?

TraceLab

TraceLab

- Framework for:
  - Creating experiments
  - Conducting experiments
  - Sharing
- Designed to support traceability link recovery
- Developed by:
TraceLab

Experiment

Diagram of TraceLab experiment workflow.
TraceLab supports scripting languages: R, Python.
How we Envision Publishing FL Papers with TraceLab?

How we Envision Publishing FL Papers with TraceLab?

New FLT
How we Envision Publishing FL Papers with TraceLab?

Running the Experiment
Running the Experiment

How to Create a Composite Component?
How to Create a Composite Component?

Export experiment as component

Define component info:
Component name: VSM FLT Experiment
Author: Even moore
Version: 
Description: Performs the Vector Space Model feature location technique.

Import | Type | Include
--- | --- | ---
GADSet | TraceLabSDK.Types.TLRateralkip | 
DocumentMap | System.Collections.Generic.List<TraceLabSDK.TLRateralkip> | 
Corpus | TraceLabSDK.Types.TLR AdmiralCollection | 
QueryMap | System.Collections.Generic.Dictionary<string, TraceLabSDK.TLR AdmiralCollection> | 
CorpusIndex | TraceLabSDK.Types.TLDiagnosticIndex | 

VSM Parameters | Ali | Type
--- | --- | ---
Gold Set Importer Directory | Gold Set Importer Direct | System.String | 
Corpus Importer Identifiers | Corpus Importer Identifiers | TraceLabSDK.Component Co | 
Corpus Importer Documents | Corpus Importer Document | TraceLabSDK.Component Co | 
Queries Importer Queries | Queries Importer Query | TraceLabSDK.Component Co | 
Queries Importer FeatureIDs | Queries Importer Feature | TraceLabSDK.Component Co | 
Queries Importer BugIDIDs | Queries Importer BugID | TraceLabSDK.Component Co |
How to Create a Composite Component?

Comparing the Results
Comparing the Results

Start

Import Dataset #1

Import Dataset #m

New FLT

FLT #1

FLT #2

FLT #N
Comparing the Results

Start

Import Dataset #1  Import Dataset #m

New FLT  FLT #1  FLT #2  FLT #N

Compute Results Metric #1  Compute Results Metric #2

Box Plots  Descriptive Statistics  Statistical Tests

End
TraceLab Vision for FL

- Platform for creating, reproducing and sharing experiments

- In the future, submit a paper with a link to a TraceLab experiment:
  - Data
  - Code
  - Configuration parameters
  - Etc.

Status of TraceLab

- Beta version available by request
- TraceLab will be released in July 2012

- Features under development:
  - Packaging feature that bundles up:
    - Data
    - Code
    - Settings
  - Performance and GUI enhancements
Our Contribution

http://www.cs.wm.edu/semeru/data/TraceLab-feature-location/

- Datasets for 5 systems:
  - Features to methods mapping
  - Execution traces
  - Queries
  - Corpora
- Reusable components and sample experiments for FL
- Evaluation metrics

Conclusions and Future Work

- TraceLab & Feature Location = Reproducible experiments

- Research community welcomed to share:
  - More datasets
  - More components and experiments
Conclusions and Future Work

• Adapt TraceLab for other SE areas:
  - Impact analysis
  - Detection of duplicate bug reports
  - Developer recommendation
• At ICSE’12 TraceLab got a lot of interest from large software groups
• Hopefully adaption by ICPC community

Thank you! Questions?

SEMERU @ William and Mary
http://www.cs.wm.edu/semeru/
Generating the jEdit Datasets

SVN Commits between v4.2-v4.3

Fixed bug #2172912: Search within selection of regexp "\s" does not match the last line. This was caused by an exception - if the last selection line is empty, buffer-getLine() was called with a negative length of -1, also removed an unused variable.

Title

Description

Query
Generating the jEdit Datasets

Configuring Components
Comparing the Results
(Alternative)