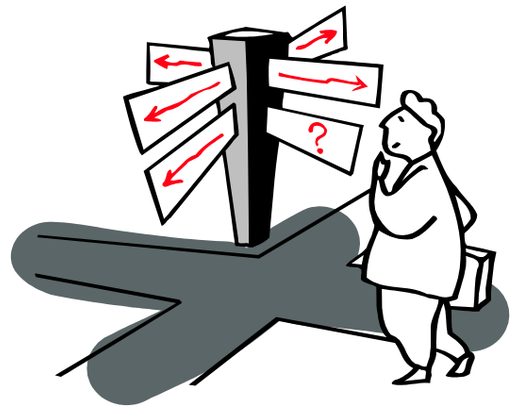
Predicting Bug-Fixing Time using Bug Change History

Universiteit Antwerpen
Vrije Universiteit Brussel

Alessandro Murgia, Javier Pérez, Serge Demeyer
Coen De Roover, Christophe Scholliers, Angela Lozano, Viviane Jonckers

Benevol 2013

Introduction



- Bug fixing time ⟶ allocate resources

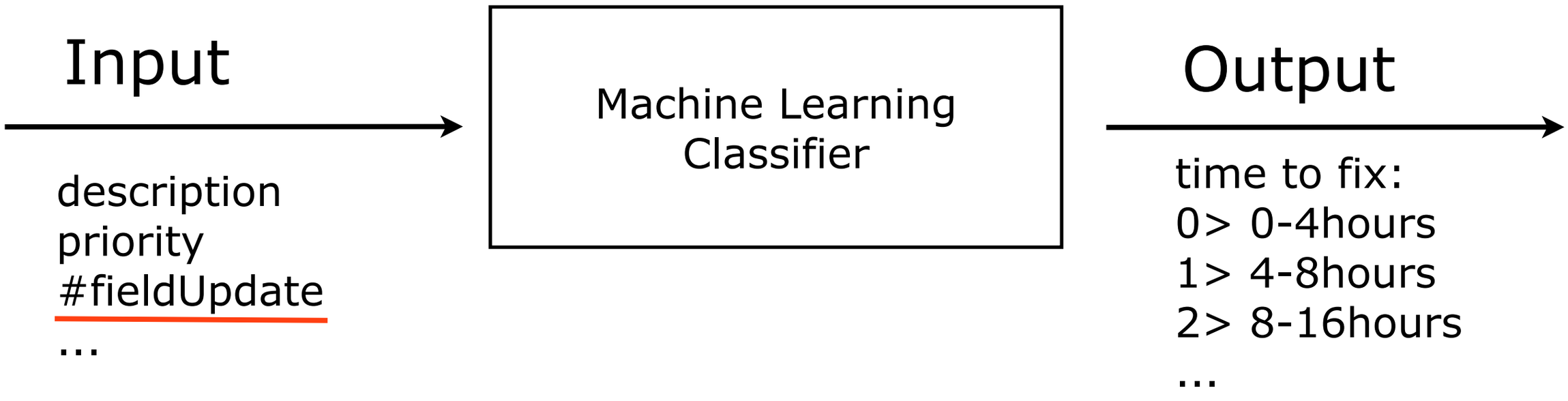
- Fixing time prediction:
  - Today: snapshot-based
  - CHAQ: snapshot-based + Change History

Goals

Identify:

- features useful for predicting bug fixing time
- industry-requirements for useful estimator

Overview


Input
description
priority
#fieldUpdate
...
Machine Learning Classifier
Output
time to fix:
0> 0-4hours
1> 4-8hours
2> 8-16hours
...

Change History 1/2

Bug 12345 - [DOGFOOD] Unable to Forward a message received as an Inline

Status:	VERIFIED FIXED	**Reported:**	1999-08-23 16:34 PDT by marina
Whiteboard:	[PDT+][PR1]	**Modified:**	2013-11-15 06:54 PST (History)
Keywords:		**CC List:**	8 users (show)
Product:	MailNews Core (show info)	**See Also:**	
Component:	Backend (show info)		
Version:	Trunk	**Crash Signature:**	
Platform:	x86 Windows NT	**Tracking Flags:**	
Importance:	P1 normal (vote)		
Target Milestone:	M11		
Assigned To:	jefft		
QA Contact:	lchiang		
URL:			
Depends on:	~~15069~~		
Blocks:	~~11091~~ ~~17976~~		
	Show dependency tree / graph		

Change History 1/2

Bug 12345 - [DOGFOOD] Unable to Forward a message received as an Inline

Status:	VERIFIED FIXED	**Reported:**	1999-08-23 16:34 PDT by marina
Whiteboard:	[PDT+][PR1]	**Modified:**	2013-11-15 06:54 PST (History)
Keywords:		**CC List:**	8 users (show)
Product:	MailNews Core (show info)	**See Also:**	
Component:	Backend (show info)		
Version:	Trunk	**Crash Signature:**	
Platform:	x86 Windows NT	**Tracking Flags:**	
Importance:	P1 normal (vote)		
Target Milestone:	M11		
Assigned To:	jefft		
QA Contact:	lchiang		
URL:			
Depends on:	~~15069~~		
Blocks:	~~11091~~ ~~17976~~		
	Show dependency tree / graph		

Change History 2/2

Who	When	What	Removed	Added
jefft	1999-08-29 10:43:15 PDT	Status	NEW	ASSIGNED
lchiang	1999-09-20 15:58:39 PDT	Blocks		~~11091~~
jefft	1999-10-29 17:59:57 PDT	Depends on		~~15069~~
lchiang	1999-11-02 11:13:05 PST	Summary	Unable to Forward a message received as an Inline	[DOGFOOD] Unable to Forward a message received as an Inline
chofmann	1999-11-04 06:05:18 PST	Blocks		~~17976~~
jefft	1999-11-04 11:50:21 PST	Status	ASSIGNED	RESOLVED
		Resolution	---	FIXED
		jagadeeshmce	2008-01-20 22:35:00 PST	CC
nobody	2008-07-31 04:30:00 PDT	Product	Core	MailNews Core
tymerkaev	2010-04-18 10:08:26 PDT	CC		tymerkaev
ysakham	2013-11-15 06:45:30 PST	Depends on		~~939101~~

Experimental Setup

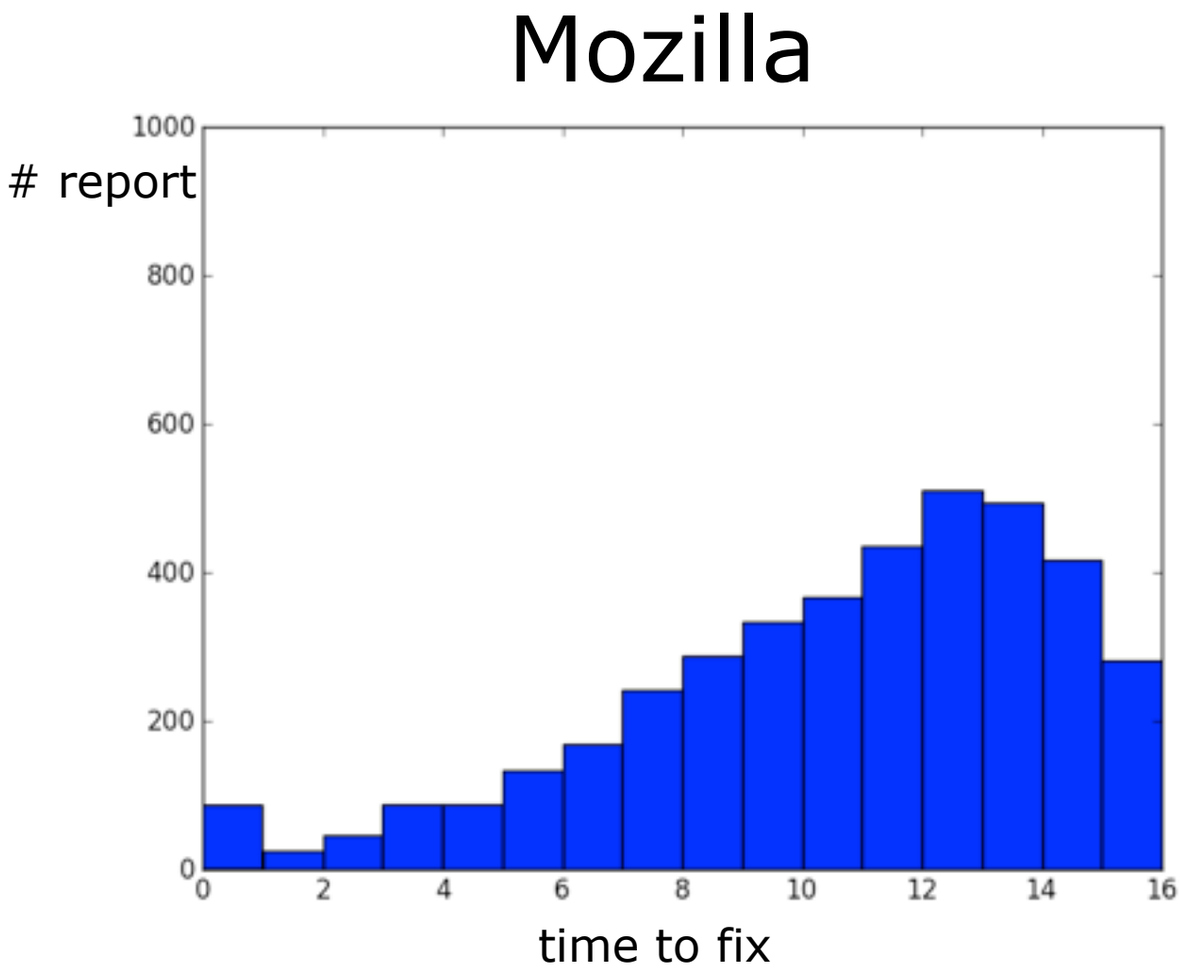
Dataset:
- Mozilla,
- Industrial Project

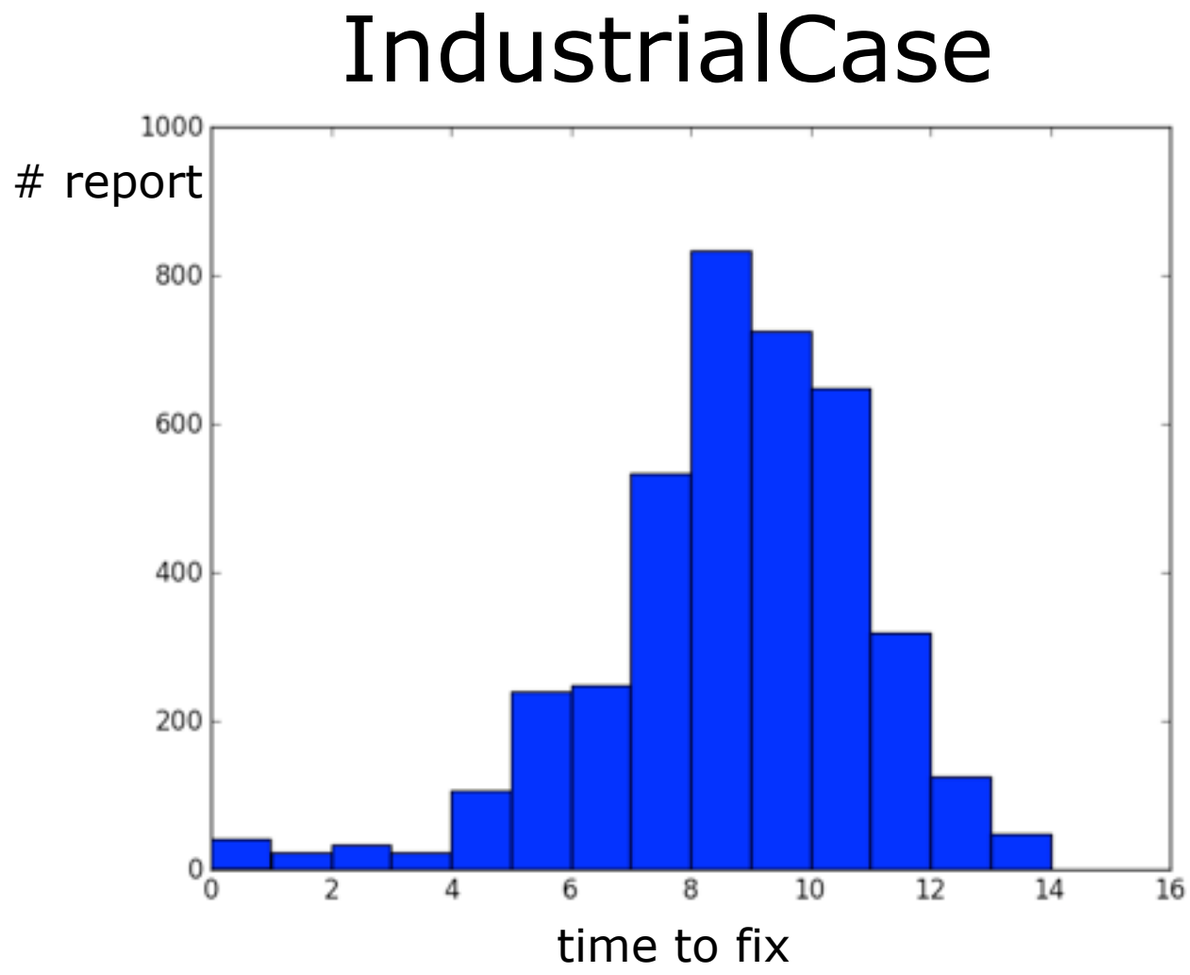
Size:
- 4000 bug reports

Performance:
- Accuracy (Precision & Recall)

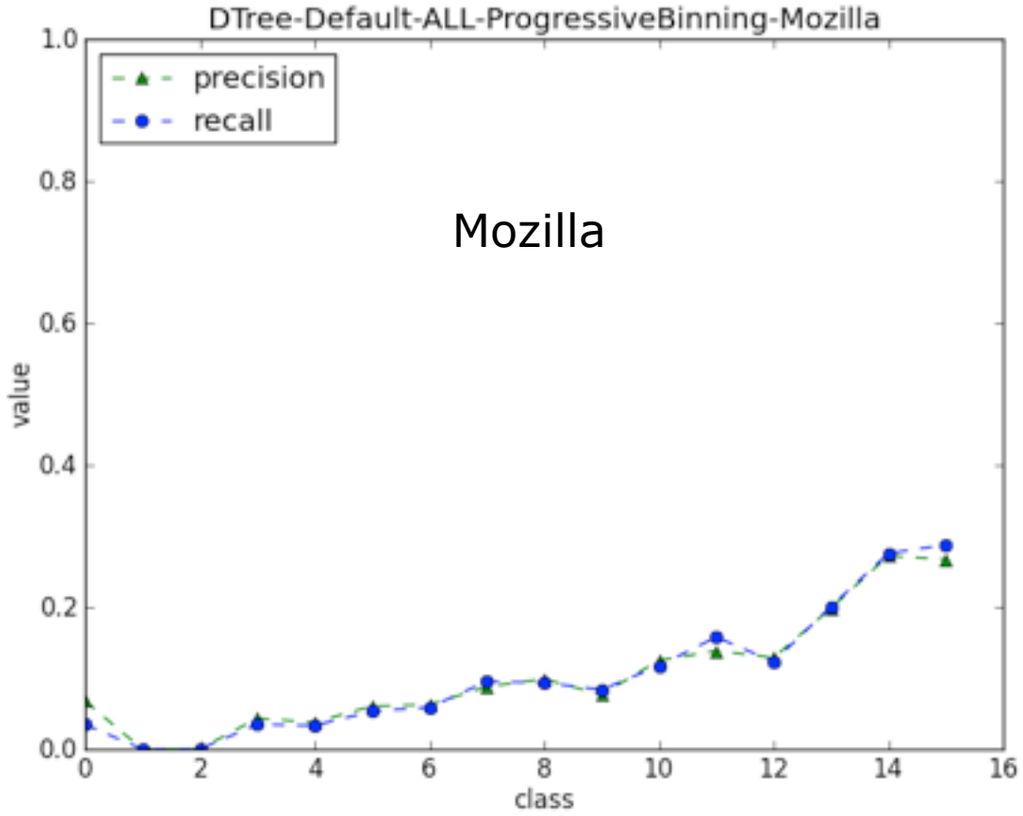
Classifier:
- Input
  - Bug Closed, Resolved
- Algorithms
  - Decision Tree,
  - Multinomial Naive Bayse
  - K-nearest-neighbor
  - Support Vector Machine
- Output
  - Mozilla (16 Classes)
  - Industrial Proj. (14 Classes)

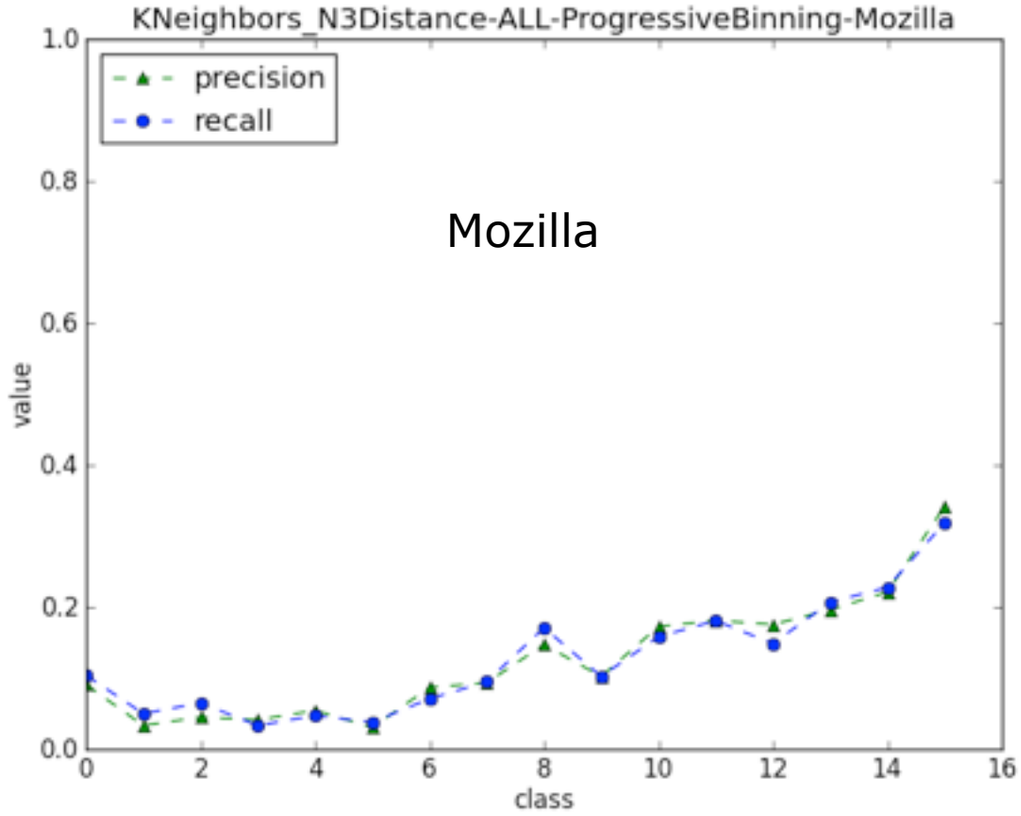
Dataset

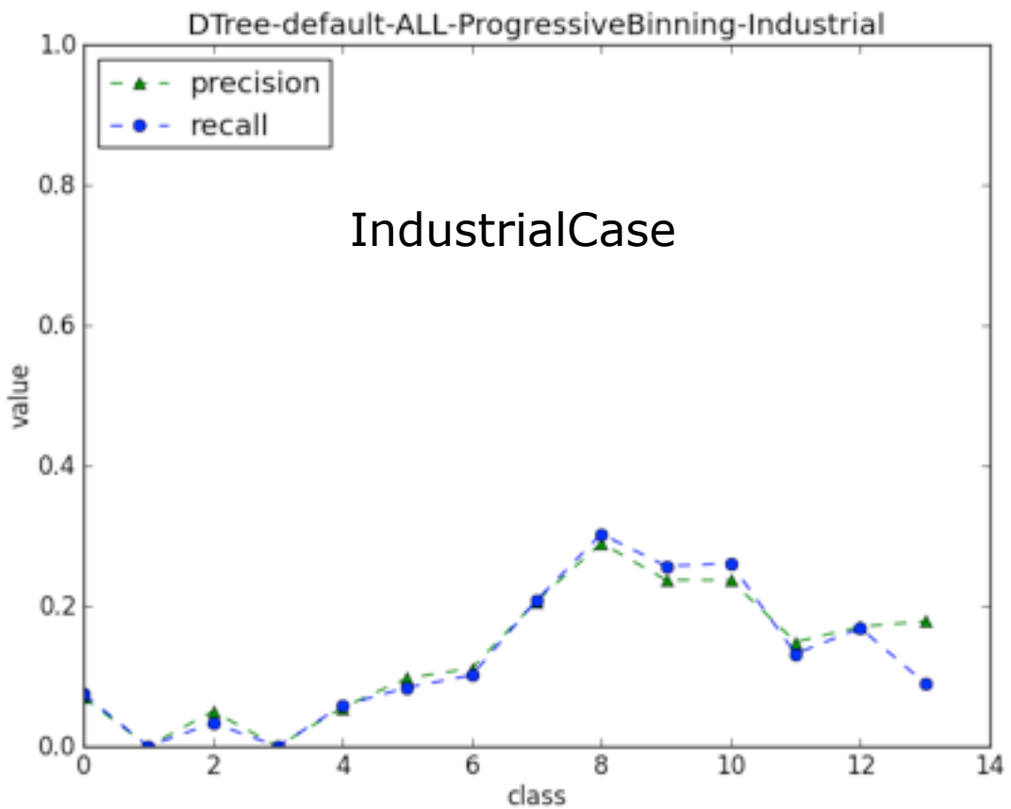

Mozilla
report
1000
800
600
400
200
0
0
2
4
6
8
10
12
14
16
time to fix

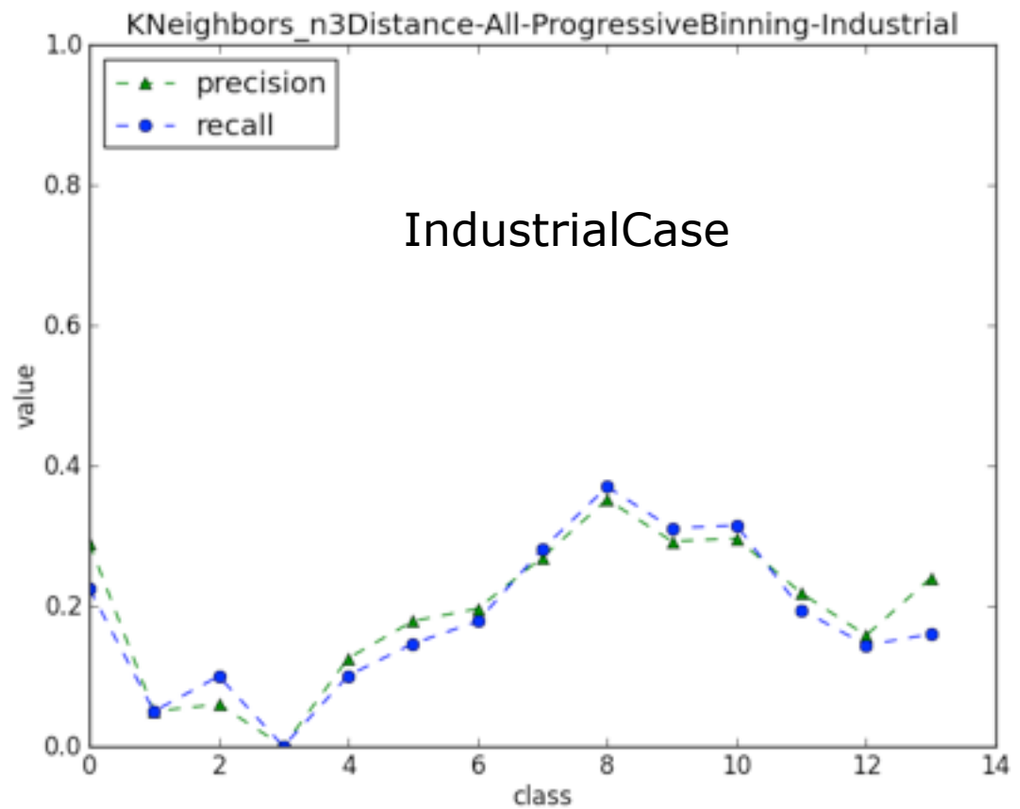

IndustrialCase
report
1000
800
600
400
200
0
0
2
4
6
8
10
12
14
16
time to fix

Results

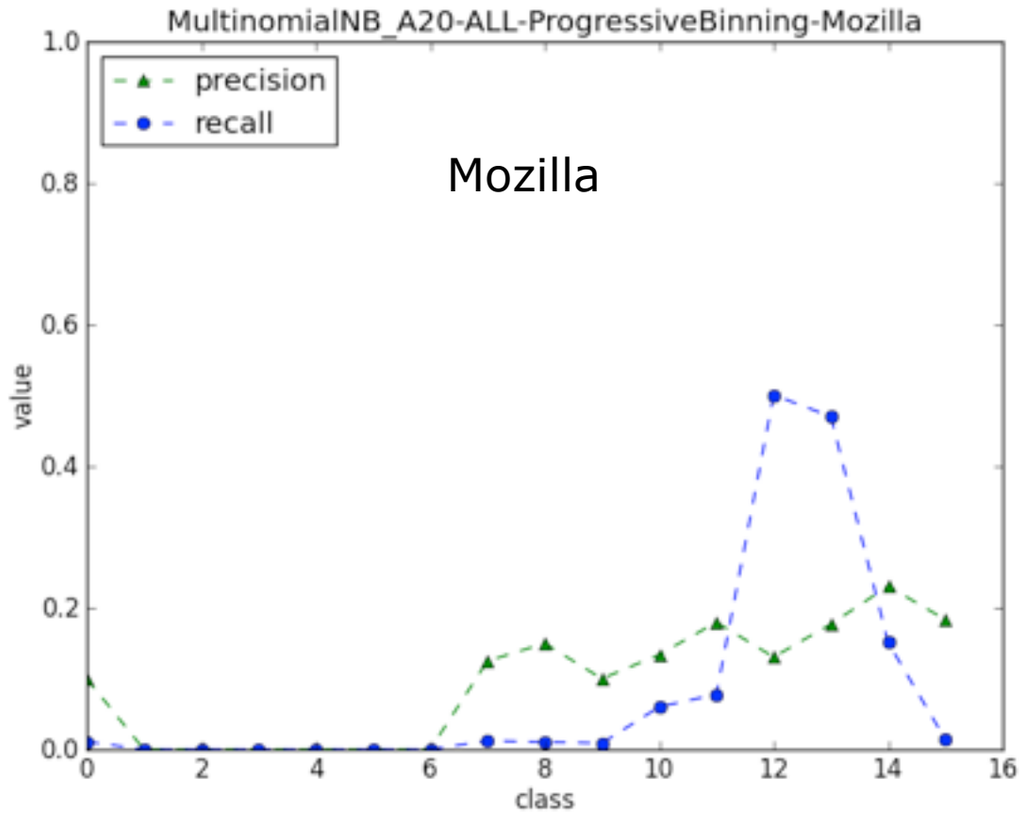

DTree-Default-ALL-ProgressiveBinning-Mozilla
precision
recall
Mozilla
value
class

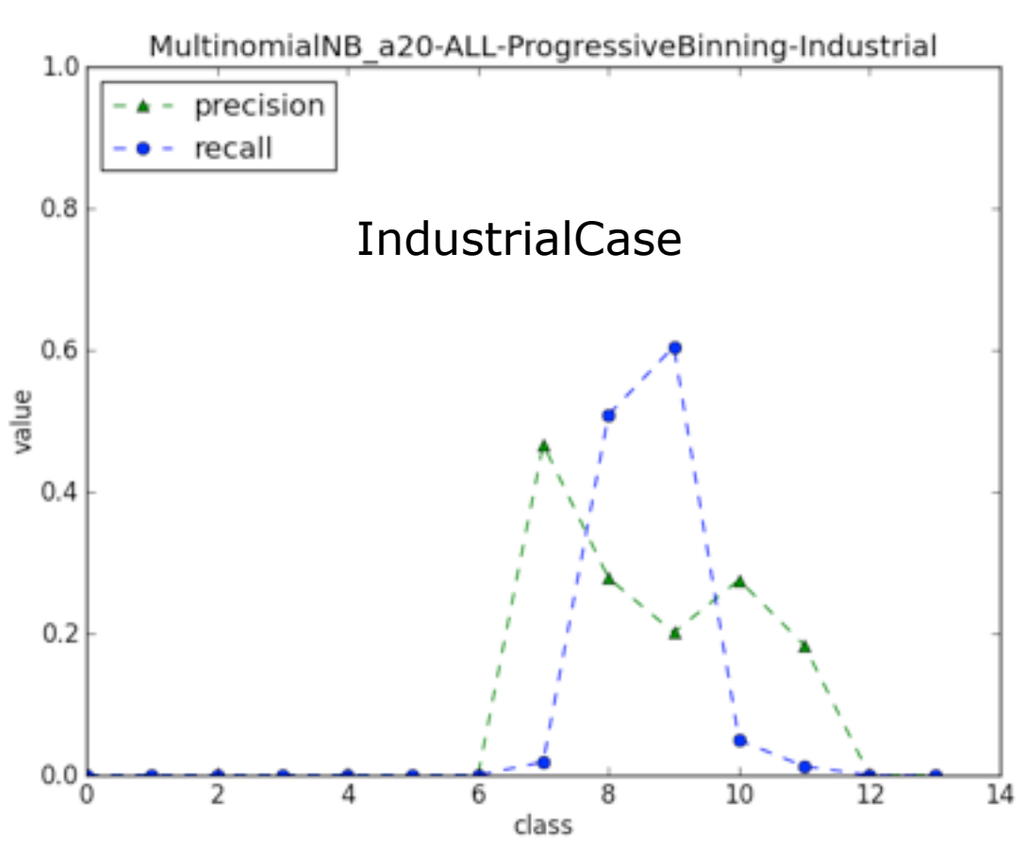

KNeighbors_N3Distance-ALL-ProgressiveBinning-Mozilla
precision
recall
Mozilla
value
class


DTree-default-ALL-ProgressiveBinning-Industrial
precision
recall
IndustrialCase
value
class

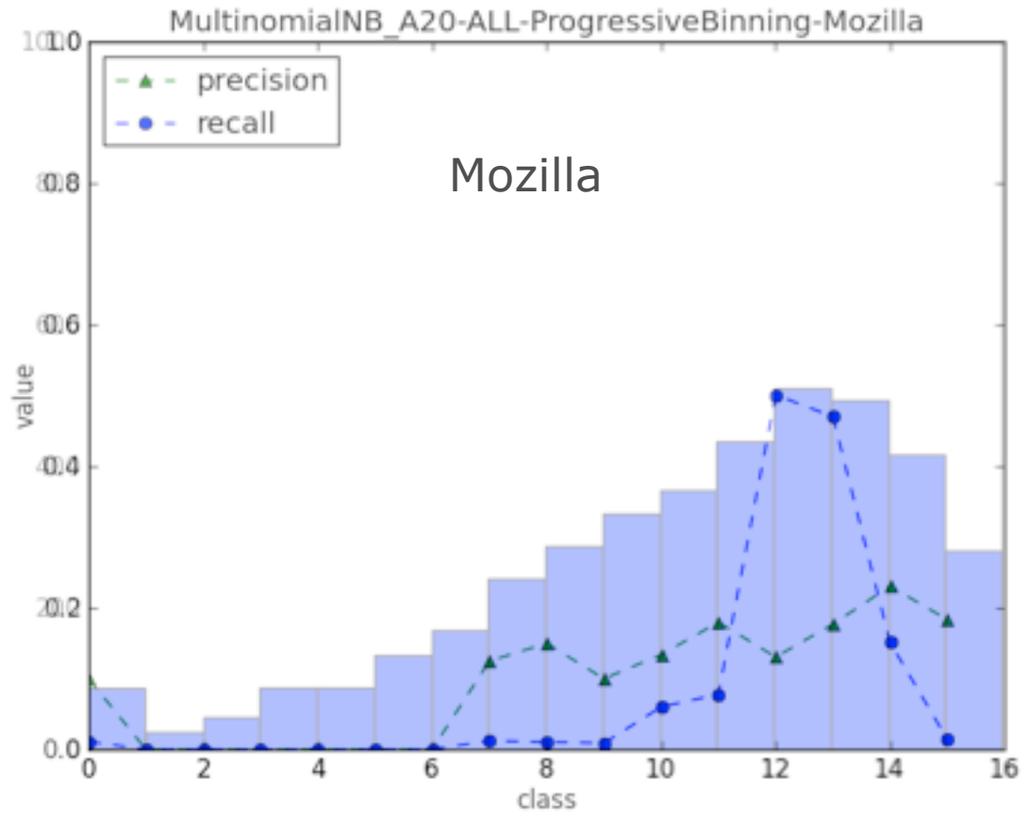

KNeighbors_n3Distance-All-ProgressiveBinning-Industrial
precision
recall
IndustrialCase
value
class

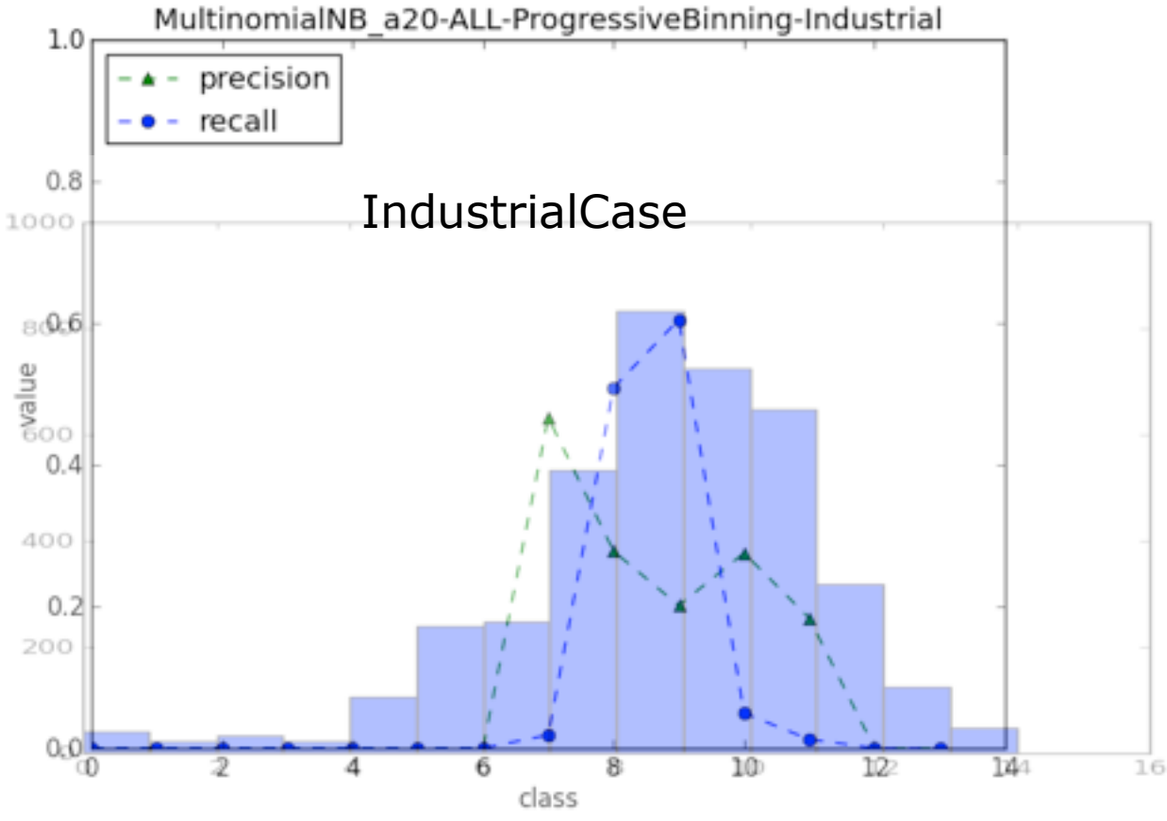
Results


MultinomialNB_A20-ALL-ProgressiveBinning-Mozilla
precision
recall
Mozilla
value
class
0.0
0.2
0.4
0.6
0.8
1.0
0
2
4
6
8
10
12
14
16

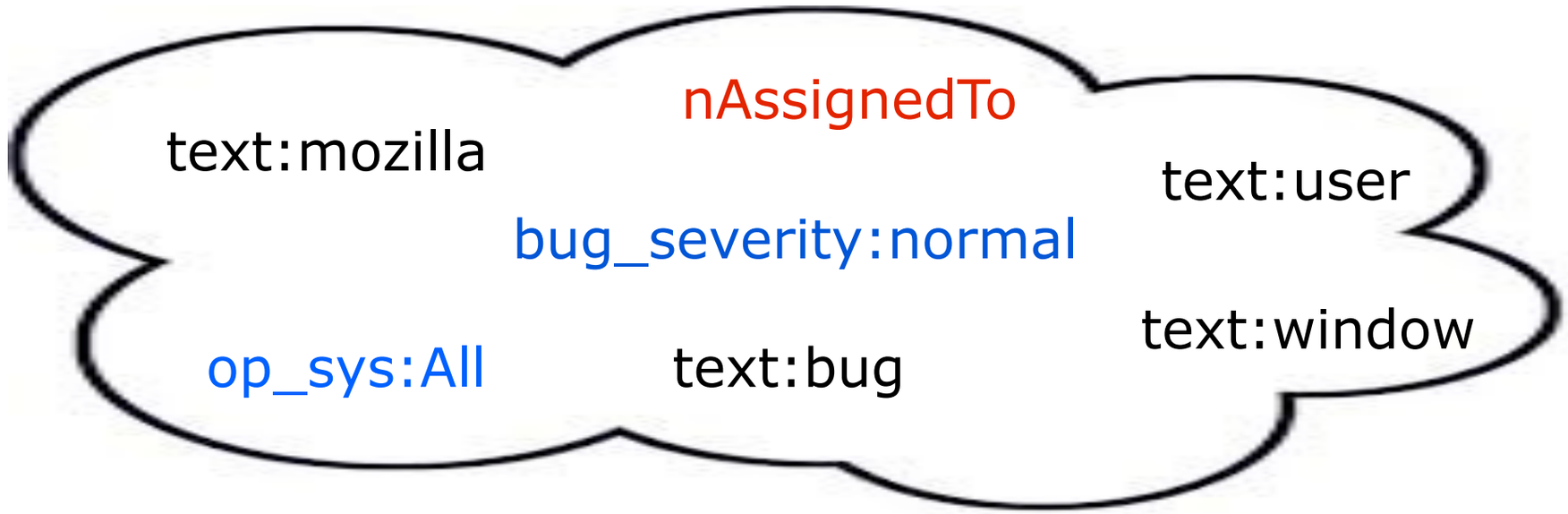

MultinomialNB_a20-ALL-ProgressiveBinning-Industrial
precision
recall
IndustrialCase
value
class
0.0
0.2
0.4
0.6
0.8
1.0
0
2
4
6
8
10
12
14

Results

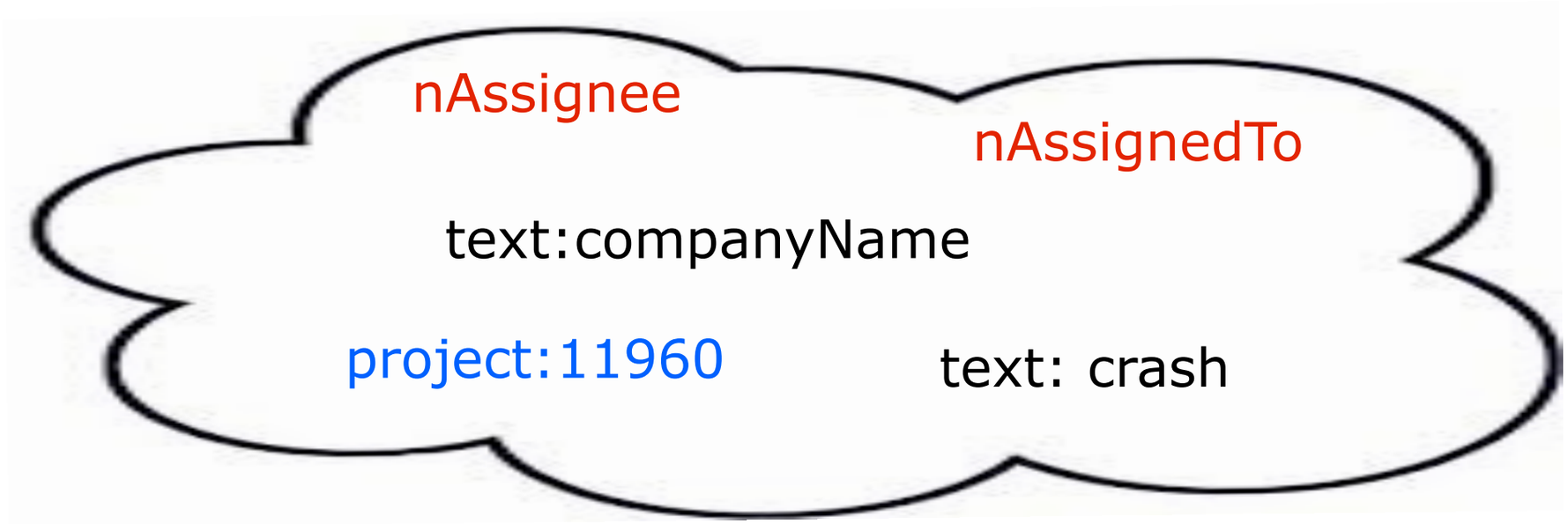

MultinomialNB_A20-ALL-ProgressiveBinning-Mozilla
precision
recall
Mozilla
value
class
0.0
0.2
0.4
0.6
0.8
1.0
0
2
4
6
8
10
12
14
16


MultinomialNB_a20-ALL-ProgressiveBinning-Industrial
precision
recall
IndustrialCase
value
class
0.0
0.2
0.4
0.6
0.8
1.0
0
2
4
6
8
10
12
14
16

Top 30 features - Multinomial Naive Bayes



Mozilla



IndustrialCase

Conclusion

Bug Fixing time prediction:

- Snapshot-based features (e.g. platform, title)
- Change-related features
  + number of re-assignment

Industry requirements

- 4 hours time slots (fast bug fixing)
- incremental time window (long bug fixing)

Set Up

Input

description
priority
#reassignment
...

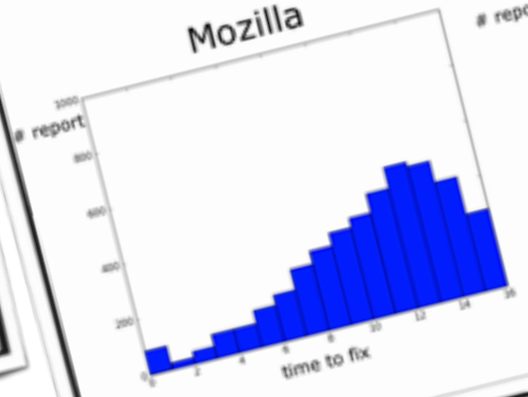
Machine Learning Classifier

Output

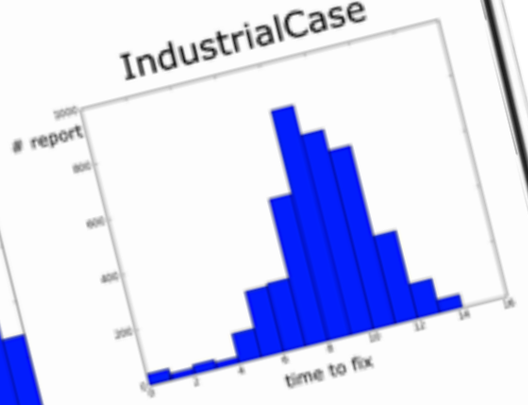
time to fix:
0> 0-4hours
1> 4-8hours
2> 8-16hours
...

Dataset

Mozilla



IndustrialCase



9

Results

10

Top 30 features - Multinomial Naive Bayes

Mozilla

IndustrialCase

13

Benevol 2013

Thanks

Benevol 2013

Any questions?

alessandro.murgia@uantwerpen.be

IEEE CSMR-WCRE 2014

February 3-6, 2014

Antwerp, Belgium

Home › Welcome to IEEE CSMR-WCRE 2014 Software...

- Home
- Important Dates
- Call for submissions
- Program
- Venue
- Fees/ Registration/ Visa
- Committees
- Promote the conference

Welcome to IEEE CSMR-WCRE 2014 Software Evolution Week

Software Evolution Week joins The Working Conference on Reverse Engineering (WCRE), the premier research conference on the theory and practice of recovering information from existing software and systems, with The European Conference on Software Maintenance and Reengineering (CSMR), the premier European conference on the theory and practice of maintenance, reengineering and evolution of software systems.

The first joint meeting will promote discussion and interaction among researchers and practitioners about the development of maintainable systems, and the evolution, migration and reengineering of the existing ones. In addition explore innovative methods of extracting the many kinds of information that can be recovered from software, software engineering documents, and systems artifacts, and examines innovative ways of using this information in system renovation and program

Alessandra Bagnato 11 Dec
@alebagnato
Preprint of @FITTESTproject paper @CSMR_WCRE 2014 at: selab.fbk.eu/preprints/csmr... @tanja_vos @Mark_Harman @pmk99 @WishnuPrasetya #csmr #wcre
Retweeted by CSMR-WCRE 2014
Expand

Marco Tulio Valente 12 Dec
@mtov
Preprint: "Remodularization Analysis Using Semantic Clustering", dcc.ufmg.br/~mtov/pub/2014..., #csmr #wcre #aserg_ufmg
Retweeted by CSMR-WCRE 2014
Expand