PAN

Uncovering Plagiarism, Authorship, and Social Software Misuse

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PAN

Uncovering Plagiarism, Authorship, and Social Software Misuse

Outline

- Author Profiling
- Author Identification
- Plagiarism Detection
- Software Submissions
- Summary

CLEF 2013 Valencia

upf. Universitat Pompeu Fabra Barcelona

iula Forensiclab

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The PAN Competition

PAN is a network around digital text forensics.

Mission

- ❑ Foster research and development in our tasks
- ❑ Push the limits of evaluating them
- ❑ Improve methodology for lab-style evaluations

Tasks

- ❑ Author Profiling (new in 2013)
- ❑ Author Identification
- ❑ Plagiarism Detection

Software Submissions

- ❑ Instead of run submissions (i.e., software output on a given input)
- ❑ Improves sustainability, replicability, and reproducibility
- ❑ Increases participant engagement
- ❑ Allows for cross-year evaluations

Author Profiling

- Given a document, what are its author’s demographics?

Corpus

- Genre: social media
- Languages: English, Spanish
- Size: 346 100 authors
- Annotations: age, gender

Selected results

- 21 softwares submitted
- Gender difficult to be discriminated, somewhat better in Spanish
- Age correctly detected in about 2/3 of cases

Award from the ForensicLab of the Universitat Pompeu Fabra

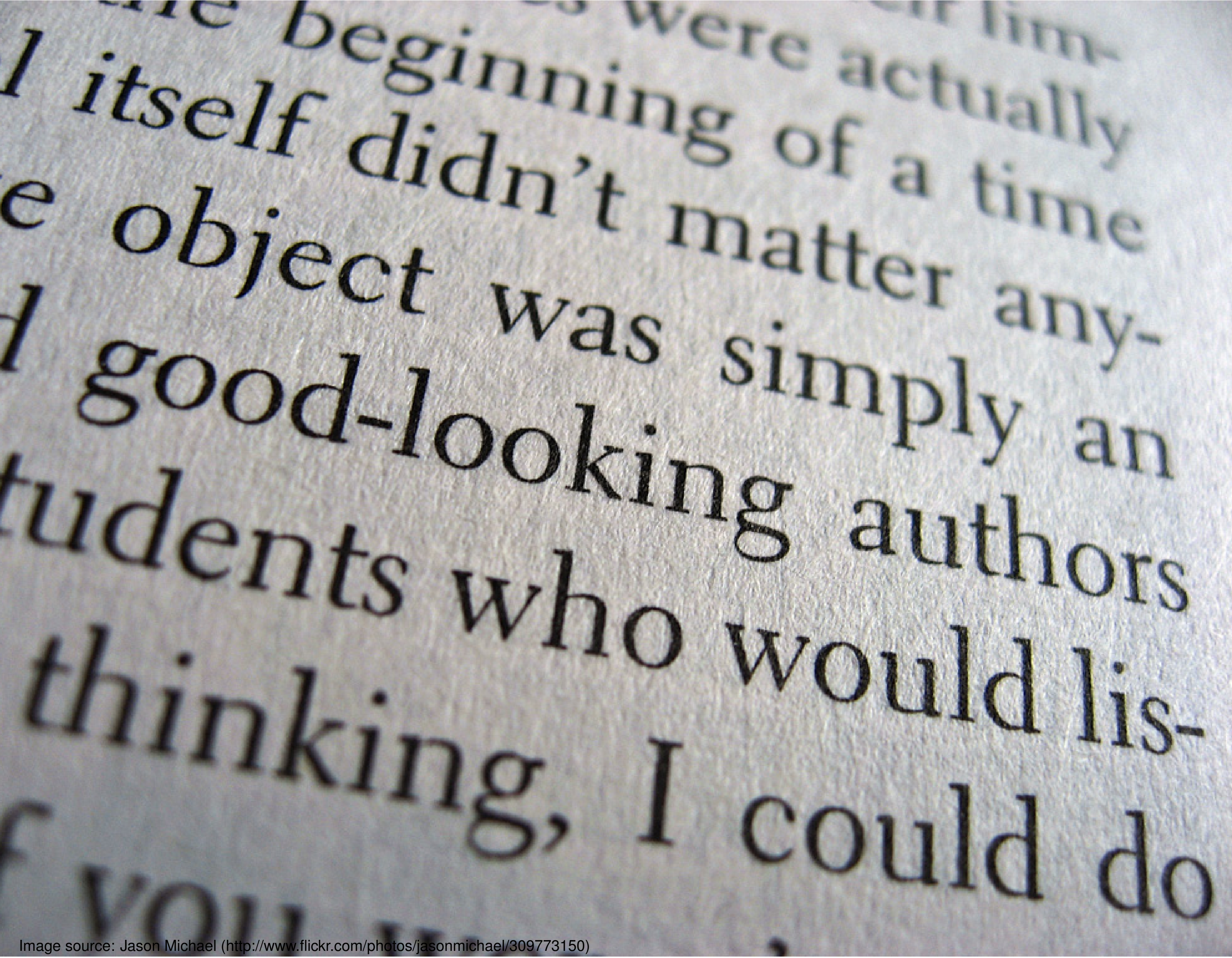

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Image source: Jason Michael (http://www.flickr.com/photos/jasonmichael/30973150)

Author Identification

- Given a document, who wrote it?

Corpus

- Genres: non-fiction writing, short fiction, news
- Languages: English, Spanish, Greek
- Size: 120 cases
- Annotations: authorship

Selected results

- 18 softwares submitted
- Greek more difficult than English and Spanish
- Balancing performance in all languages with a single approach difficult
- Meta-model competitive to participants, but does not dominate

Plagiarism Detection

- Given a document, is it an original?

Corpus

- Genre: web, news
- Language: English
- Size: 10000 suspicious documents
- Annotations: reused text passages, obfuscation

Selected results

- 19 softwares submitted
- Advanced evaluation framework for web-scale retrieval
- Different retrieval paradigms open up trade-off between costs and recall
- Summary plagiarism most difficult to be detected
- First-time cross-year evaluation; first steps toward all-time evaluation

Software Submissions

Software Submissions

Challenges ➜ Approaches

1. Environment diversity ➜ virtualization

   Support a wide variety of programming languages and operating systems.

2. Executing untrusted software ➜ virtualization

   Better be safe than sorry when executing binaries from a third party.

3. Data leakage ➜ sandboxing

   Prevent data leaking by running software in a secured environment.

4. Error handling ➜ unit testing

   Streamline the development round-trips for fixing execution errors.

5. Responsibility ➜ staged submissions

   Incentivice participants to submit early.

6. Execution cost ➜ provide hardware or raise usage fees

   We provided four servers each hosting up to 20 virtual machines.

Software Submissions

The 2013 Experience

- Entire lab accepts software submissions
- 62 virtual machines requested and provisioned
- 47 softwares installed, prepared for execution, and submitted by participants
- Testing and round-trips to fix errors
- Managed execution and evaluation using TIRA

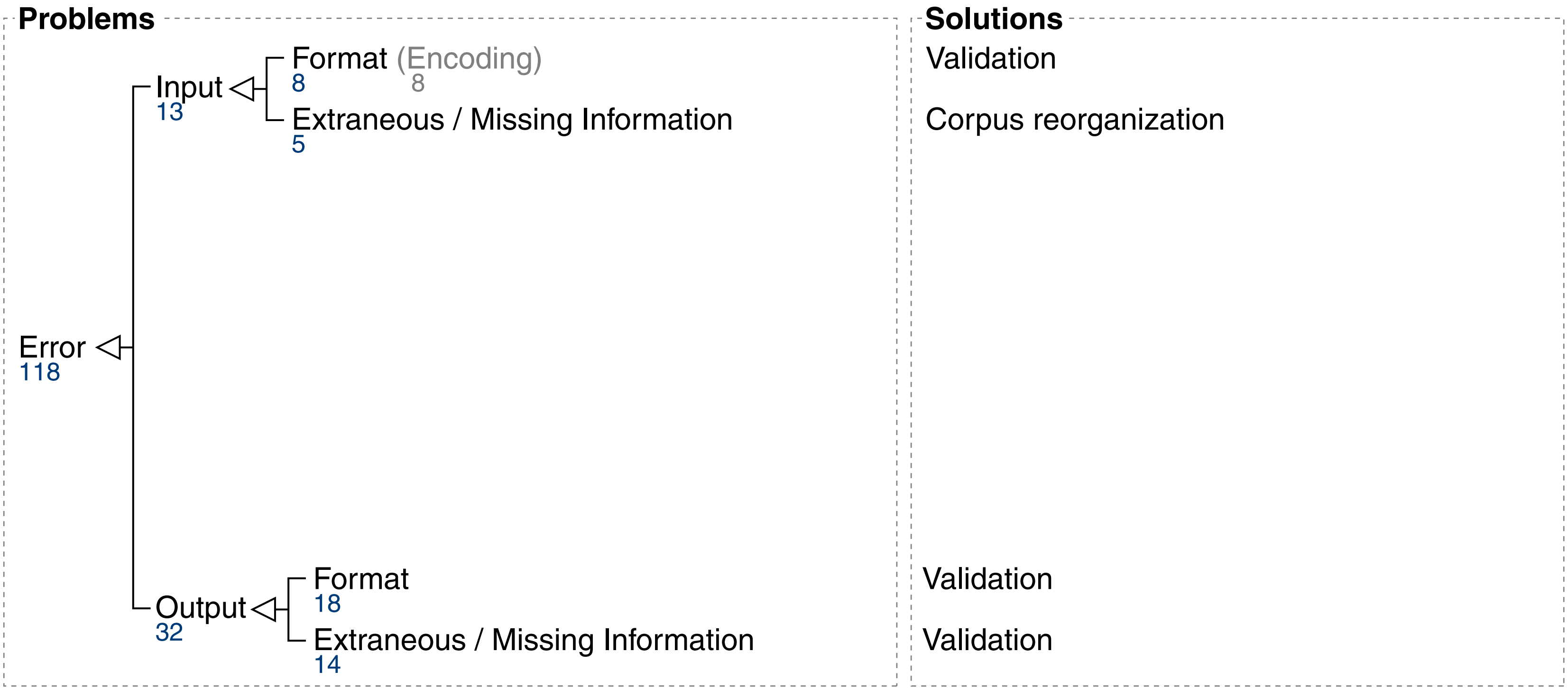
The 2012 Experience

- One task accepts software submissions
- 10 softwares submitted
- Manual preparation for execution by us
- Testing and round-trips to fix errors
- Managed execution and evaluation using TIRA

[tira.webis.de] [demo]

Software Submissions

Error Analysis



Problems

Error 118

Input 13

Format 8 (Encoding) 8

Extraneous / Missing Information 5

Output 32

Format 18

Extraneous / Missing Information 14

Solutions

Validation

Corpus reorganization

Validation

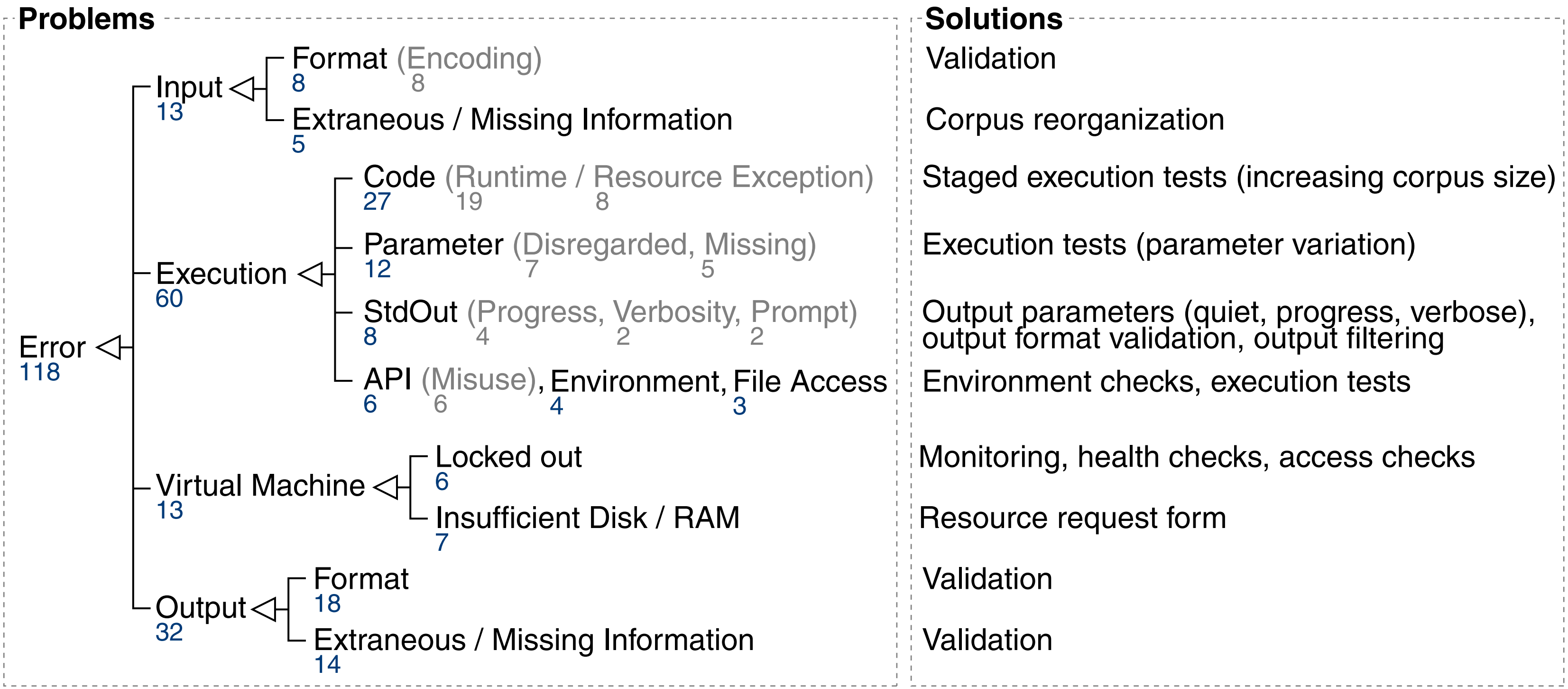
Validation

- 1493 mails exchanged in 392 conversations
- 39 of 46 teams experienced at least one error, 26 at least two, 1 team 10
- No one panicked
- Staged submissions helped resolve errors early on

➜ Rigorous unit testing and tools to assist participants in development

Software Submissions

Error Analysis



Problems

- Error 118
  - Input 13
    - Format (Encoding) 8 8
    - Extraneous / Missing Information 5
  - Execution 60
    - Code (Runtime / Resource Exception) 27 19 8
    - Parameter (Disregarded, Missing) 12 7 5
    - StdOut (Progress, Verbosity, Prompt) 8 4 2 2
    - API (Misuse), Environment, File Access 6 6 4 3
  - Virtual Machine 13
    - Locked out 6
    - Insufficient Disk / RAM 7
  - Output 32
    - Format 18
    - Extraneous / Missing Information 14

Solutions

- Validation
- Corpus reorganization
- Staged execution tests (increasing corpus size)
- Execution tests (parameter variation)
- Output parameters (quiet, progress, verbose), output format validation, output filtering
- Environment checks, execution tests
- Monitoring, health checks, access checks
- Resource request form
- Validation
- Validation

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Software Submissions

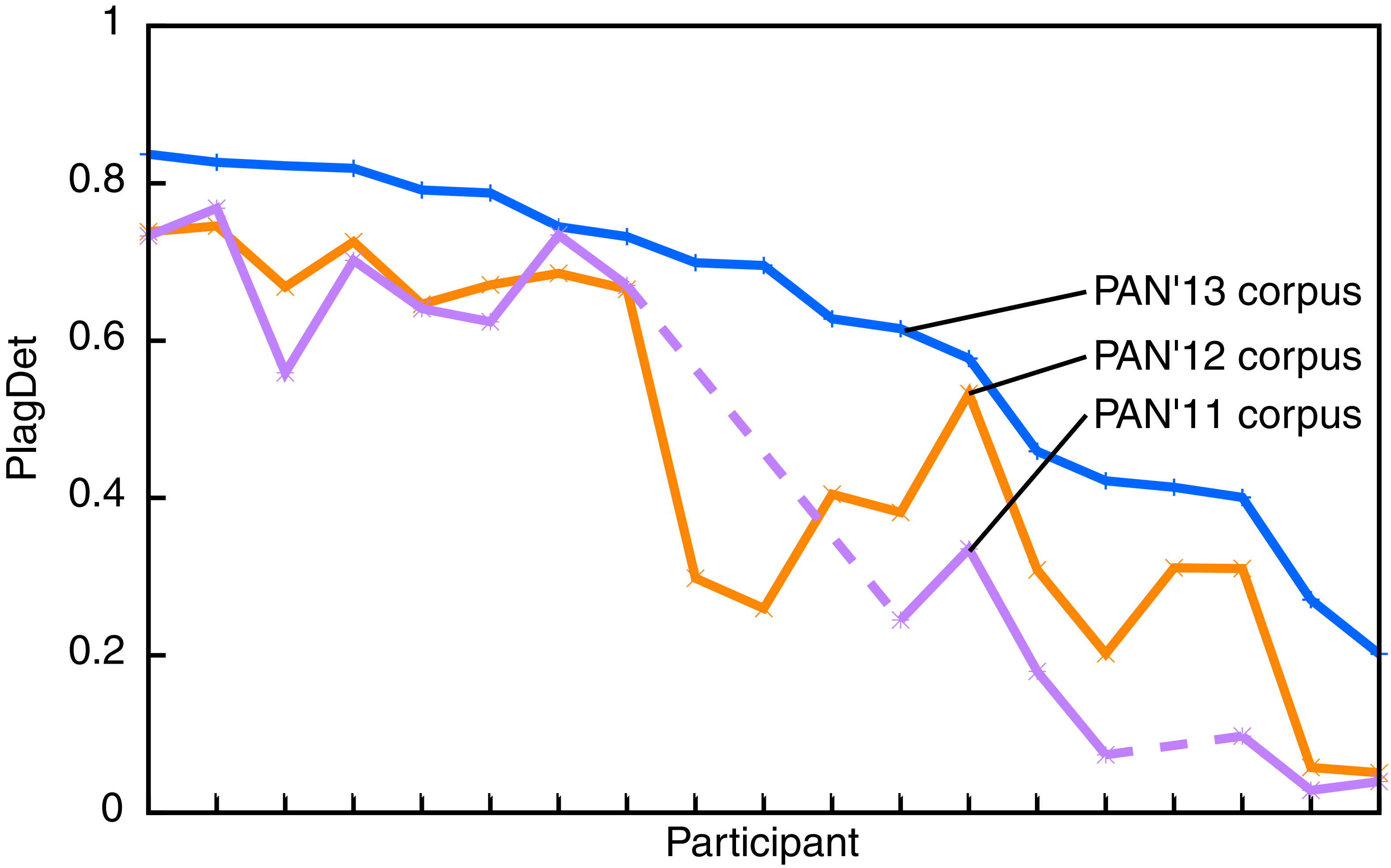
Cross-year Evaluation 2011-2013

Software Submission		PlagDet on PAN Plagiarism Corpus		
Team	Year	2013	2012	2011
Kong	**2012**	0.84	0.74	0.73
Oberreuter	**2012**	0.83	0.75	0.77
R. Torrejón	2013	0.82	0.67	0.56
Kong	2013	0.82	0.73	0.70
Palkovskii	**2012**	0.79	0.65	0.64
R. Torrejón	**2012**	0.79	0.67	0.62
Suchomel	2013	0.74	0.69	0.73
Suchomel	**2012**	0.73	0.67	0.67
Saremi	2013	0.70		
Shrestha	2013	0.70		
Kueppers	**2012**	0.63	0.40	
Palkovskii	2013	0.62	0.38	0.25
Nourian	2013	0.58	0.53	0.34
Sánchez-Vega	**2012**	0.46	0.31	0.18
Baseline		0.42	0.20	0.07
Gillam	**2012**	0.41	0.31	0.10
Gillam	2013	0.40	0.31	0.10
Jayapal	2013	0.27	0.06	0.03
Jayapal	**2012**	0.20	0.05	0.04

Software Submissions

Cross-year Evaluation 2011-2013 (continued)

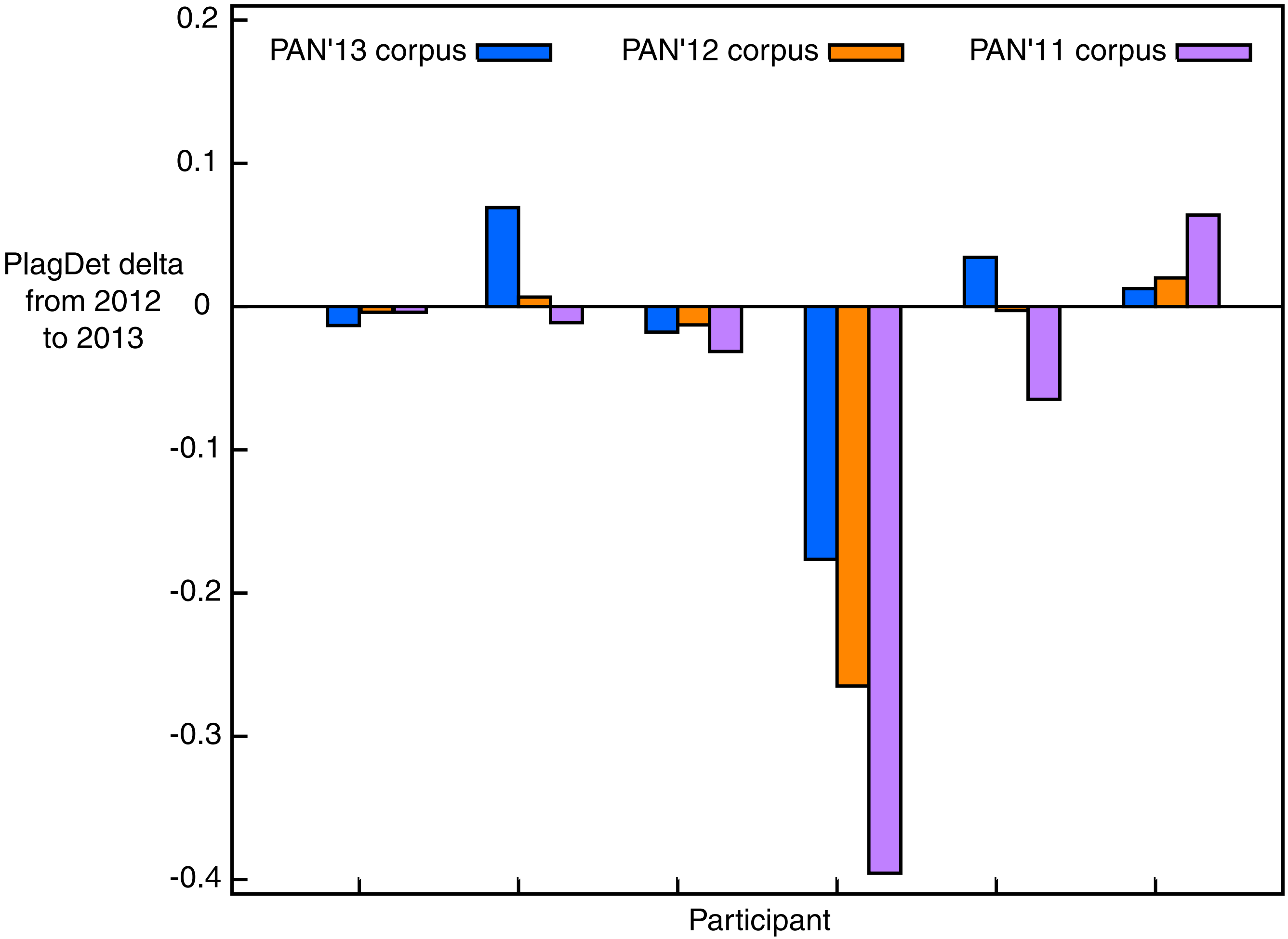
Assessing corpus difficulty



Software Submissions

Cross-year Evaluation 2011-2013 (continued)

Assessing improvments across versions



Summary

Statistics	**ALLC**	**SEPLN**	**FIRE**			**CLEF**			
	2004	2009	2011	2012	2013	2010	2011	2012	2013
Task(s)	1	1	1	1	1	2	3	3	3
Follower		78				151	181	232	286
Registrations	11	21	6	12	16	53	52	68	110
Runs/Software	13	14	6	8	8	27	27	48	58
Notebooks	8	11	6	2	6	22	22	34	47
Attendees	5	18	6	30		25	36	61	

Take-away messages

- Software submissions improve sustainability
- Software submissions allow for re-evaluation
- Software submissions allow for cross-year evaluation
- Software submissions do not discourage participation

Summary

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Thank you for your attention!