Collaboration Networks in Software Development: Perspectives from Applying different Granularity Levels using Social Network Analysis - Research in progress

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Motivation

- Large software projects may involve a lot of developers (Sometimes thousands of them!).
- Our interest is to understand better how developers collaborate and how this interaction evolves over time.
- We opted to study Free/Libre and Open Source Software (FLOSS) projects due to the easy, public data availability in websites like GitHub.

How do we study collaborations?

- Using Social Network Analysis tecniques we get collaboration networks.

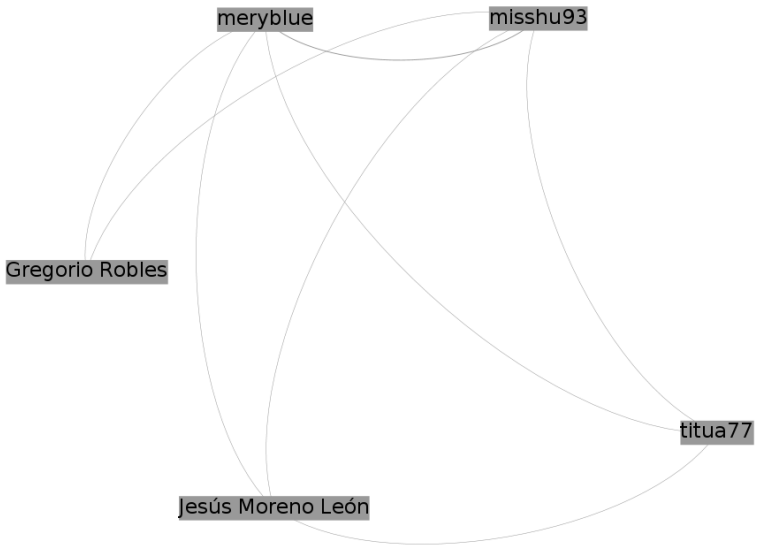


Figure : Collaboration network graph from DrScratch project (LibreSoft, Rey Juan Carlos University) - 1st semester, 2015

In these network graphs:

Nodes = Developers

Two developers (nodes) are connected if they have collaborated together.

Edges = Collaborations

Edges width represents the amount of collaboration (The wider the edge is, the greater is the number of interactions between those two nodes).

Up to now...

- In most social network studies the resulting network is based on file/module data.
- If there is a collaboration between two developers in the same file/module, these developers are connected.

A different point of view

- When there are tens of files in a module or thousands of lines in a file, did collaboration really exist?
- We think the resulting collaboration network graph depends heavily on the granularity level that is considered.

A different point of view: New-level analysis

- We've been working to obtain collaboration graphs at function/method level.
- In these graphs, two developers collaborate if they have modified the same function in a given time period.
- Excluding large fuctions/methods, we think this new point of view can help us to understand better this analysis.

Methodology: Our tool

- In LibreSoft, our department at Rey Juan Carlos University, we have developed a python script named GraphDataCreator
- This script studies changes in a given Git-tracked repository.
- Using the commit history of all contributors in a specified period of time.

Detailed algorithm I

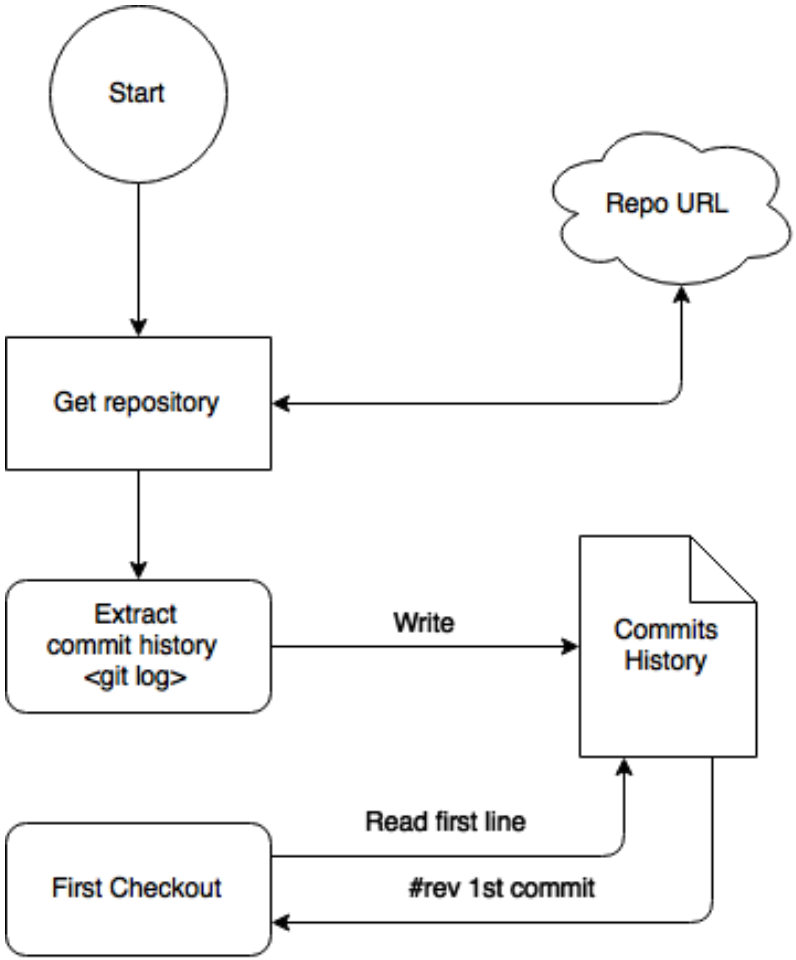


Figure : Phase 1 of GraphDataCreator

Detailed algorithm II

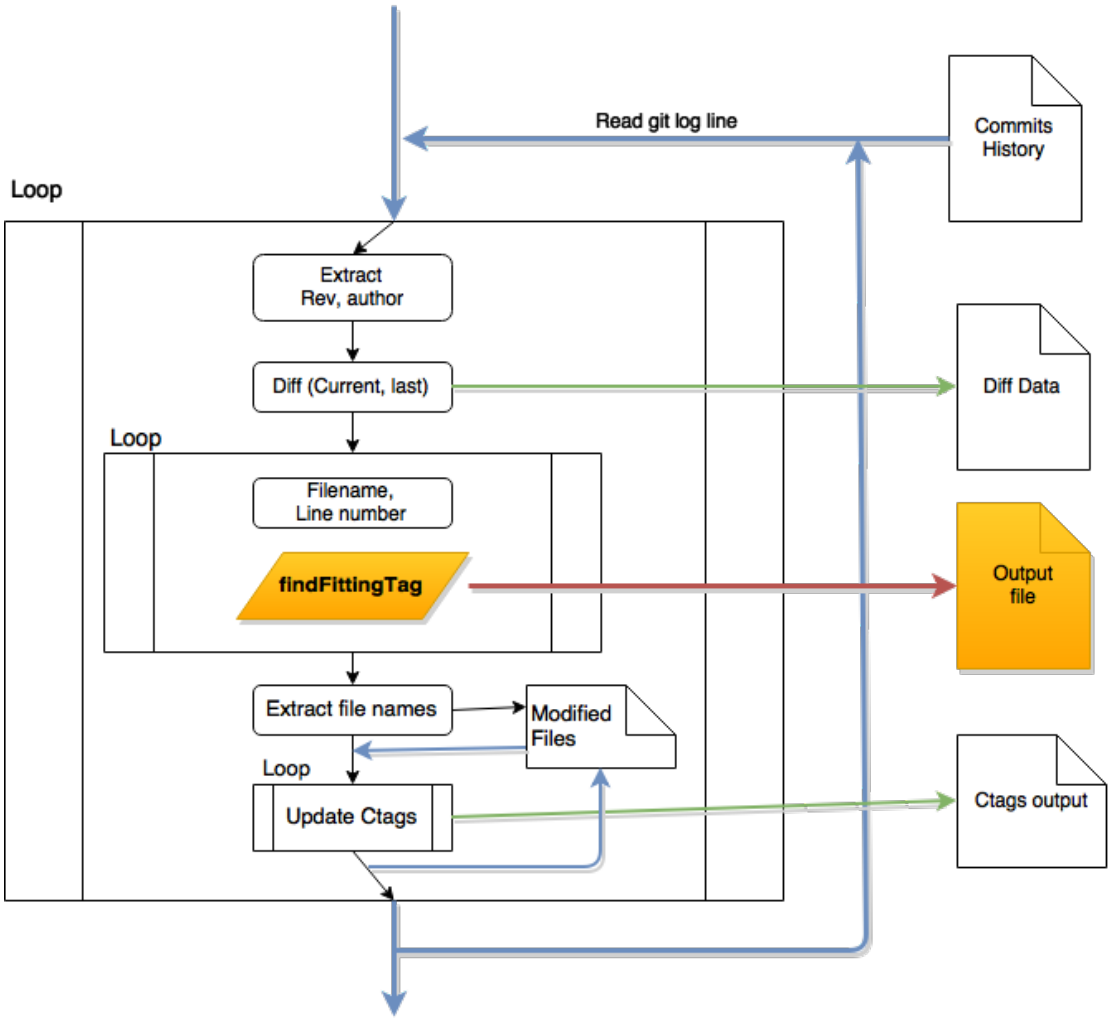


Figure : Phase 2 of GraphDataCreator

Detailed algorithm: findFittingTag

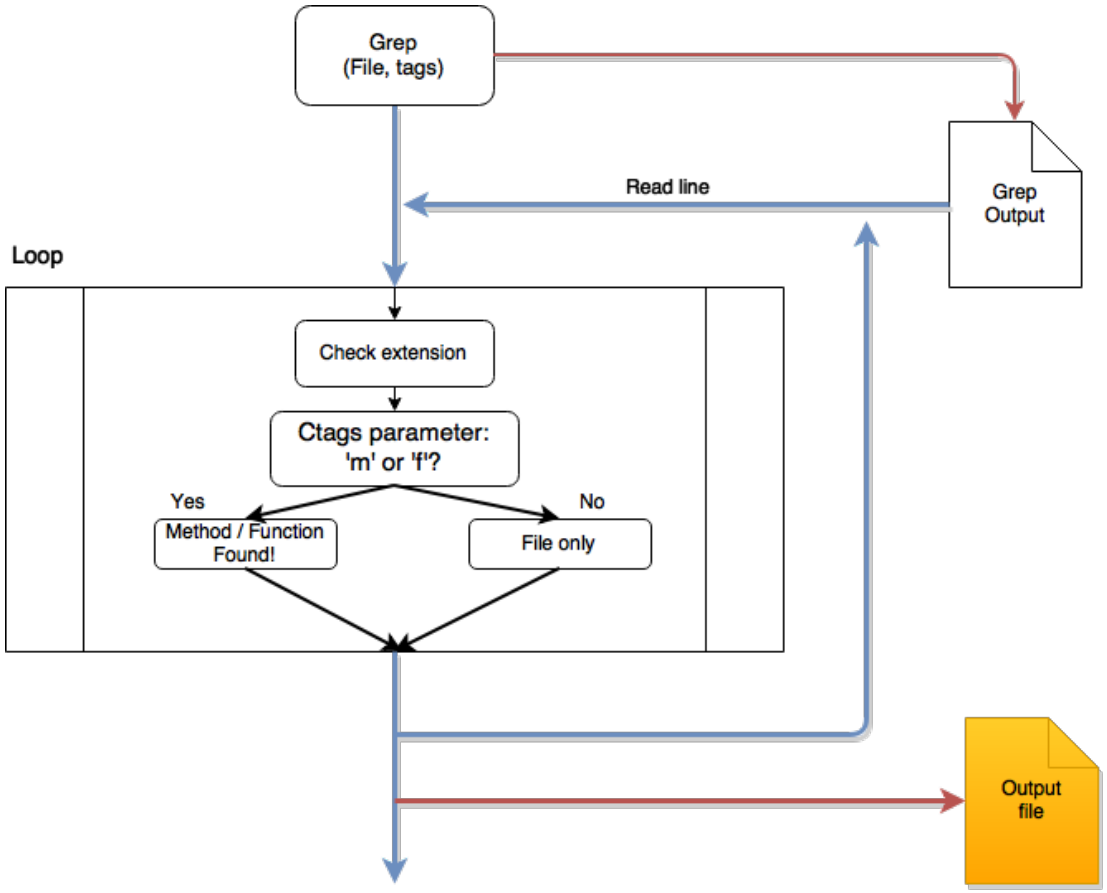


Figure : Method 'findFittingTag' of GraphDataCreator

Detailed algorithm III

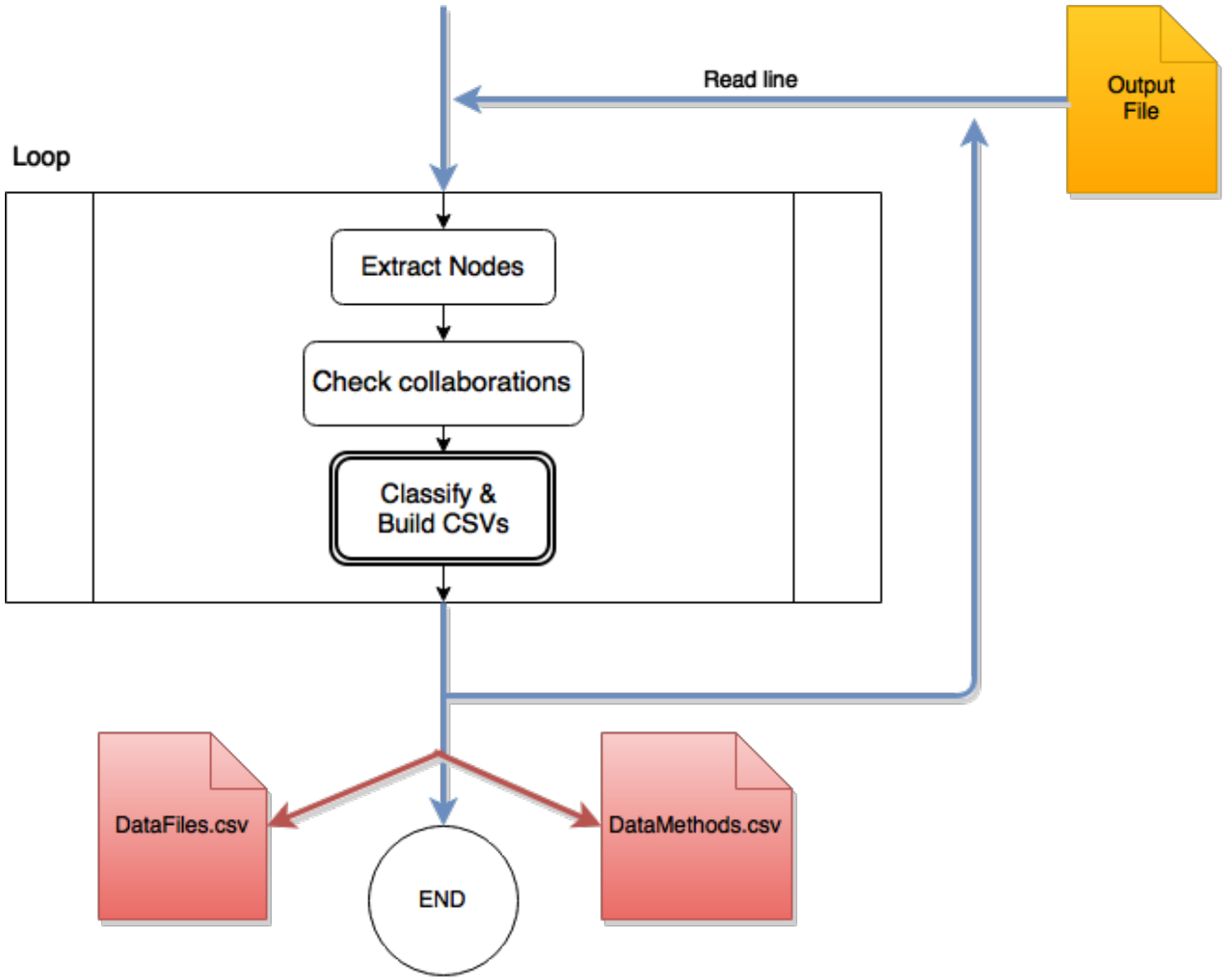


Figure : Phase 3 of GraphDataCreator

Case of study: Gedit

- We used the program to study the evolution of GNOME-text editor Gedit *.
- The considered date range for this study goes from the very beginning of the project to this year.
- To extract data from wide time periods we have developed a super-script that automatically divides large date ranges into smaller periods.

Summing up...

Date range

- Goes form April 15, 1998 until April 15, 2015. (17 years!)
- Divided into six-month periods

Resulting data

- Two different graphs: for each date range, an in-file and an in-method network.
- Statistic parameters referred to networks, such as betweeness centrality and clustering coefficent.

Graphic results: 1st semester, 2001

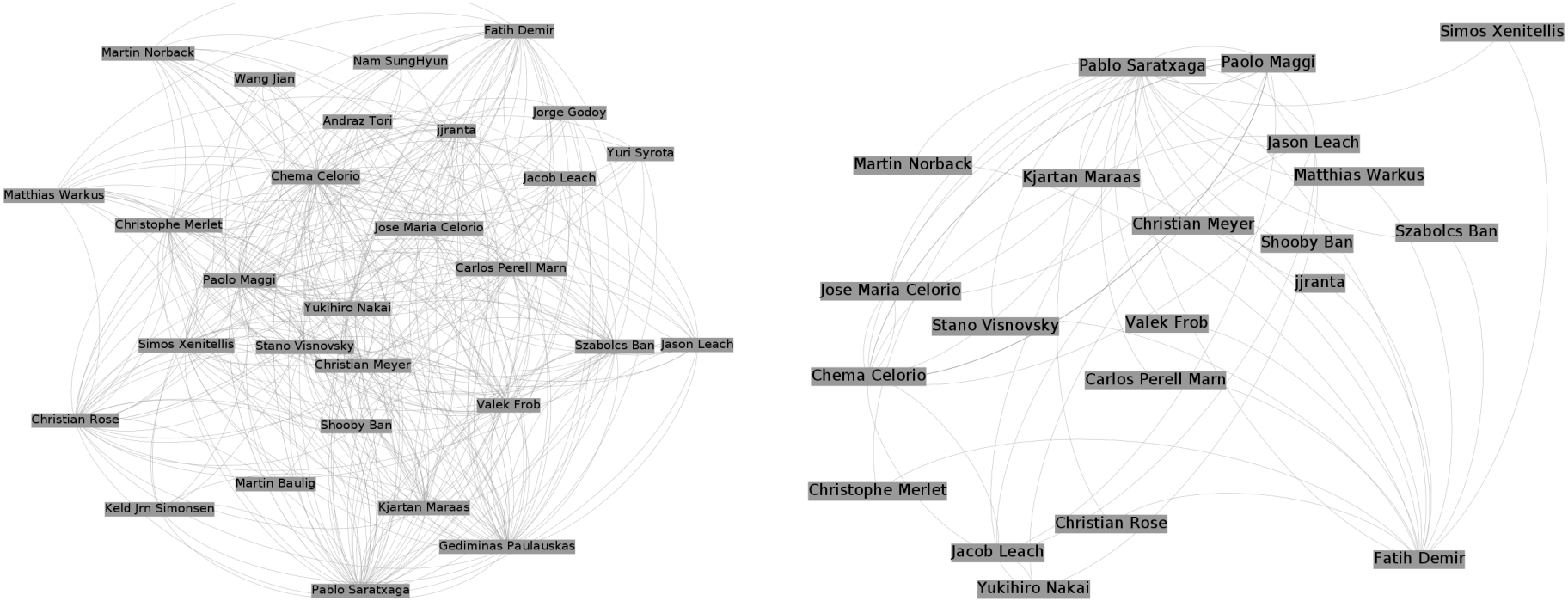


Figure : In-file (left) and In-method (right) collaboration network graphs

Graphic results: 1st semester, 2014

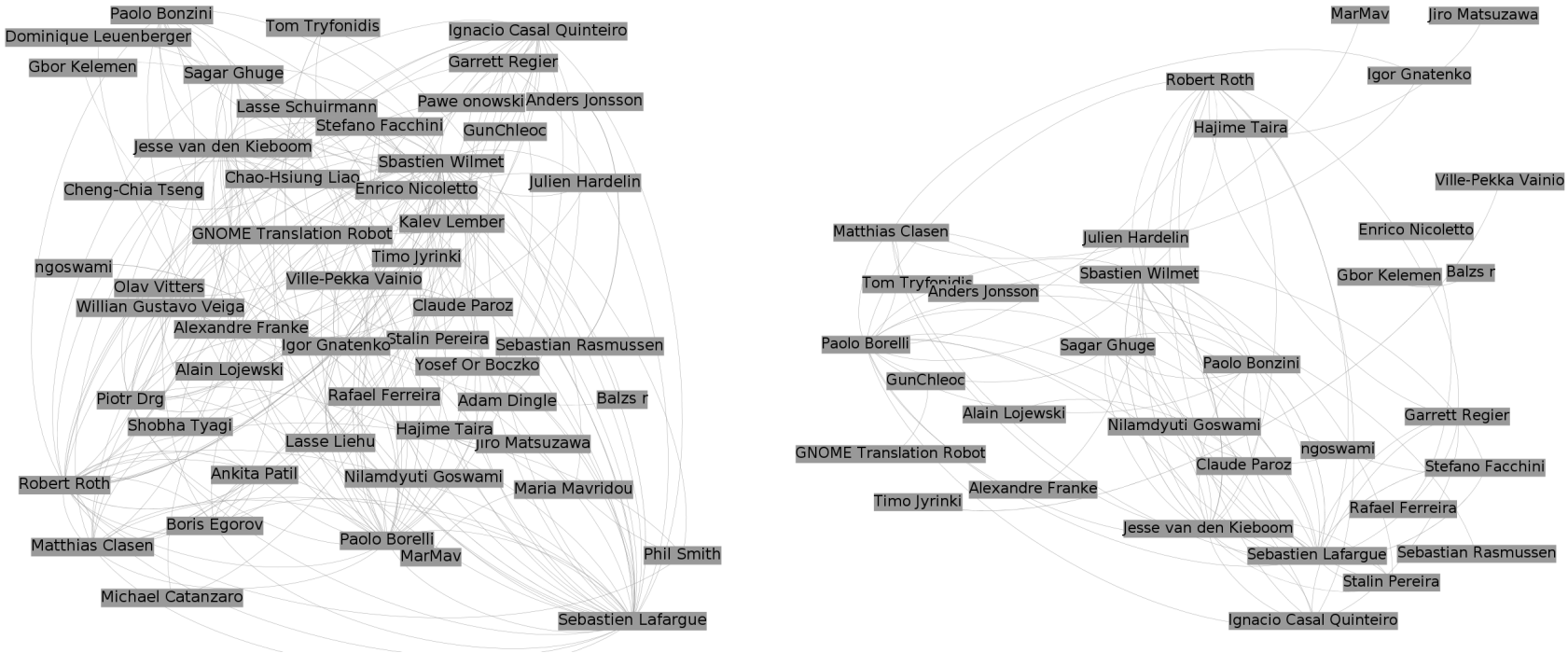
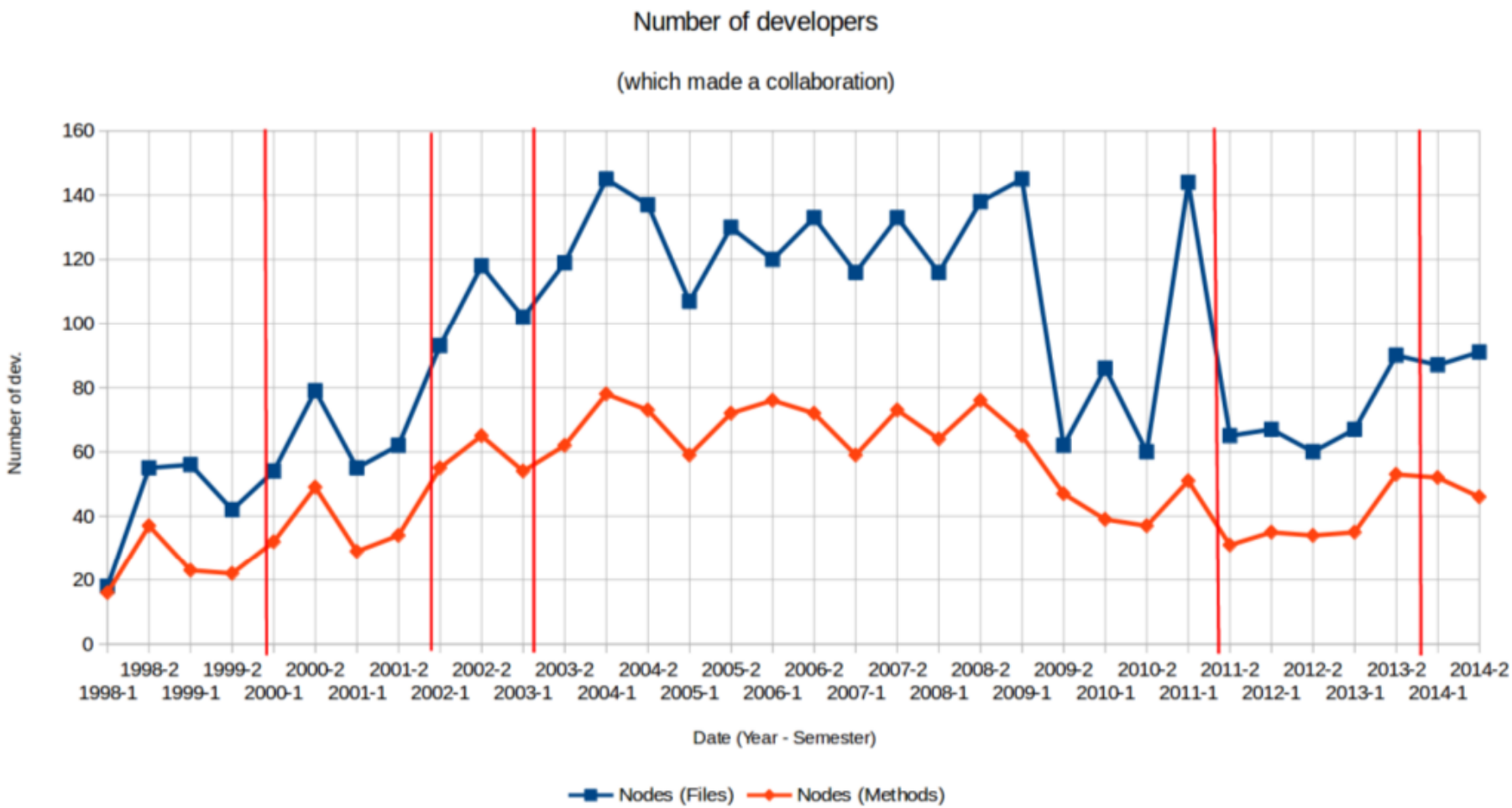
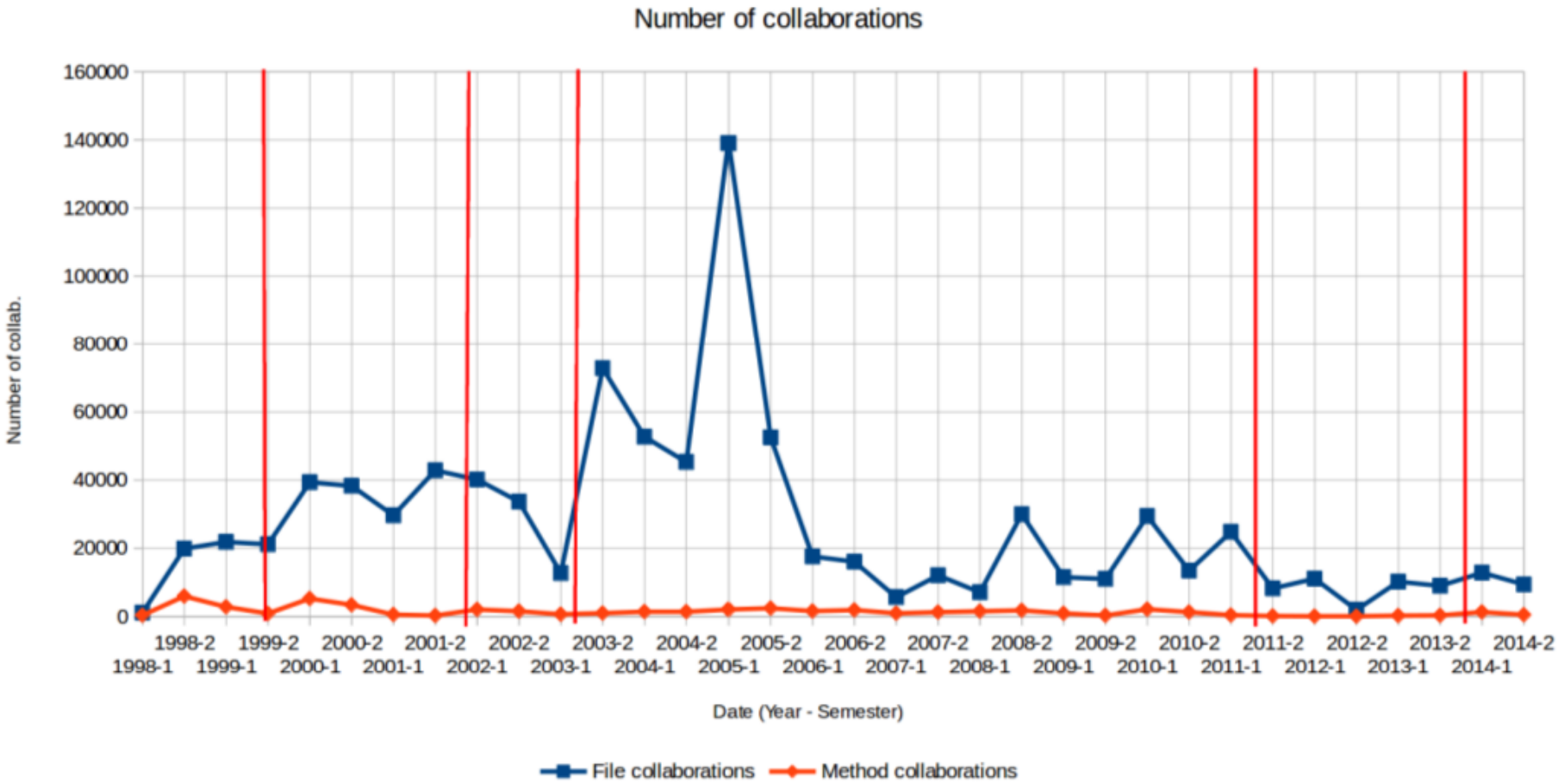


Figure : In-file (left) and In-method (right) collaboration network graphs

Numeric results: Number of developers



Numeric results: Number of collaborations



Future work

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- 2
- 3

Citation

An example of the `\cite` command to cite within the presentation:

This statement requires citation [Smith, 2012].

References

John Smith (2012)

Title of the publication

Journal Name 12(3), 45 – 678.

Any questions?

Thanks for your attention!