# 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.

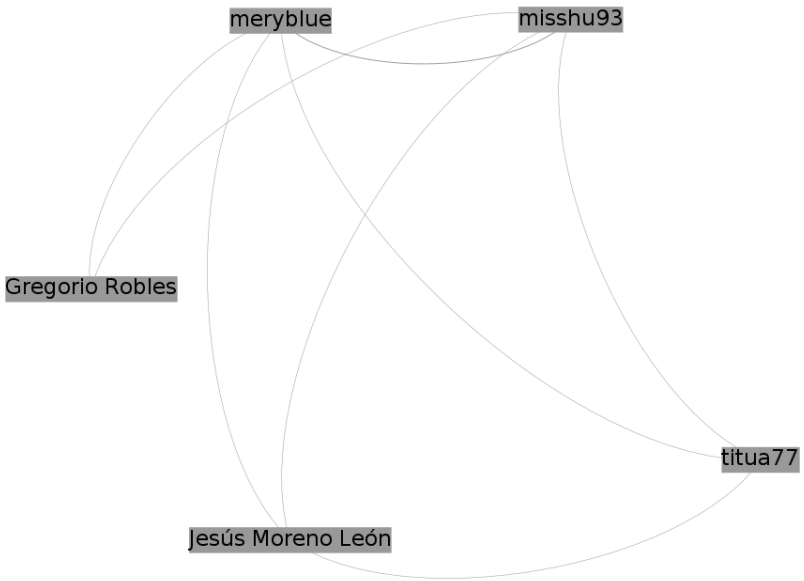



Figure : Collaboration network graph from DrScratch project (LibreSoft, Rey Juan Carlos University) - 1st semester, 2015

# 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

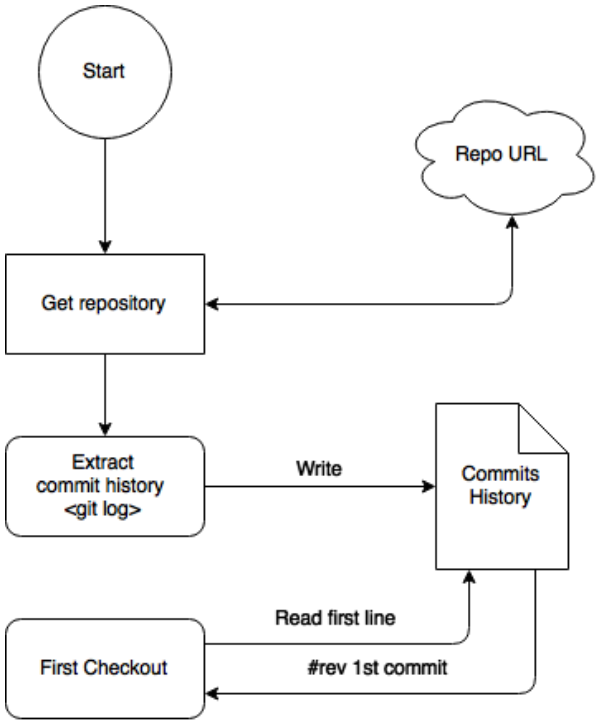



Figure : Phase 1 of GraphDataCreator

# Detailed algorithm II

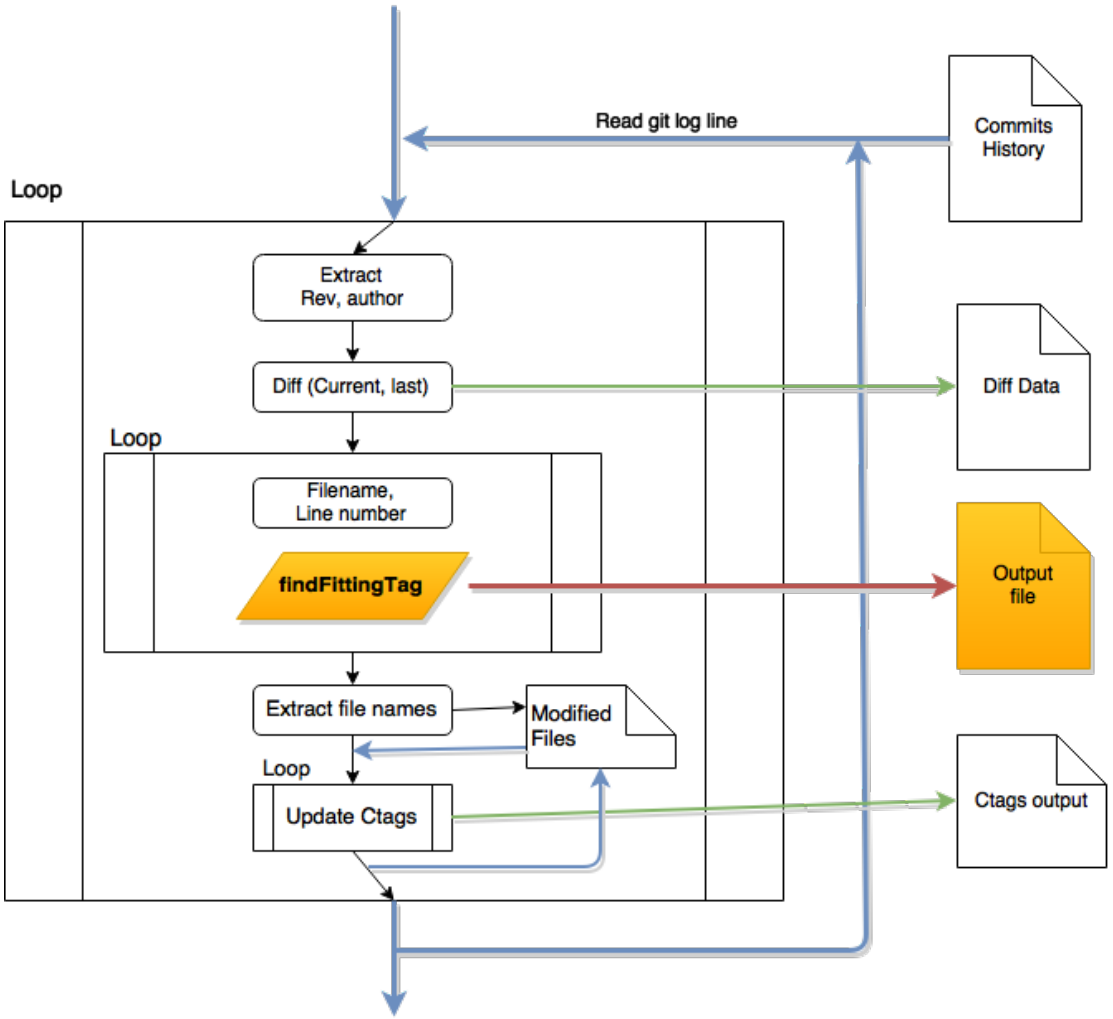



Figure : Phase 2 of GraphDataCreator

# Detailed algorithm: findFittingTag

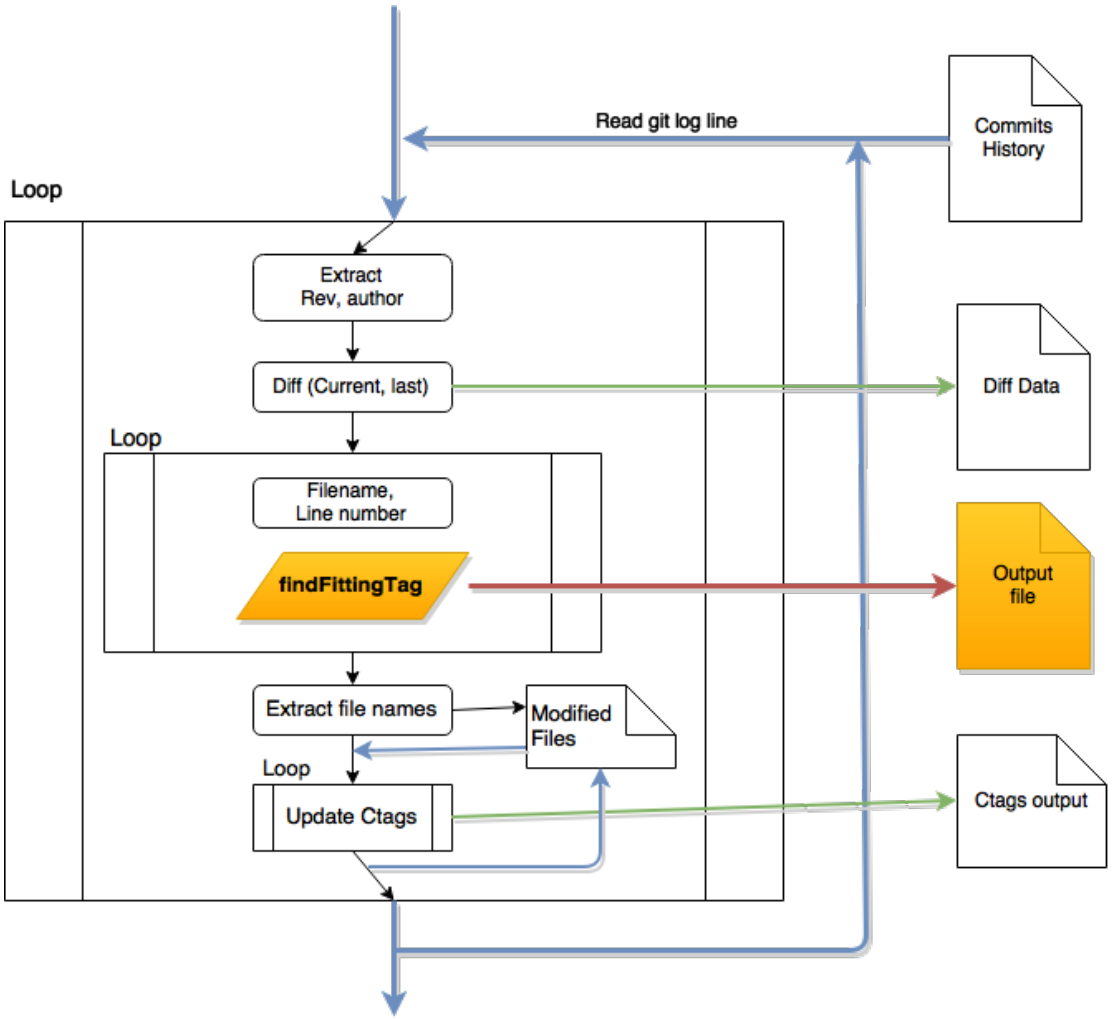



Figure : Method 'findFittingTag' of GraphDataCreator

# Detailed algorithm III

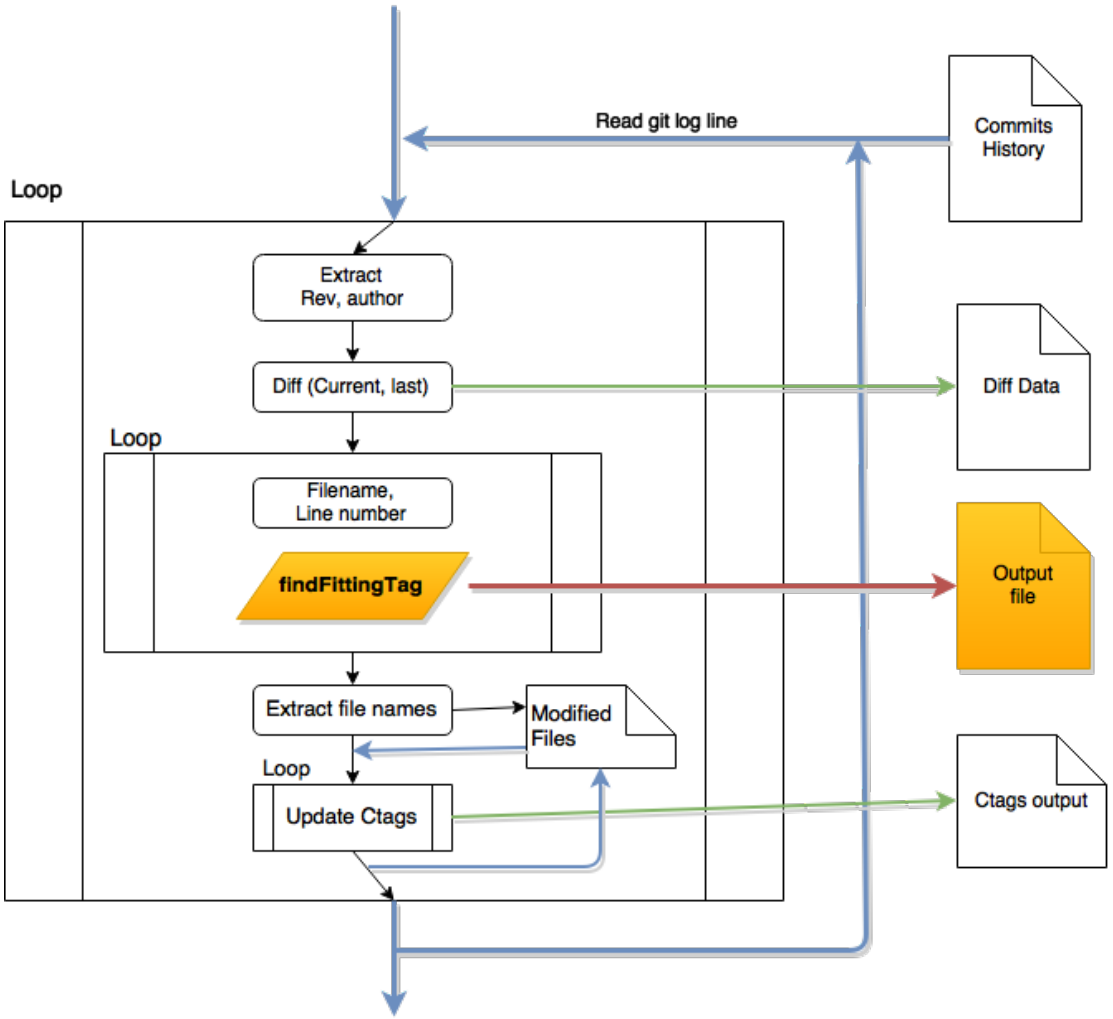



Figure : Phase 3 of GraphDataCreator

# 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. * Data extracted from GitHub repository: https://github.com/GNOME/gedit

# Summing up...

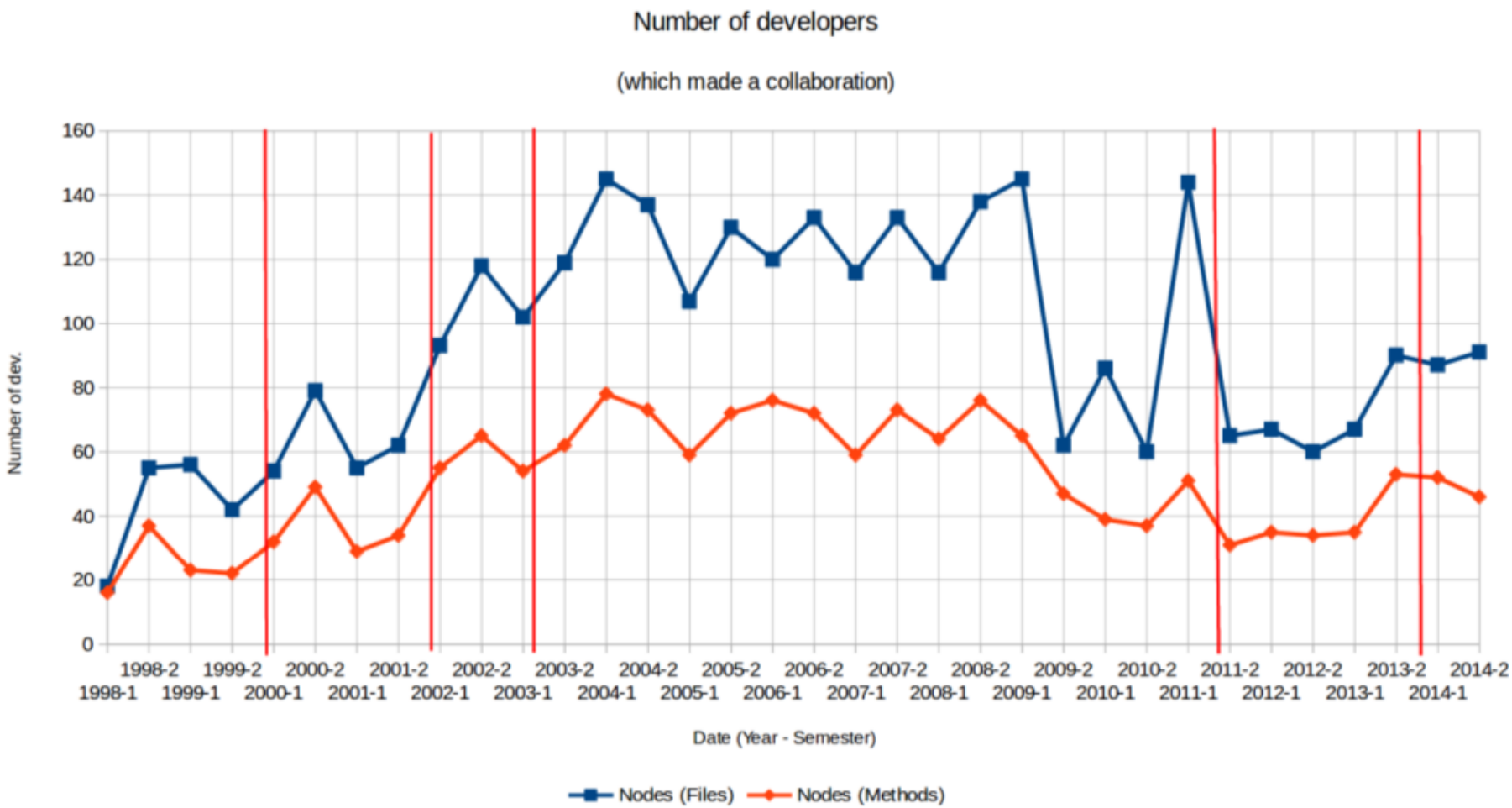
## Date range

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

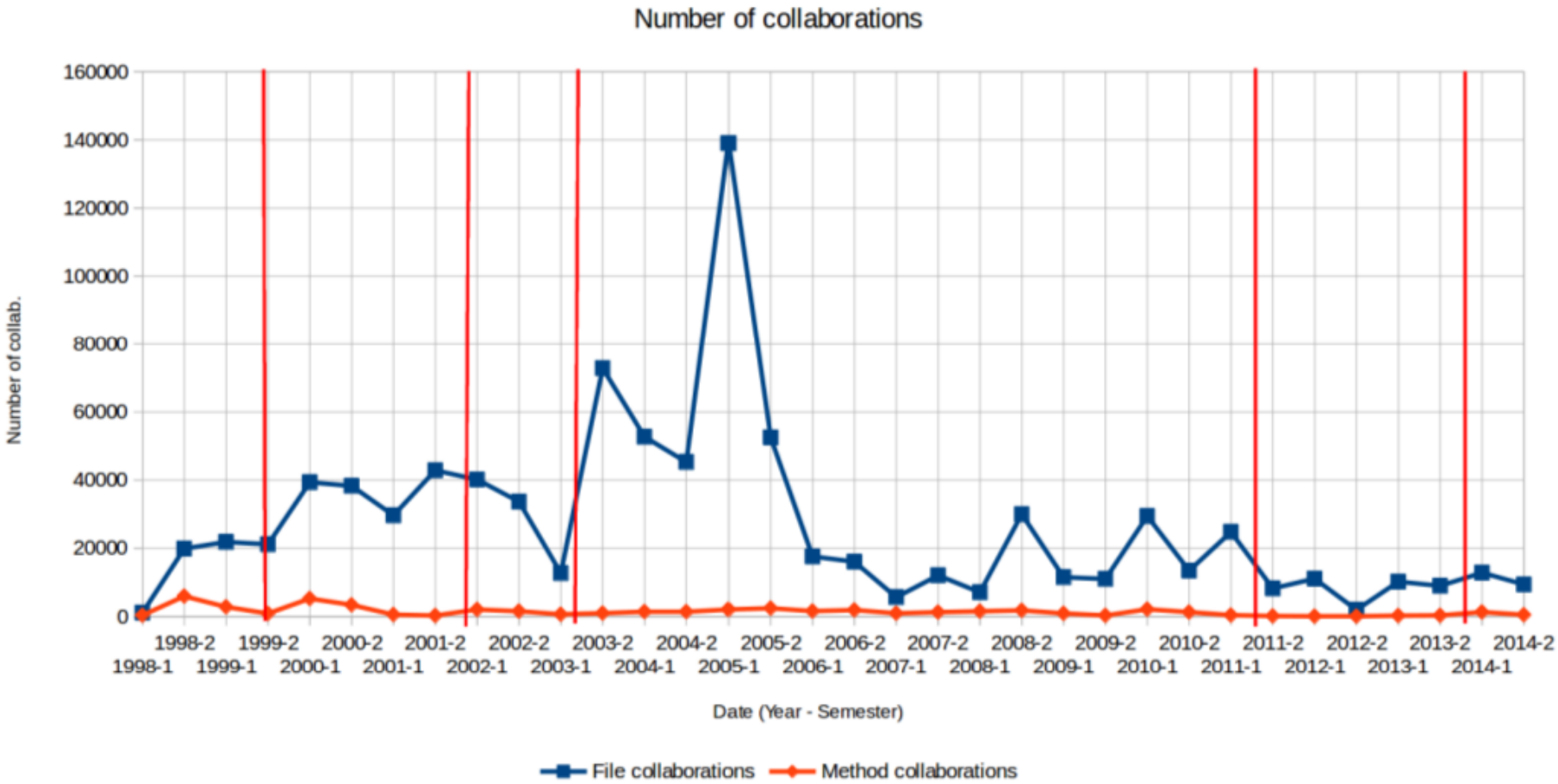
## Resulting data

- 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.

# Numeric results: Number of developers



# Numeric results: Number of developers



# Multiple Columns

**Heading**

1. Statement
2. Explanation
3. Example

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# Table

| Treatments | Response 1 | Response 2 |
|---|---|---|
| Treatment 1 | 0.0003262 | 0.562 |
| Treatment 2 | 0.0015681 | 0.910 |
| Treatment 3 | 0.0009271 | 0.296 |

Table : Table caption

# Theorem

## Theorem (Mass–energy equivalence)

$E = mc^2$

# Verbatim

## Example (Theorem Slide Code)

```
\begin{frame}
\frametitle{Theorem}
\begin{theorem}[Mass--energy equivalence]
$E = mc^2$
\end{theorem}
\end{frame}
```

# Figure

Uncomment the code on this slide to include your own image from the same directory as the template .TeX file.

# 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.

# Titulo

- Punto 1
- Punto 2
- Punto 3

# The End