

## Context

- **Context:** Rationale-aware documentation is key for project sustainability [Burge et al.'08]
- **Problem:** Lack of automated tools to assess commit messages quality
- **Contribution:** A tool that extracts and analyses decision and rationale sentences in a commit message and in the commits of any open-source Github project

## Previous work

- **Rationale Dataset [ICPC'24]**
  - **Out-Of-Memory Killer** component
  - 180 commit messages
  - Sentence-based labelling
  - Labels: *Decision*, *Rationale*, *Supporting Facts*
- **Rationale Analysis [ICPC'24]**
  - *Presence* of rationale
  - *Factors* impacting rationale
  - *Evolution* of rationale over time
  - *Structure* of commit messages
- **Rationale Extractors [FSE'25]**
  - **Two** binary BiLSTM classifiers
  - *Decision-sentences* classifier
  - *Rationale-sentences* classifier
  - Trained on the OOM-Killer dataset [ICPC'24]
  - Validated on:
    - Two other Linux modules
    - Five open-source projects

## CoMRAT: Module Analyzer

### The mm/slob.c module

message_preprocessed	author name	commit date	Decision	Rationale
mm/slob: remove slob.c	Vlastimil Babka	2023-02-28	1	1
Remove the SLOB implementation	Vlastimil Babka	2023-02-28	1	1

Number of commits: 146

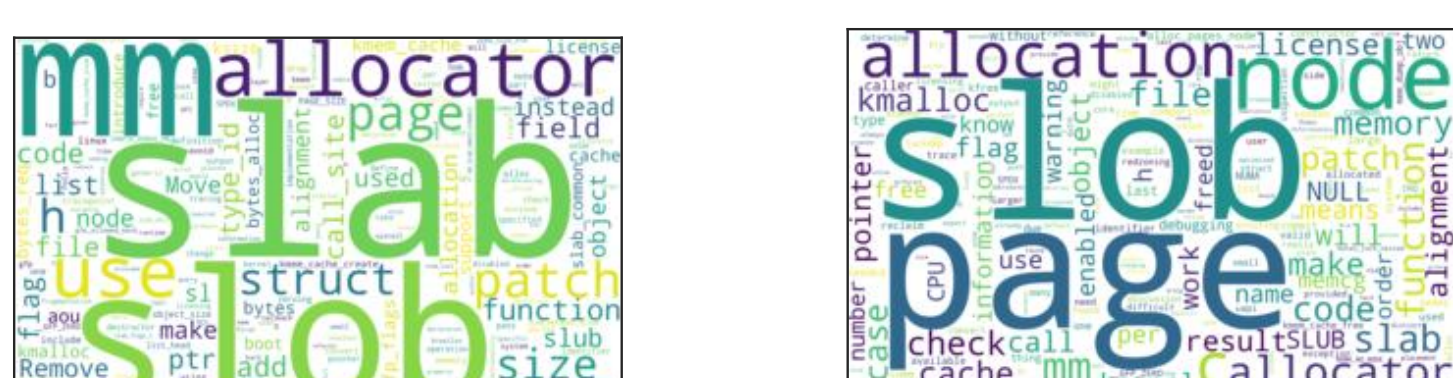
Number of sentences: 833

Decision only sentences: 233

Rationale only sentences: 162

Decision & Rationale sentences: 252

No Decision and No Rationale sentences: 186



Rationale Presence

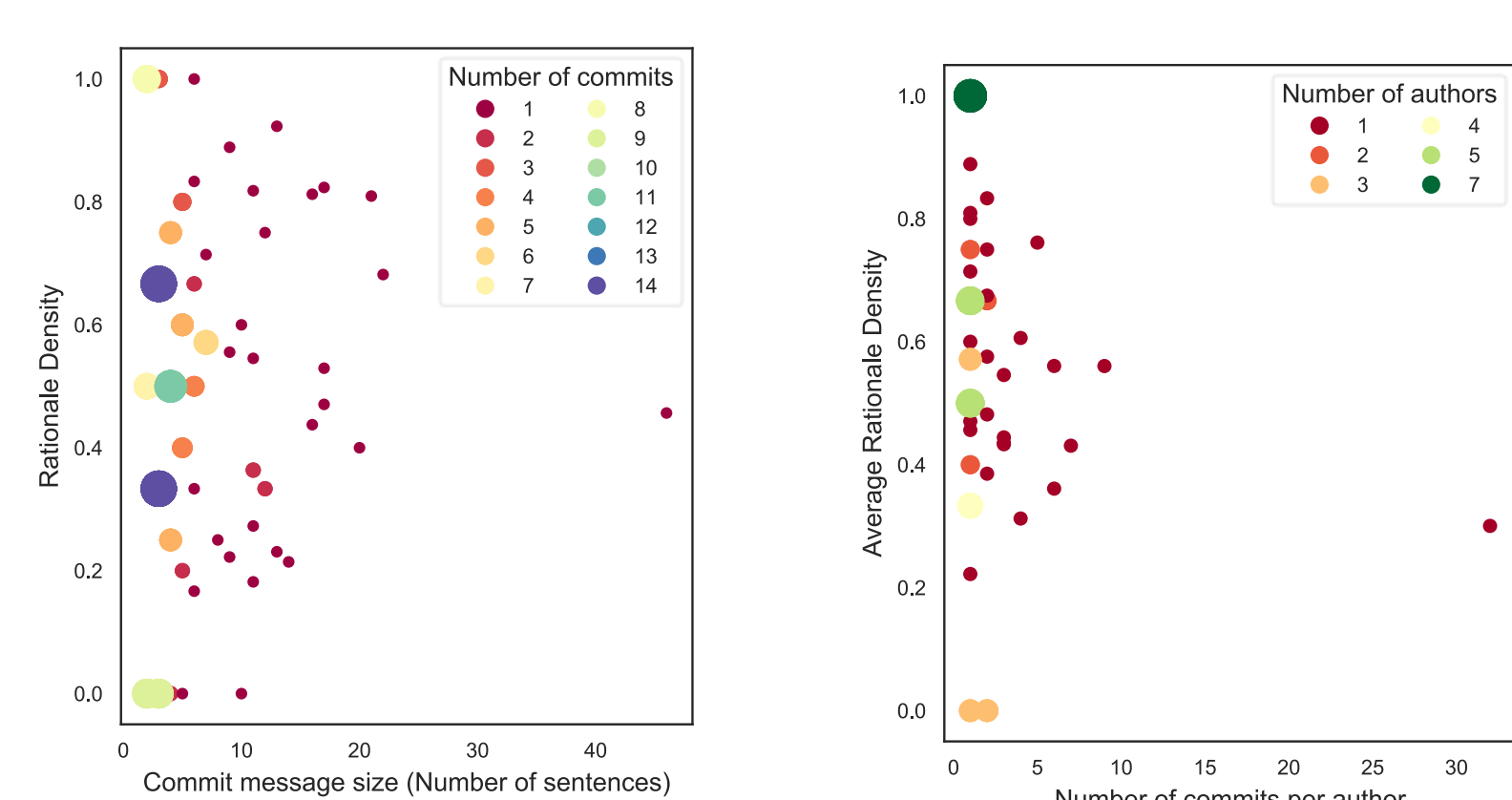
Total Number of commits: 146

Number of commits containing rationale: 124

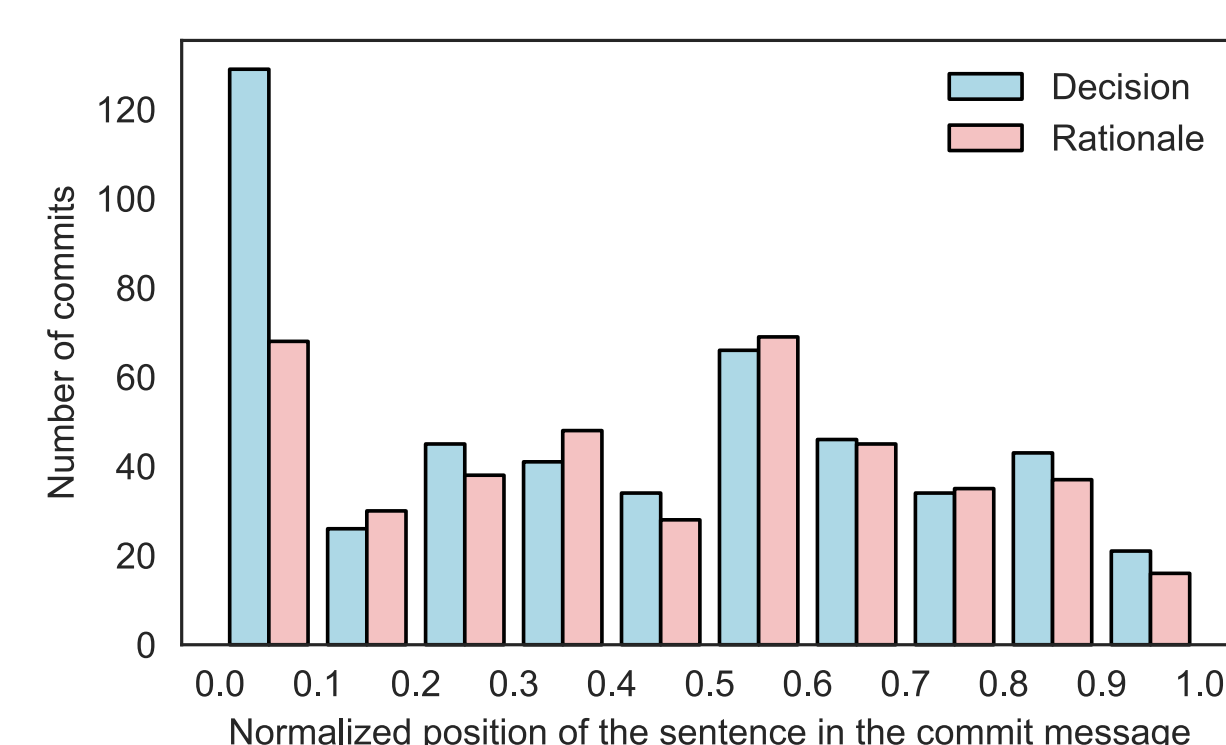
Rationale Percentage: 84.93%

Average Rationale Density: 0.56

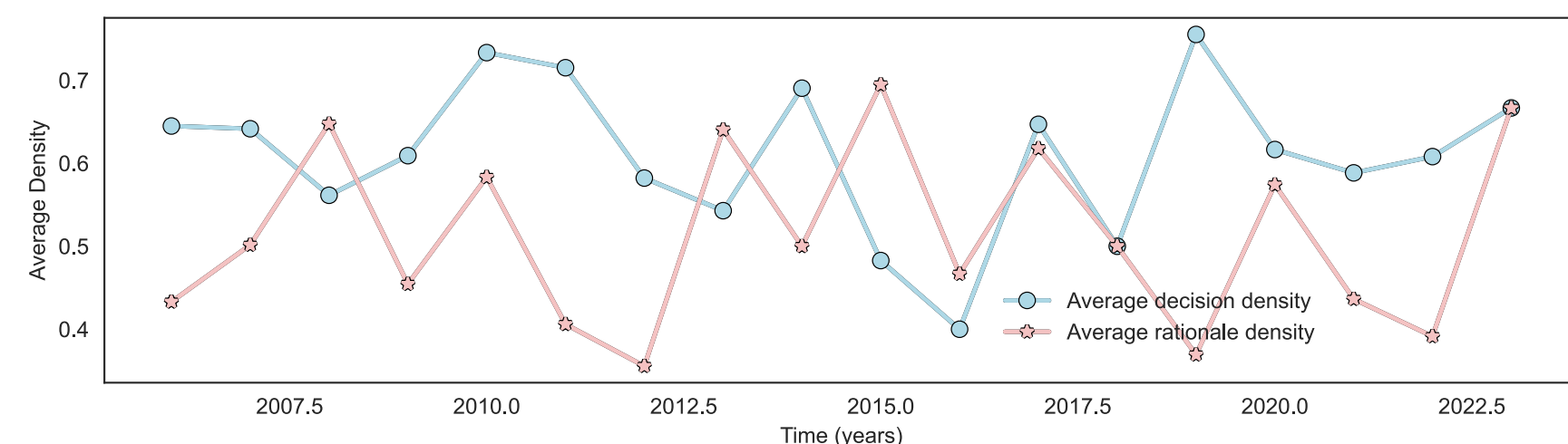
Rationale Factors



Commit Message Structure



Rationale Evolution



## CoMRAT: Commit Message Analyzer

- **Input:**
  - A commit message
- **Output:**
  1. Labelled sentences as *Decision* or *Rationale*
  2. Commit message *rationale density* and *decision density*
  3. A warning or a success message

## Potential Uses

- **Module Analyzer**
  - Create datasets of commits with rationale
  - Support future research about developers' rationale
  - Analyses results could be used as guidelines
- **Commit Message Analyzer**
  - Evaluate commit messages' quality
  - Enforce rationale-aware documentation

## Preliminary Evaluation

- **Module Analyzer**
  - Expert Software Engineering researcher evaluation
  - Measure of execution time for five modules
- **Commit Message Analyzer**
  - Preliminary user study
  - A labelling task and a post-study questionnaire
  - Five graduate students with 2+years of Git development

CoMRAT is both *useful* and *usable* for *researchers* and *developers*

## Technical Details

- Web application
- Python 3.11 and *streamlit* library
- Temporarily hosted on: <https://rationale-analyses-tool.streamlit.app/>

## Take Our Survey !

### A large-scale survey:

- **About:** Rationale in Commit Messages
- **Target group:** Software developers and project maintainers
- **Duration:** 10 minute



## Contact

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\*M. Dhaouadi, B. J. Oakes, and M. Famelis, "CoMRAT: Commit Message Rationale Analysis Tool" in the IEEE/ACM 22nd International Conference on Mining Software Repositories (MSR), 2025.

## References

1. [Burge et al.'08] J. E. Burge, J. M. Carroll, R. McCall, and I. Mistrik, Rationale-based software engineering. Springer, 2008.
2. [ICPC'24] M. Dhaouadi, B. J. Oakes, and M. Famelis, "Rationale Dataset and Analysis for the Commit Messages of the Linux Kernel Out-of-Memory Killer" in Proceedings of the 32nd IEEE/ACM International Conference on Program Comprehension, 2024, pp. 415-425
3. [FSE'25] M. Dhaouadi, B. J. Oakes, and M. Famelis, "Automated Extraction and Analysis of Developer's Rationale in Open Source Software" To appear in the Proceedings of the ACM on Software Engineering (PACMSE), 2025.