Emotion Impacts in Coding Efficiency

JIAMING XU, 1007698831, Group 8, ECE, University of Toronto, Canada
TENG YUE, 1007826792, Group 8, ECE, University of Toronto, Canada
WENRUI XU, 1008313228, Group 8, ECE, University of Toronto, Canada

This report mainly discussed the impact of different emotions may have on coding efficiency. We use both quantitative and qualitative analysis to find the results. For the quantitative analysis, we investigate the open-source repositories, mine the emotion hidden inside the commit messages and find the relationship between emotion and coding efficiency. For the qualitative analysis, we make some interviews with software engineers from big companies, research teams and open-source community.

Additional Key Words and Phrases: emotion mining, coding efficiency

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1 INTRODUCTION

Briefly introduce the research topic, including the background information, the motivation and contribution of our research.

2 LITERATURE REVIEW

Detailed information of definition of emotions, categorization and emotional mining.
Major references are:[4],[3],[8],[10],[7],[9],[1],[6],[2],[5].

2.1 Definition & Categories of Emotions

The definition and features of emotions from a psychological aspect. Using a consistent categorization standard to analyze the emotions. Explain the categories and the words which belongs to these emotions. In this part, we will discuss definition from wikipedia[8], the Ekman emotion framework[3].

2.2 Emotion and productivity

In this part we will discuss how does emotion affect productivity. The papers are [5],[2],[6],[1],[7]

2.3 Emotional Mining

Introduce the emotional mining methods used in github.The papers discussed in this part is [9],[10],[4].

Authors' addresses: Jiaming Xu, jm.xu@mail.utoronto.ca, 1007698831, Group 8, ECE, University of Toronto, Toronto, Ontario, Canada, M5B 0A5; Teng Yue, larst@affiliation.org, 1007826792, Group 8, ECE, University of Toronto, Toronto, Ontario, Canada, M5B 0A5; Wenrui Xu, larst@affiliation.org, 1008313228, Group 8, ECE, University of Toronto, Toronto, Ontario, Canada, M5B 0A5.

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3 RESEARCH QUESTIONS

- How do we define and categorize emotions?
- How do we know engineers' emotions from their codes?
- How do we measure the efficiency of coding?
- Does the emotion change have impact on the efficiency of coding?
- What effect will the emotion change cause on coding efficiency?

4 METHODOLOGY

We will collect our data in both qualitative and quantitative ways.

4.1 Quatitative Methods

We will use the emotional mining methods to mine the emotions in the selected repositories which are easy to analyze. Then we will calculate the coding efficiency of each mined commit messages accordingly.

4.2 Qualitative Methods

We designed an interview to make qualitative study on different groups of software engineers, including researchers in Universities, software engineers in large companies and open-source developers.

5 RESULTS

This part will show the results of both quantitative and qualitative research methods.

5.1 Quatitative Results

This part will show the results of emotional mining.

5.2 Qualitative Results

This part will show the results of interviews.

6 DISCUSSION

We will analyze the results of the study to show the relationship between different emotions and coding efficiency in both qualitative and quantitative ways.

7 CONCLUSION

Conclude the paper by summarizing the findings of the research questions and our contributions. Then consider the future works to improve our researches.

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A CRITIQUES AND SOLUTIONS

Critique: "one concern that comes to my mind is that developers are often required to write commit messages in a certain format, which may not be able to convey emotions. For example, some short messages like '[merge] merge from main branch' are neural and could be difficult to analyze. How would you cleanse the dataset while remaining unbiased is a challenge. Overall, the proposal was well structured and the research methods make sense to me. "

Solution: We make a new design to select some open-source github repositories which contains relatively more valid data. And we will pick some of them which are easy to analyze their emotions hidden inside, and abandon the others. We will reduce the bias by calculating the efficiency with the time between the selected commit log and its previous log. So we think this does not add much bias to our results.

Critique: "Suggestions: - Your research topic is really interesting! Lots of great work is being done around the emotions of engineers/designers/developers. If you need some inspiration for how to analyze and process data related to emotions, here is a paper that investigates the emotions during mechanical design, that I think could be relevant: https://doi.org/10.1115/1.4047685 - At times, the writing is vague or unclear. It may be more impactful for the statements/claims you make if you use examples and provide sources. - Try to reconsider using lines of code as your measure of working efficiency, considering it was used quite a few times in class as an example of a flawed metric. - Try to add more to your motivation for the next deliverables and really prove that what you are studying is important and impactful! "

Solution: We read the paper and try to improve our writing by adding more examples. We think you made a good point about the measurement, we are considering using the coding value metrics as a backup option. And we will use some more examples to prove our study's significance.

Critique: "It is worth noting that generally speaking, the wording of the common commit logs is usually quite neutral. How to analyze the emotions of the programmers based on these commit messages accurately deserves further refinement. "

Solution: We refined our mining methods and try to mine the emotions from the commit messages using Regular Expression. We will pick the messages which contains the words expressing their feelings.

Critique: "I only have one concern that the fourth research question, 'Does the emotion change have impact on the efficiency of coding?' is a close-end question, maybe some further supplement to find some exact relationship or modifying it to be a 'what' question would be better? And I would suggest that combining qualitatively analyzing the coding efficiency via something like self-report of developers may also provide some help."

Solution: We added a new RQ to ask 'What impact the emotion change will have on the efficiency of coding?'. And we have changed part of our plans to include an interview of engineers/open-source developers.

Critique: "First, the use of interviews may generate biases, such as people who are willing to be interviewed tend to show a more positive mood when they are chosen and tracked, etc. Also, you intend to analyze the programmer's commit messages to analyze the mood, but in reality, in many cases, the commit messages are

probably just a very concise but objective description of the content of this code commit, not mixed with subjective emotions, so I think more considerations are needed to choose the quantitative analysis object. ”

Solution: We carefully select the interviewees instead of just recruit them with a reward. The interviewees are selected by us, not recruited with an advertisement. And we select them considering different factors including working experience, ages, job positions, etc. So I don't think there exist such problems. As to the second point, we have mentioned it before.

Critique: ”Probably need more literature reviews on previous studies for comparison”

Solution: We read more papers and references to add more literature reviews.

Critique: ”Firstly, the research questions are specific, but the first three questions seem more about the background information instead of the analysis result of collected data. If it is possible to add more questions about the connection between emotion and code efficiency, like will engineers (students) try to switch their emotions when they try to promote efficiency? Is that useful? Do engineers realize which emotion is most optimal for their code efficiency? etc. Secondly, for the interview part, whether keeping a record of mood and code efficiency at the beginning of working will have an impact on their work efficiency? Since they may be more productive if they record their progress.”

Solution: For the first problem, we think emotion is mostly an unconscious psychological activity, so most of time, people will not try to change it consciously. So we add some questions in our interview about the emotion changes and the coding efficiency changes to solve this problem. For the second point, we revised our interview methods. We will not record their performance any more for two reasons: First, the time of research is too short to complete some projects. So it's meaningless to record their coding efficiency in a month. Second, as you said, if recorded, they will realize that they are monitored and increase their working efficiency unconsciously. So we just use an interview to ask them recall their emotion change, working efficiency and evaluation during the project.

Critique: ”For the research questions, I think most of them are description questions, while other types of questions are relatively few. I suggest that more frequency and descriptive-process questions can be supplemented to the research questions. ”

Solution: We revised the RQ to add more descriptive-process questions. It's a very good point.

B TODOS FOR THE NEXT 2 WEEKS

Here is our plan of work for the next 2 weeks.

- Keep interviewing more software engineers, including open-source coders, junior/senior engineers, PhD. students and researchers.
- Get to know more about the emotion mining from the commit messages, and get the valid commit logs as the raw data.
- Select some appropriate open-source repositories which are easy to analyze as the study case.
- Record and translate the interview into English version to analyze the cases.