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HUOM! TÄMÄ ON RINNAKKAISTALLENNE

Rinnakkaistallennettu versio voi erota alkuperäisestä julkaistusta sivunumeroiltaan ja ilmeeltään.

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An online tool for analyzing written student feedback

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ABSTRACT

Collecting student feedback is commonplace in universities. Feedback surveys usually have both open-ended questions and Likert-type questions, but the answers to open questions tend not to be analysed further than simply reading them. This paper presents a tool for analyzing written student feedback using topic modeling and emotion analysis. We demonstrate the utility of this tool using course survey responses from a software engineering (SE) programme.

CCS CONCEPTS

• **Applied computing** → Learning management systems; E-learning.

KEYWORDS

text mining, structural topic model, emotion analysis, student evaluation of teaching

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1 INTRODUCTION

In universities, the most common way to evaluate the quality of teaching is to analyze feedback collected from the students [5]. However, there is evidence that it is not utilized effectively [6]. Open-ended questions are often left unused, as they require human interpretation. As course participant counts rise, analyzing open feedback becomes even more infeasible.

There exists a significant amount of studies related to the utilization of open-ended feedback data in teaching, quality control, and curriculum evaluation. Extracting suggestions from student's evaluation of teaching using text mining techniques [3], and demonstrations of different techniques have been shown to work with evaluation of teaching data, like sentiment analysis [1, 2, 5, 7, 8], and key phrase extraction [9]. These studies demonstrate the possibilities and usefulness of analyzing open student feedback. However, we are not aware of tools that are designed for feedback text analysis in the educational context.

2 A TOOL FOR ANALYZING WRITTEN FEEDBACK DATA

In this study, a tool was created (Palaute - plot, analyze, learn, and understand topic emotions. *Palaute* is also Finnish for feedback) to better address the demand for written student feedback analysis. The goal was to create a tool that would improve the workflow of addressing student feedback by summarizing and generating insights from the data. The additional benefit of using Palaute is that it allows much larger data sets than is easily feasible with manual coding. This means that multiple data sets from different years from the same course can be combined and analysed easily, as well as, program-wide analyses can be conducted, or analyses of large MOOCs. Combining the written feedback from all of the courses of a study program should give new and interesting insights into the health of the program.

The source code of Palaute is licensed as GNU general public license v3.0 (GPLv3) and can be found at [4]. The tool is built with the R programming language, using the Shiny package for building web applications. Palaute can be run on any web server, and a Docker file can also be downloaded to deploy the tool with minimal setup.

3 DISCUSSION AND CONCLUSIONS

We evaluated the Palaute tool using a data set of open answers to course evaluation surveys in a software engineering programme. The data set consisted of feedback from 36 course modules with a total of 742 individual responses. We used the feedback data from all courses in a CS programme to demonstrate the tool's utility at a university or study programme level, but the tool could also analyze data from MOOCs or other big courses.

The tool can be used to produce an LDA topic modelling analysis (using R STM package) and a text sentiment analysis (using the R syuzhet package). The results of the sentiment analysis can be used

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Table 1: Labelled topics

Topic	Topic proportion	Label
1	6%	Some courses have unnecessary exams
2	11%	Low motivation due to heavy workload
3	11%	Course topics are thought as interesting
4	6%	Timing and schedule issues
5	6%	Problems with automatic code checker
6	10%	Exercises were too difficult
7	8%	Positive suggestions for improving the courses
8	10%	Lack of time and hurry
9	6%	Students having communication issues with the teachers
10	11%	Good teaching methods and other praise
11	9%	Other comments
12	6%	User interface course and its problems

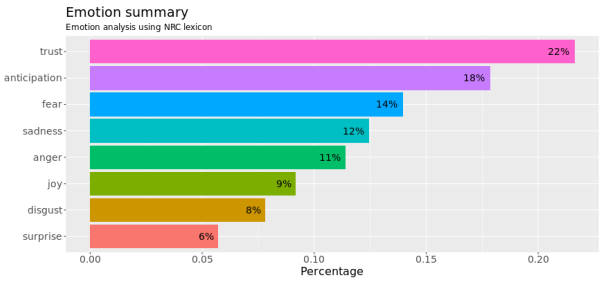

Figure 1: Emotion analysis summary

as is, as depicted in Figure 1. Results of the topic modeling require some human interpretation, as the topics are presented by their keywords and most central texts in the dataset. Table 1 presents the topics uncovered from our dataset, with the authors' interpretation of the topics' contents (based on an informal investigation into the topic modeling results). Additionally, the keywords, sentiment prevalence, and emotion analysis for each topic can be examined, as shown in Figure 2.

Using the tool we can see that the comments highlight multiple issues the students are currently facing. Overall, the feedback is pretty negative with most of the negative comments regarding the heavy workload, the automatic code checker, and individual pain points. The negative comments center around specific courses, while positive comments are more ambiguous about the courses they target. Positive feedback shows that there are students that enjoy the SE courses and think they are interesting and well put together.

In our demonstration, the tool yielded interesting points for deeper investigation and improvement of the curriculum. We find these insights valuable, as they could not previously have been distinguished using only numeric scales in feedback questionnaires.

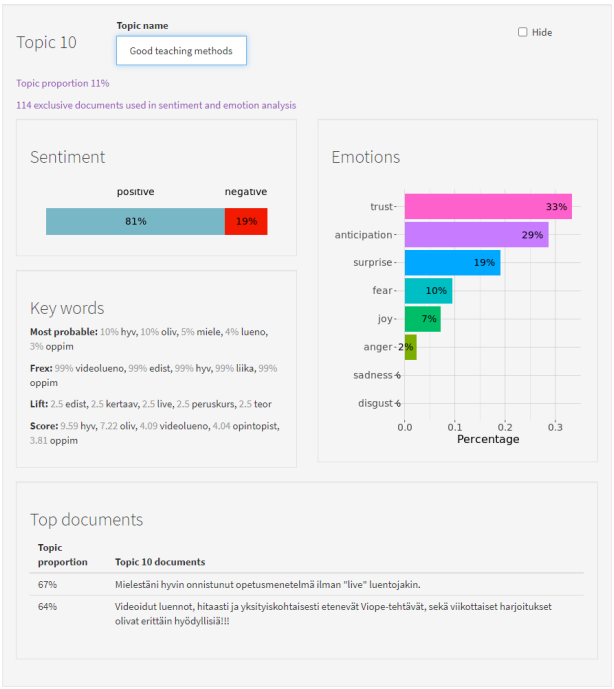

Figure 2: Details of one topic uncovered in the LDA analysis

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