



Review report of a final thesis

Student: Vladimir Ananyev
Reviewer: Ing. Tomáš Šabata
Thesis title: Approximation Algorithms for Clustering
Branch of the study: Computer Science

Date: 26. 1. 2019

<i>Evaluation criterion:</i>	<i>The evaluation scale: 1 to 4.</i>
1. Fulfilment of the assignment	<i>1 = assignment fulfilled, 2 = assignment fulfilled with minor objections, 3 = assignment fulfilled with major objections, 4 = assignment not fulfilled</i>
<i>Criteria description:</i> Assess whether the submitted FT defines the objectives sufficiently and in line with the assignment; whether the objectives are formulated correctly and fulfilled sufficiently. In the comment, specify the points of the assignment that have not been met, assess the severity, impact, and, if appropriate, also the cause of the deficiencies. If the assignment differs substantially from the standards for the FT or if the student has developed the FT beyond the assignment, describe the way it got reflected on the quality of the assignment's fulfilment and the way it affected your final evaluation.	
<i>Comments:</i> The student has completed all goals of the thesis. He described two methods approximating linkages and implemented one of them. He compared the chosen method with efficient implementation of the exact single linkage in terms of time complexity and clustering quality.	
<i>Evaluation criterion:</i>	<i>The evaluation scale: 0 to 100 points (grade A to F).</i>
2. Main written part	<i>75 (C)</i>
<i>Criteria description:</i> Evaluate whether the extent of the FT is adequate to its content and scope: are all the parts of the FT contentful and necessary? Next, consider whether the submitted FT is actually correct – are there factual errors or inaccuracies? Evaluate the logical structure of the FT, the thematic flow between chapters and whether the text is comprehensible to the reader. Assess whether the formal notations in the FT are used correctly. Assess the typographic and language aspects of the FT, follow the Dean's Directive No. 26/2017, Art. 3. Evaluate whether the relevant sources are properly used, quoted and cited. Verify that all quotes are properly distinguished from the results achieved in the FT, thus, that the citation ethics has not been violated and that the citations are complete and in accordance with citation practices and standards. Finally, evaluate whether the software and other copyrighted works have been used in accordance with their license terms.	
<i>Comments:</i> The introduction is very brief and order of chapters mentioned in the end is in the wrong order which confuses the reader. The thesis contains several statements which do not bring any value without more explanation or citations. The theoretical background is described in well chosen level of detail. I especially appreciate the discussion of algorithms' time complexities. Some statements are unnecessarily introduced multiple times. Unfortunately, the chapter with experiments is not too well structured. The author created his own method for comparison of clustering quality but the description is not formally described and the motivation is unclear (E.g. Why is median used to aggregate levels instead of average?) Only one method from section 2.6 was used in the final evaluation. In the end, the conclusion about the similarity of linkages based on evaluation metrics is missing and its very hard to decide as a reader. Citations of used datasets are missing and their names are not enough to identify them properly. Next, I am missing citation of the SciPy library. The thesis is written in clear English language, which is not the native language of the author. It contains a minimal number of typing errors.	
<i>Evaluation criterion:</i>	<i>The evaluation scale: 0 to 100 points (grade A to F).</i>
3. Non-written part, attachments	<i>100 (A)</i>
<i>Criteria description:</i> Depending on the nature of the FT, comment on the non-written part of the thesis. For example: SW work – the overall quality of the program. Is the technology used (from the development to deployment) suitable and adequate? HW – functional sample. Evaluate the technology and tools used. Research and experimental work – repeatability of the experiment.	

Comments:

The author implemented discussed algorithms in language C. He claims the implementation of them is not available or it has not well usable API.

I consider the result of the thesis to have a big impact if it would be published in one of the widely used open-source libraries for ML such as scikit-learn.

Evaluation criterion:

The evaluation scale: 0 to 100 points (grade A to F).

4. Evaluation of results, publication outputs and awards

80 (B)

Criteria description:

Depending on the nature of the thesis, estimate whether the thesis results could be deployed in practice; alternatively, evaluate whether the results of the FT extend the already published/known results or whether they bring in completely new findings.

Comments:

Author has completed several experiments with chosen methods and compared them in terms of similarity and time complexity.

Unfortunately, the similarity is not well interpretable. Since the comparison method is not standard and results are not well discussed it is hard to conclude whether the author considers the approximation as satisfiable. The author claims that dendrograms are similar based on visual comparison. It is unclear to me how they were compared. Furthermore, X-axis labels in figures 4.1 and 4.2 are unreadable which makes it incomparable for a reader.

Evaluation criterion:

No evaluation scale.

5. Questions for the defence

Criteria description:

Formulate questions that the student should answer during the Presentation and defence of the FT in front of the SFE Committee (use a bullet list).

Questions:

Do you consider LSH-link as a satisfiable accurate approximation of single linkage and why? Please use the experiment results in your conclusion.

What number of hash tables (parameter l) was used for the acquisition of results in section 4.3.1. Have you tested other settings? How does it affect quality of approximation?

Evaluation criterion:

The evaluation scale: 0 to 100 points (grade A to F).

6. The overall evaluation

85 (B)

Criteria description:

Summarize which of the aspects of the FT affected your grading process the most. The overall grade does not need to be an arithmetic mean (or other value) calculated from the evaluation in the previous criteria. Generally, a well-fulfilled assignment is assessed by grade A.

Comments:

The theoretical part of the thesis is well written and structured.

Unfortunately, experiments structure is confusing and the interpretation of results is unclear and weak.

Signature of the reviewer: