

Reet Barik

MS Nonthesis Final Examination

The Examination Committee:

Ananth Kalyanaraman (Chair), Jana Doppa, Zhe Dang

Written report due by email to committee chair: 11:59pm PDT, Wednesday, November 20, 2019

Fall 2019

Instructions

You are being assigned this MS nonthesis final examination, on **Monday, November 21, 2019**. Please email your written report as a PDF document to Prof. Ananth Kalyanaraman (ananth@wsu.edu), Chair of the Examination Committee, no later than **11:59pm PDT, Wednesday, November 20, 2019**. Be sure to follow all the guidelines as described below. Direct any questions you have concerning this examination to the chair of the examination committee.

Guidelines for the Written Report

Congratulations! You are about to commence work on the written part of your Final Examination for the MS degree in Computer Science from Washington State University. As such, you need to be aware of all rules that pertain to this examination. The examination procedure is listed in the Graduate Program Policies and Procedures manual with which you should be familiar. The purpose of this document is to inform you of what is expected of you regarding the structure and content of the written component of the exam. The goal of the exam is to assess your ability to do self-directed research. *Research* includes the abilities to (a) evaluate existing work, (b) set it in the context of other work in your area, and (c) suggest novel, logical, and productive ways to extend it. A good written scientific report exhibits all of these traits. Furthermore, all written reports should observe the following guidelines:

1. Your work must be your own. You may not communicate with any other person regarding your work on this examination unless authorized by the exam Committee.
2. The Committee is expecting a document of between **10 and 15 pages, 1.5 line spacing, 12-point Times New Roman or equivalent font**. You may NOT exceed 15 pages (reference section is *not* included in this limit).
3. You are expected to cite other work, both online and printed, but in doing so:
 - (a) You should never copy the other work verbatim. This especially includes cutting and pasting online information. (Committee members know how to use search engines, too!)

- (b) Direct quotes are often useful in the arts and humanities, but are used to a more limited extent in computer science. In those instances in which you do need to quote a source directly, you must place it in double quotes (""). If it is longer than two lines, you must indent it in order set it off from the rest of your text. Note that you must cite both the source and *page number* of any direct quote.
- (c) Most of your discussion of other work should paraphrase, not quote, the part(s) of it relevant to your topic. (Space and time constraints should limit you here in any case.)
- (d) An exception to this may be made in the use of figures, i.e., diagrams and images, formulas, and tables, that cannot be easily paraphrased, but their source should always be cited in their captions and/or context. There should be no more than a few such uses in your write-up.
- (e) You must always place a citation immediately before each instance of a description of other work, e.g., According to Knuth [1], ... You don't need to do this for every sentence: If you start a paragraph this way, readers will assume that the whole paragraph applies to the cited work. On the other hand, if you discuss the same paper on 3 or 4 different pages, each page should include the citation.
- (f) The particular style of the citation is up to you. Examples include number-only ([1]), author last name and date in parentheses ((Knuth, 1968)), author-and-number (Knuth [1]), or abbreviated-author-year ([Knu68]).

As with any examination (including take-home) at WSU, you are subject to WSU Standards of Conduct for Students (a copy of which is in your Student Handbook), particularly the section on Academic Integrity. At the discretion of your exam Committee, violations of these standards may be grounds for your failing the Examination and may in addition be reported to the Graduate Studies Committee, the WSU Office of Student Conduct and lead to further action on the School, Graduate School, or University level.

EXAM QUESTION

For most parallel graph-theoretic applications, data movement has become a primary bottleneck toward achieving scale in computing. One of the primary contributors to data movement is how the graph is stored or represented in memory. To this end, various vertex ordering schemes have been studied in the past. There are generally two schools of approaches here — conduct a heavy-weight preprocessing step to reorder vertices with a goal to subsequently reduce or optimize data movement during the processing of the graph; or alternatively, perform a lighter weight reordering depending on the end-application characteristics.

Cited below are two recently published papers that relate to these two schools of approaches - [1] and [2].

Your task for this exam is to read both these papers, critically evaluate both papers, contrast and compare them (including any similarities and differences in their approaches and any tradeoffs), and present your own views and ideas (if any) on the problem.

The papers necessary to answer this exam are attached. If you are unable to locate any other paper that you deem necessary in any of the WSU libraries or online, please contact the Chair of the exam committee. You are advised to search for papers in Google Scholar prior to approaching the chair for assistance. Good luck!

References

- [1] H. Wei, J. X. Yu, C. Lu, and X. Lin. Speedup graph processing by graph ordering. *In Proceedings of the 2016 International Conference on Management of Data*, pp. 1813-1828. ACM, 2016.
- [2] V. Balaji, B. Lucia. When is Graph Reordering an Optimization? Studying the Effect of Lightweight Graph Reordering Across Applications and Input Graphs. *In 2018 IEEE International Symposium on Workload Characterization (IISWC)*, pp. 203-214. IEEE, 2018.