

1 Homework J

- **Due: Tuesday, October 6, 2:45 PM**¹ ~~Friday, October 2, 2:45 PM~~
- Please refer to the [syllabus](#) for homework policies.
- If you explicitly do not want your submission to be considered as a solution key, please state so clearly at the top of your submission.
- If you put your solutions for different problems on different pages (e.g., with the `\clearpage` command) that would be appreciated.

Problems

1. In class, we introduced the buy-at-bulk network design problem, and briefly sketched how randomized tree metrics can lead to a good approximation algorithm for this otherwise extremely difficult problem.

Give the full details of the algorithm and analysis of this approach to approximating the buy-at-bulk network design problem. This should require more care than simply saying “use tree metrics”. Among other things, it should be clear what your algorithm does concretely with the input graph, and ultimately how it explicitly builds a solution. There should also be an analysis proving that the approximation ratio is $O(\log n)$. You can use the randomized tree metric algorithm as a black box, but keep in mind that the input – a metric – and the output – a hierarchical tree metric (and maybe a log about how it was built) – do not match the format of the input and output of the buy-at-bulk network design problem.

¹I forgot to upload this assignment to the website, so I pushed back the due date.