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# Data Structure Final Project Report

**A. How I Implement my code**

In this final project, we're asked to implement two things. The first one is finding the coreness for each vertex and the second one is finding the largest possible clique.

A k-core of a graph G is a maximal connected subgraph of G in which all vertices have degree of at least k. First we compute the degrees of vertices. Then we order the set of vertices V in increasing order of their degrees. For each vertices in the order, we store the core of that vertex as the degree of that vertex, then for each of the neighbours of that vertex, if the degree of any of the neighbours is bigger than that vertex, then the degree of that vertex is subtracted by 1, then we reorder the vertices accordingly.

A clique is a subset of a graph G, whose induced subgraph is a complete graph. For a graph to be complete, then each of the vertex in that graph should be adjacent to all other vertices in the graph. Simply saying, each of the vertex must connect to all other vertices in the graph. With this, therefore the coreness of all of the vertices in a clique must be the total number of vertices in that clique minus 1. Therefore, the way I implement in finding the largest possible clique is from the coreness table from the k-core function. I look through all of the vertices and find the largest possible coreness in that coreness table. This is because I'm going to find the largest possible clique. After getting that largest possible coreness value, I re iterated again from the beginning to find all of the vertices that has that coreness value. Then I calculated how many vertices that has that coreness value. If the total number of vertices having that coreness value is coreness value + 1, this means that those vertices form complete graph with the biggest possible coreness value. If the total number doesn't reach that amount, then we repeat the above steps by finding the vertices with the coreness of previous coreness decreased by 1.

**B. Challenge I encounter in this project**

For me, this project is not easy at all. I encountered several difficulties when making this project.

One of the difficulties is finding the correct reference for my ideas. There are lots of sources from the internet, and choosing the correct one as a reference is not so easy. Even if I've found one, understanding the material, especially if it's a research paper, is not easy at all. A lot of complicated terms and ideas that's being introduced in the paper that is not really taught during the class.

Another difficulty is also dealing with the interrupt signal and the makefile. Although Tas already gave the powerpoint, it's kind of hard for me to follow the slides as I'm new to this idea of makefile. But after asking the TA via email, I can finally deal with it.

**C. Reference that give me idea**

K-CORE : http://vlado.fmf.uni-lj.si/pub/networks/doc/cores/cores.pdf
CLIQUE : https://iq.opengenus.org/algorithm-to-find-cliques-of-a-given-size-k/