Algorithms for NFT Transaction Data Analytics (Graph of buyer ID’s connected by NFT transactions)

1. Data collection: download daily first 120 blocks of NFT transactions data (in CSV format, primarily on ERC721) for three months (07-01-2022 to 09-30-2022) from <https://etherscan.io/exportData?type=nfttracker-trade>.

The full information can be viewed at https://etherscan.io/nfttracker.

Notice that the data download is limited by Etherscan and we will be studying within the limit of downloadable data.

1. Five queries will be assigned to each team so two people can pair to work on a query. In case there are 9 people in your team, discuss with Dr. Park the scope of a query on which only one person to be assigned.
2. Write a program with a composite of algorithms to fulfill each of the following five queries. Then, evaluate its asymptotic run time and the average of 100 actual run times.
3. A directed acyclic graph of buyer ID’s as vertices is to be built. A directed edge from a buyer *i* to another buyer *j* is to be established if there was a transaction to trigger a change of the ownership of the NFT from *i* to *j* at the price of the NFT to be assigned as a weight to the edge. Each buyer vertex will record the price of the current buyer paid and carry a time (not the finish time in DFS) tag so no cycles be formed.

Output the graph in a form of an adjacency matrix.

Give your interpretation on the results in the context of buyers/NFT’s/prices/time.

1. Perform DFS, topological sort and then strongly connected components.

Then, output the acyclic component graph of the strongly connected components in a form of adjacency matrix.

Give your interpretation on the results in the context of buyers/NFT’s/prices/time.

1. Ignore the directions on the edges, and then identify a minimum spanning tree and a maximum spanning tree.

Then, output each tree in a form of adjacency matrix along with min or max total and the NFTs involved.

Give your interpretation on the results in the context of buyers/NFT’s/prices/time.

1. Identify a shortest path tree from an arbitrary buyer.

Then, output the shortest path tree in a form of a adjacency matrix filled with the shortest weight sum and the NFT’s on the path.

Give your interpretation on the results in the context of buyers/NFT’s/prices/time.