30th May 2021:

HPC issues: High electricity bills – need to include power cost minimization in job scheduling

Current solutions – switch off unused nodes – voltage and frequency scaling – using renewable sources of energy.

Opportunity – different electricity rates so schedule to get max- hpc sites to be part of bids

Usage of hpc systems can be predicted hence scheduling and bidding can be done

Minimum cost maximum flow – network simplex algorithm

31st May 2021:

Solving MCMF problem: cycle cancelling, linear programming, network simplex algorithm

Problem description – each edge have capacity – maximum flow possible, flow and cost-price of unit flow along that edge. Hence total price = cost\*flow. Minimize this subject to 1. Flow<=capacity, 2. Flow conservation.

Example from paper:

* Jobs and system as node

Let factories and hospitals/state capitals be nodes in flow network. We say a factory is compactible with hospital/state capital if it does not have any restriction in supplying to the hospital/state capital (due to state restriction/political issues). For every compactible hospital/state capital we add an edge with capacity = production capacity of factory and cost defined as follow.

Cost = w1\*negligence cost +w2\* time cost + w3\*monetary cost

Negligence cost is inversely proportional to demand of that hospital/collective hospitals in that state

Time cost is based on time required to travel distance between factory to hospital. This can change even for same distance due to different mode of transportation available. This can be made independent of flow by taking dynamic flow

Monetary cost is actual cost incurred

Cost

What you did in this week?

1. read the paper. Read about minimum cost maximum flow problem and solving it using linear programming and simplex algorithm

Cost function – time cost, monetary cost, demand cost of the hospital

2. Simplex library implemented in python – networkx – tried a few algorithms in code

3. Data collection – Not much data available for distribution sources. The best data found was with state wise productions. mailed secretary of AIIGMA – all india industrial gases manufacturers association

4. API for calculating actual distance to be travelled via road between places when given coordinates. Google cloud credits. Practically free to use for our needs

To do:

1. Learn network algo

2. propose model

3. define cost function

4. code