Day 24 Notes

Zach Neveu

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1 Agenda

- Quiz
- Max-Flow Review
- Max-Flow Min-cut theorem

2 Max-Flow Review

- Ford-Fulkerson - while an augmenting path exists, add flow to it
- How do we know this is optimal?
- **cut**: a slice across a flow-network dividing the network into two parts with the source and sink on opposite sides (s,t). Capacity of a cut is $c(s,t)$ which is the net flow across the cut from the source to the sink.
- Flow over a cut can't be larger than capacity of cut.
- Overall flow limited by minimum cut.
- Hypothetically, if we found a max flow, there will be no augmenting path.
- If the flow has hit the capacity for some cut, then the capacity has been hit.
- If a max-flow has been found, then a cut through the residual capacity diagram exists where remaining capacity is 0.

3 Ford-Fulkerson Efficiency

- Number of iterations needed upper-bounded by value of max flow (flow increases at least 1 on every iter)
- Overall efficiency: $O(Ef*)$. Depends on size of maximum flow
- Other algorithms
  - Edmonds-Karp: $O(VE^2)$
  - Also algorithms for $O(V^2E)$, $O(V^3)$