The Lightning Network

Lightning Day

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Presentation Overview

1. **The Lightning Network**
2. **Bandit Problems**
3. **Challenges of Maximizing Profit**

1. **The Lightning Network**

2. Bandit Problems

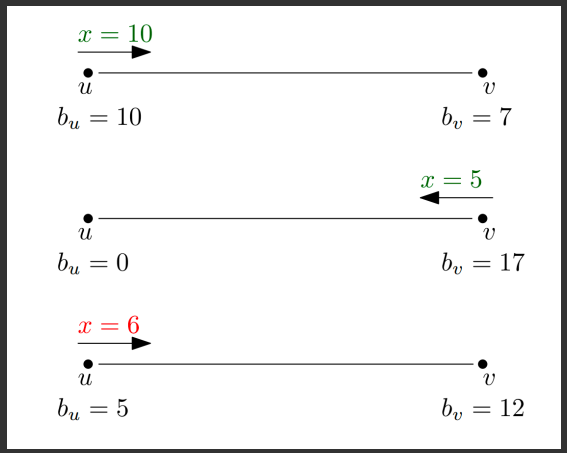
3. Challenges of Maximizing Profit

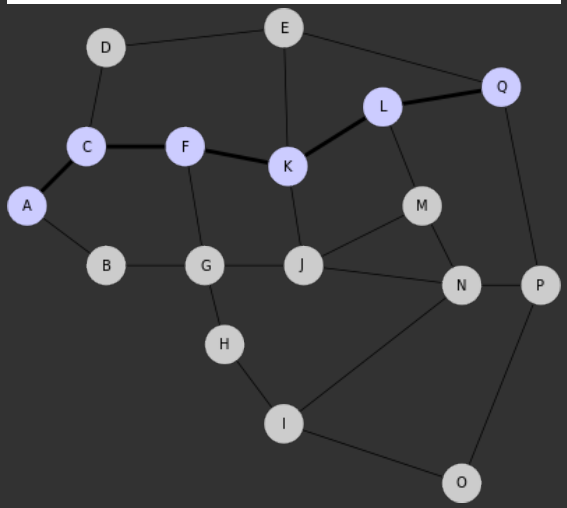
The Lightning Network

- a number of nodes connected by "channels"
- faster than making transactions on The Bitcoin Network
- transaction on The Lightning Network and transaction fees

$$\text{fee}(\tau) = \alpha\tau + \beta$$

- making profit from transactions
  - channel selection
  - capacity allocation
  - fee selection





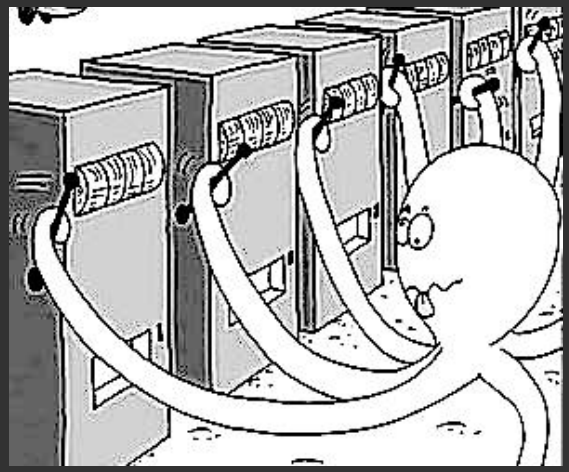
1. The Lightning Network

2. Bandit Problems

3. Challenges of Maximizing Profit

Bandit Problems

- set of arms $\mathcal{X}$
- stochastic feedback $r(x) : \mathcal{X} \to \mathbb{R}$ with unknown distribution.
- sequentially choosing arms for T turns
- we intend to maximize $\mathbb{E}\left[\sum_{i=1}^{T} r(x_i)\right]$ over all possible distributions
- exploitation and exploration tradeoff



Formalization of Our Problem

- V the set of nodes
- $\mathcal{X} \triangleq \{(v, c) | v \in V, c \in \mathbb{R}^+\}$
- $\mathcal{F} \triangleq \{(\alpha, \beta) | \alpha, \beta \in \mathbb{R}^+\}$
- $2^{\mathcal{X} \times \mathcal{F}}$ is our set of arms
- the amount of revenue received from transaction fees is an stochastic reward function

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Channel selection

- The "Maximum Betweenness Centrality Improvement" Problem
  - The greedy approach
  - Hardness results
- how our problem is different from the MBI
  - transaction frequency and distribution of the amounts
  - we are restricted by total capacity rather than number of channels
  - the fee policy affects our profit
- "How to make profit from payment channels", Ersoy et al.

Capacity Allocation

- The Budget Constraint
- Convex Feasible Set
- "Stochastic convex optimization with bandit feedback", Agarwal et al.

Fee Policy

- ”How to make profit from payment channels”