Dota 2 Matchmaking

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What is Dota2?

- An Action-RTS game by Valve
- 5 vs 5 Team based competitive battle arena game
- Much like a social network
- Recently broadcast on ESPN
- $10 Million tournament

DOTA 2™

Motivation and Objectives

- Current system not sufficient
- Skill spectrum is too large
- Queue stacking

DOTA 2™

Background

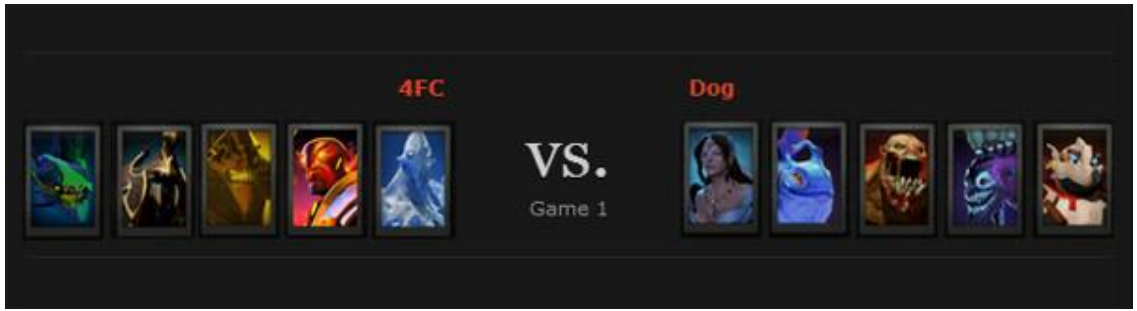
- Current matchmaking system not reliable enough
- Numbers are too superficial (based solely on win/lose)
- Dota 2 is team based, we need more information to rate a player's skill
  - In game objectives (level up, obtain gold, buy items)
  - Analyze player's mechanics (like creepscore in Dota)

Solution

- Create a new matchmaking system based on normalized skill data
- Proposed recommendation model to obtain comparable data
- Implementation done in Java
  - Testing environment that simulates a player pool
  - Problem reduced to 3 algorithms

Algorithms Involved

1) Initialize/fit model against player data
2) Pull players from pool to form match
3) Pull parties of players to form match



Pooling System

How we pick teams from the pool:

We use the skill variable var_q calculated by first algorithm. Details on next slide.

Model

- SVD/Stochastic gradient descent model:

$$min\left(J_{train} = \sum_{i=1}^{n}\sum_{j=1}^{m} \lambda \cdot (v_{ij} - \widehat{v}_{ij})^2\right)$$

subject to:

$$\lambda \geq \mu$$
$$v_{ij}, \widehat{v}_{ij} \geq [0]_9$$

Data Fitting

- Once the system is trained, skill value for specific user is calculated:

$$q = f(\lambda, v_i)$$

- Player then enters pool with her skill value

Where to go from here?

- Current project uses random data for players (could pull real-world data)
- Could add more parameters to skill-calculations
- Same model concept could be applied to any skilled-based game

Questions?