INTERNATIONAL INSTITUTE OF INFORMATION TECHNOLOGY
HYDERABAD

R&D SHOWCASE 2021

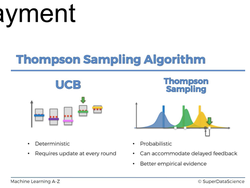
Game Theory for Modern AI Applications

Multi-Armed Bandit

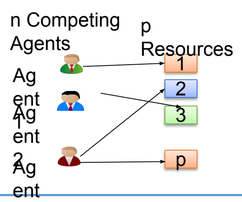
- In Ballooning MAB, Minimize regret in different scenarios
- Propose DPSS-UCB for MAB where planner needs to maximize utility while ensuring average quality
- Applications:
  - Choosing which answer to display at the top on platforms like Stack overflow and Quora
  - Displaying most useful reviews in websites like Amazon and IMDb

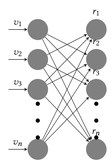
Economic Design using NN

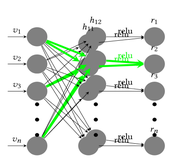
- Multi-Slot Sponsored Search Auction
  - K advertisers, m slots, T rounds
  - Use MAB to learn probability of an ad getting clicked
  - Use neural networks for designing the payment rule, while the allocation rule is modeled using Thompson sampling
  - Learnt payment rule guarantees better cost while maximizing the social welfare

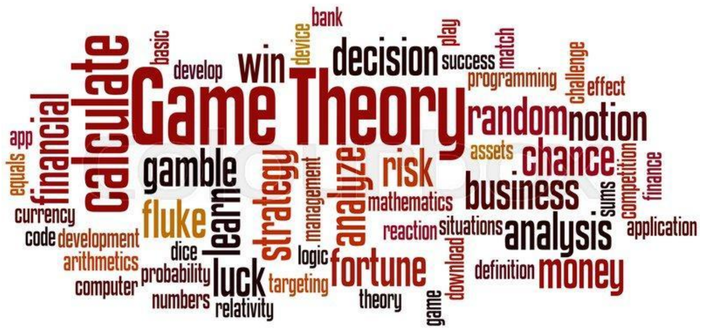


- Redistribution Mechanism
  - Allocating p public resources to n agents, goal is to allocate resources to those agents who value it the most, and redistribute the surplus
  - Design a neural network of all the scenarios to maximize redistribution







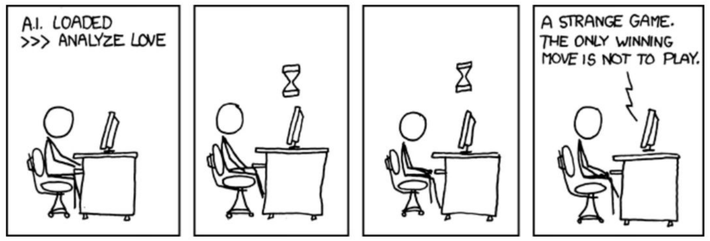


Game Theory

Game theory is the study of mathematical models of conflict and cooperation between intelligent rational decision makers. E.g., Chess, bridge

Artificial Intelligence

Artificial Intelligence is technology that behaves intelligently using skills associated with human intelligence, including the ability to perceive, learn, reason and act autonomously

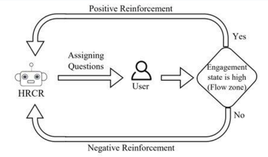


Smart Grid

- Using techniques from RL, DP and other areas of ML
  - To seek appropriate actions in tariff and wholesale market
  - Designing **MDPLCPBS** for bidding in PDA
- Uses a NN to predict the energy consumption of customers using weather data

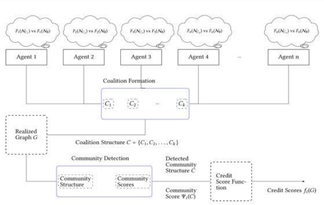
Reduce Churning in CQA Forums

- New algorithm **HRCR** that recommends questions to users that it reduces their churning probability
- We use HMMs to uncover the users' engagement states inside forum then apply RL to recommend users the questions that matches better.



Online Discussion Forums

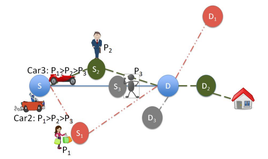
- Credit Score is assigned to user based on the activity of user on the forum
- User can manipulate this score by forming coalitions
- Propose a coalition resistant credit score function which discourages such strategic endorsement
- Penalizing coalitions such that not forming coalition is the best response



stackoverflow Quora MDC YAHOO! ANSWERS

Dynamic Task Assignment

- Workers have preferences and will stay with a platform if it gives assigns suitable task to them
- Propose a Dynamic Matching Mechanism - SDV, with the notion of premium to be paid by workers to achieve preferable matches
- Application : Food Delivery, Cab Services



Publications

- Ganesh Ghalme; Swapnil Dhamal; Shweta Jain; Sujit Gujar; Yadati Narahari, **"Ballooning Bandits",** AI Journal 2021
- Ayush Deva; Kumar Abhishek; Sujit Gujar, "**A Multi-Arm Bandit Approach To Subset Selection Under Constraints**", AAMAS 2021
- Susobhan Ghosh; Sujit Gujar; Praveen Paruchuri; Easwar Subramanian; Sanjay P, "**Bidding in Smart Grid PDAs:Theory, Analysis and Strategy**", AAAI 2020
- Padala Manisha; Sujit Gujar, **"Thompson Sampling Based Multi-Armed-Bandit Mechanism Using Neural Networks",** AAMAS 2019
- Padala Manisha; Jawahar C V; Sujit Gujar, **"Learning Optimal Redistribution Mechanisms Through Neural Networks",** AAMAS 2018
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- Reza Hadi Mogavi; Sujit Gujar; Xiaojuan Ma; Pan Hui, **"HRCR: Hidden Markov-Based Reinforcement to Reduce Churn in Question Answering Forums Conference",** PRICAI 2019.
- Ganesh Ghalme; Sujit Gujar; Amleshwar Kumar; Shweta Jain; Narahari Y, **"Design of Coalition Resistant Credit Score Functions for Online Discussion Forums Conference",** AAMAS 2018.
- Sujit Gujar;Boi Faltings, **"Auction Based Mechanisms for Dynamic Task Assignments in Expert"**, AAMAS 2015

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