

# SUJIT PRAKASH GUJAR – Executive Summary

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## CONTACT INFORMATION

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Currently, I am serving as *Computer Associates Technology Chair Faculty* and *Associate Professor*, at International Institute of Information Technology, Hyderabad.

**Research Contributions** My expertise is in game theory, machine learning, deep learning, optimization, and blockchains. My research primarily focuses on building theory for modern real-world AI applications and making AI systems fair, ethically sound, and strategy proof.

## Peer Reviewed Publications

	IIITH	Overall
Journal	9	14
Conferences (Core A*)	39	44
Conferences (Core A)	8	11
Other Recognized Conferences	31	34
Others (Non-archival workshops/Book chapters)	13	19

**Patents** US Patents: 6 Granted (at Xerox), 8 Published (at Xerox), 3 submitted (at IIITH).

## Premier Publication Venues

Journals	Artificial Intelligence Journal (AIJ), Journal of Artificial Intelligence Research (JAIR), JAAMAS, IEEE IoT, Annals of Mathematical AI
Conferences	AAMAS (30), AAAI (7), IJCAI (5), INFOCOM, WINE, ECAI, ECML, UAI

## Awards, Recognition, Citations, PC Memberships

Research Gift	Adobe Inc, 20K USD Research Gift (June 2023)
Best Doctoral Thesis	Dept of Computer Science and Automation, IISc
Best Poster Design	AAMAS 21
Best Paper	HCI'23, DAI'21
Best Paper runner-up	PRICAI'22, CODS-COMAD 2020
Citations	1850+ with h-index 20, i-10 index 48
SPC /PC	IJCAI, AAAI, AAMAS, UAI (multiple times)

## Research Funding (all amounts in INR)

JP Morgan (2.36M), SERB Core Research Grant (3.96M), KoinEarth (1.18M), Bharat Electronic Ltd (2.54M), MEITY (14 M - 4 PIs), Ripple (1M) [Cyber Physical Systems DST 3.13M approved]

## Supervision of Students at IIITH

	Current	Graduated
PhD	1	3
MS (by Research)	3	14

(I have also mentored 4 other PhD students with significant contribution to their work).

## Teaching Summary at IIITH

Undergraduate: Data Structures and Algorithms, Advanced Computer Networks, Optimization Methods, Human Values – I, II

Graduate Level: (all introduced by me) Introduction to Game Theory, Advanced topics in Game Theory, Distributing Trust and Blockchains, Fairness, Ethics and Privacy in AI

# SUJIT PRAKASH GUJAR

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## RESEARCH INTERESTS

Game Theory, Mechanism Design, Machine Learning, and Blockchain applied to building next generation AI systems

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## CURRENT AFFILIATION

**May 2016-Till Date**

*Computer Associates Technology Faculty Chair*

*Associate Professor* at the International Institute of Information Technology, Hyderabad.

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## POSTDOCTORAL FELLOWSHIP

November 2015 - April 2016.

Sr. Research Associate,

Prof Y Narahari, IISc.

January 2014 - October 2015.

Prof Boi Faltings, École polytechnique fédérale de Lausanne (EPFL).

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## INDUSTRIAL RESEARCH

January 2011-Nov 2013.

**Research Scientist**, Xerox Research Centre, India (XRCI)

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## EDUCATION

**Ph.D.** [2006 - 2011]

Department of Computer Science and Automation (CSA),

Indian Institute of Science (IISc), Bangalore.

**Advisor:** Prof Y Narahari.

**Title:** Novel Mechanisms for Allocation of Heterogeneous Items in Strategic Settings

**M.E.**, [2004 - 2006]

Department of Computer Science and Automation (CSA), IISc, Bangalore.

**Thesis Title:** Measures for Classification and Detection in Steganalysis

**Thesis Supervisor:** Prof. C. E. Veni Madhavan. **(Rank 1)**

**B.E. (ECE)**, [1997 - 2001], Govt. College of Engineering, Pune

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## ACADEMIC HONORS AND RECOGNITION

- Recipient of **Adobe Research Gift** USD 20,000 (June 2023)
- “Fair Allocation with Special Externalities.” Best Paper 1st Runner-up PRICAI’22.
- “We might walk together, but I run faster: Network Fairness and Scalability in Blockchains.” Best Poster Design Award at AAMAS’21.
- “Building Ethical AI: Federated Learning Meets Fairness and Differential Privacy.” Best Paper DAI’21.
- “Human Machine Collaboration for Face Recognition.” Best Paper Runner-up, CODS-COMAD’20.

- Recipient of **Alumni Medal** of IISc for the *Best Doctoral Thesis* in the Dept Computer Science and Automation, Indian Institute of Science, for the academic year 2012-13, March 2012.
- Recipient of Research Internship at Harvard University (Prof David C Parkes. Harvard EconCS Group, School of Engineering and Applied Sciences), (Summer 2009.)
- Recipient of Highly Competitive **Infosys Doctoral Fellowship** (2007-10).
- **Rank 1**, ME (Internet Science and Engineering), Department of Computer Science and Automation, IISc, 2004-2006 batch.
- GATE Score **99.66** percentile, MHRD Scholarship holder.
- Selected through **IIT JEE** (Joint Entrance Examination) for admission to IIT. (AIR 2255).
- 5<sup>th</sup> position in '**Ganit Parangat**' state level (Maharashtra) examination. Ganit Parangat is Mathematical examination conducted at school level for testing mathematical abilities.

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## ACADEMIC SERVICE

- Senior Program Committee IJCAI-2021
- Program Committee Member  
AAAI-2025,25,24,23,22,21,20 IJCAI-2024,2423,22,20,19,18,17,16  
AAMAS-2020,19,18,17  
UAI-2021, GAIW 2024, IEEE ICBC 2024 NeurIPS 2025
- Local Organizing Committee, Workshop, 'Algorithmic Frontiers of Fairness' at FSTTCS'23
- Local Organizing Chair, Asian Conference on Machine Learning, ACML'22
- Reviewer

### *Conferences*

WWW'19, ACM EC'15, FSTTCS'15, AAAI'14, WINE'12, Int. Conf. on Operational Research'12

### *Journals*

PLOS ONE, Journal of Artificial Intelligence Research (JAIR), Journal of AAMAS (JAAMAS), Games and Economic Behaviour (GEB), Artificial Intelligence Journal (AIJ), Transaction of Mobile Computing (TMC), Machine Learning (MACH), Electronic Commerce Research and Applications (ECRA), European Journal of Operational Research (EJOR), Journal of Industry, Competition and Trade (JICT), IEEE Systems, Man and Cybernetics: Systems (SMC), Sadhana

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## RESEARCH FUNDING

Name of the project	Funding agency	Amount (In INR)	Duration
Achieving Privacy in Federated Learning	JP Morgan	23.6L	Jun'23-Dec'23
Achieving Fairness in Federated Learning Model	SERB, DST	39.68L	Feb'23-Feb'26
Design and Development of a Unified Blockchain Framework for offering National Blockchain Service (Primary Co-PI)	MEITY	144.75L	Apr'21-Mar'24
Design & implementation of mechanics as smart contracts	KoinEarth	11.8L	Nov'17 -
Game Theory for Interception	Bharat electronics Ltd (BEL, Gaziabad)	25.488L	Nov'19-Mar'22
Mobile Distributed Ledger	Ripple	10L	Aug'19-
Multi-Armed-Bandit Mechanisms for Smart Power Grids.	ICPS, SERB	31.30L	Apr'19-

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## RESEARCH STATEMENT

My research mainly focuses on building theory for modern real-world, AI applications. Broadly, I am focusing on fairness and game-theoretic challenges in AI systems. AI systems or multi-agent systems are becoming autonomous and more and more decentralized than just distributed. E.g., blockchain is an example of a decentralized database. In Federated learning, many nodes participate in training machine learning models in a decentralized manner. As systems are becoming complex, with individuals having more than before computing power, Internet access at high speeds, IoT etc., fairness and game theoretic challenges are inevitable, and the existing approaches are not designed for such future systems.

My vision for the research is to make such decentralized systems ethical, fair, protect individual privacy, and deter any strategic manipulations with the help of game theory, blockchains, machine learning, and cryptography. My agenda is to design systems that ensure fairness to the participants and achieve some social goals. I classify my research into two parts—(Part I) AI-based systems and (Part II) blockchains systems. At high level I am interested in looking into the following aspects. (More details in the Appendix)

### AI-based Systems

What is ethical? It has been shown that what we consider moral, ethical, or fair is as evolutionary as biology. New fairness measures would undoubtedly arise. Can we design AI systems so that it is easy to adapt to new fairness measures without retraining or access to the original data?

The primary reason ML tasks create unfairness is bias in the data. A lot of work has been addressed to improve fairness while training the systems. There are some works that try to address bias in the data by pre-processing it to make AI systems fair. However, it has not resulted in strong improvements. We are interested in developing solutions for such pre-processing techniques that are reduced the bias in the data. It has itself many challenges like even how do you estimate the quality of the data for fairness unless you train ML models? Such biases will be much more prevalent in federated learning (FL) settings as each client would have very different data types. I am interested in developing techniques that mitigate such biases.

### Blockchain Systems

Appropriate incentives are required to ensure clients in FL settings participate reliably, and private payment channels are desired. Blockchain-based communication is an option that can offer it. How to design incentive schemes that can be used over blockchains? Note incentive schemes requiring heavy computations are not suitable over blockchains.

As systems become decentralized and require privacy, verifiability, and trustworthiness, blockchains are the key to building future FL and non-FL applications. Current blockchain protocols cannot support large-scale operations. We are interested in designing secure and scalable blockchain protocols. Additionally, we are interested in ensuring that the miners, who maintain blockchains, are rewarded fairly. There are many fundamental questions here. Do non-inflationary rewards proposed in bitcoin suffice? Especially given that existing outside cryptocurrency world is inflationary. The costs that miners incur are inflationary. New reward schemes and theoretical analysis of future blockchain systems are warranted, which my research will focus on in the coming years.

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## PUBLICATIONS

### Journal Publications

1. Haris Aziz, Sujit Gujar, Manisha Padala, Jeremy Vollen, and Mashbat Suzuki, “*Coordinating Monetary Contributions in Participatory Budgeting*,” In Journal of Automated Agents and Multi-Agent Systems. (JAAMAS), *To Appear*.
2. Vlasios Koutsos, Sankarshan Damle, Dimitrios Papadopoulos, Dimitris Chatzopoulos, and Sujit Gujar, “*AVeCQ: Anonymous Verifiable Crowdsourcing with Worker Qualities*,” IEEE Transactions on Dependable and Secure Computing (TDSC).
3. Sankarshan Damle, Aleksei Triastcyn, Boi Faltings, and Sujit Gujar, “*Differentially Private Multi-Agent Constraint Optimization*,” In Journal of Automated Agents and Multi-Agent Systems. (JAAMAS), March 2024.
4. Reza Hadi Mogavi, Chao Deng, Justin J. Kim, Peng Yuan Zhou, Young D. Kwon, Ahmed Hosny, Ahmed Tlili, Simone Bassanelli, Antonio Bucchiarone, Sujit Gujar, Lennart Nacke, and Pan Hui, “*ChatGPT in Education: A Blessing or a Curse?*,” Journal Computers in Human Behavior: Artificial Humans.
5. Ashutosh Ranjan, Vinay Ramani, and Sujit Gujar, “*Dynamic Matching in Campus Placements: The Benefits and Affordability of the Dream Option*,” IIM B Management Review. vol. 34.3, 2022, pp 262-277.
6. Dimitris Chatzopoulos, Anurag Jain, Sujit Gujar, Boi Faltings, and Pan Hui, “*Towards Mobile Distributed Ledger*,” IEEE Internet of Things Journal, vol. 9.11, 2021, pp 7891-7903.
7. Ganesh Ghalme, Swapnil Dhamal, Shweta Jain, Sujit Gujar, Y. Narahari, “*Ballooning multi-armed bandits*,” Journal of Artificial Intelligence (AI) vol. 296, 2021, pp 103485.
8. Satyanath Bhat, Shweta Jain, Sujit Gujar and Y. Narahari, “*An Optimal Bidimensional Multi-Armed Bandit Auction for Multi-Unit Procurement*,” Annals of Mathematics and Artificial Intelligence, Volume 85(1), 2019, pp 1-19.
9. Shweta Jain, Sujit Gujar, Satyanath Bhat, Onno Zoeter and Y. Narahari, “*A Quality Assuring, Cost Optimal Multi-Armed Bandit Mechanism for Expertsourcing*,” Artificial Intelligence, Volume 254, January 2018, pp 44-63.
10. Sujit Gujar and Y. Narahari, “*Optimal Multi-Unit Combinatorial Auctions*,” Operational Research, Volume 13, Issue 1, April 2013, pp 27-46.
11. Akash Das Sarma, Sujit Gujar, Y. Narahari, “*Truthful Multi-Armed Bandit Mechanisms for Multi-Slot Sponsored Search Auctions*,” Current Science, Special Issue on Game Theory, Volume 103(9), November 2012, pp 1064-1077.
12. Sujit Gujar and Y. Narahari, “*Redistribution Mechanisms for Assignment of Heterogeneous Ob-*

jects,” Journal of Artificial Intelligence Research, Volume 41, 2011, pp 131-154.

13. Dinesh Garg, Y. Narahari, Sujit Gujar, “*Foundations of Mechanism Design: A Tutorial - Part 1: Key Concepts and Classical Results*,” Sadhana - Indian Academy Proceedings in Engineering Sciences, Volume 33, Part 2, April 2008, pp 83-130.
14. Dinesh Garg, Y. Narahari, Sujit Gujar, “*Foundations of Mechanism Design: A Tutorial - Part 2: Advanced Concepts and Results*,” Sadhana - Indian Academy Proceedings in Engineering Sciences, Volume 33, Part 2, April 2008, pp 131-174.

## Book Chapters

15. Sanjay Chandekar, Bala Suraj P, Susobhan Ghosh, Dr. Easwar Subramanian, Dr. Sanjay Bhat, Dr. Praveen Paruchuri, and Dr. Sujit Gujar. “*Chapter 3: VidyutVanika: AI-Based Autonomous Broker for Smart Grids: From Theory to Practice*,” Invited Book Chapter in Energy Sustainability through Retail Electricity Markets: The Power Trading Agent Competition (Power TAC) Experience.
16. Sujit Gujar, “*Blockchain Technology: What is it and What is its future?*” Invited Chapter in Manorama Year Book, 2019.
17. Sujit Gujar and Boi Faltings, “*Auction Based Mechanisms for Dynamic Task Assignments in Expert Crowdsourcing Agent-Mediated Electronic Commerce*,” Designing Trading Strategies and Mechanisms for Electronic Markets: AMEC/TADA 2015 and AMEC/TADA 2016, New York, NY, USA, July 10, 2016, Revised Selected Papers 271 (2017): 50.
18. Y. Narahari and Sujit Gujar, “*Auctions in Electronic Commerce*,” Invited Book Chapter in: The Handbook of Technology Management, Volume III, pg 612-625, 2009. John Wiley and Sons.

## Publications in Highly Selective Conferences

19. Avyukta Manjunatha Vummintala, Shantanu Das, Sujit Gujar, “*FROC: Building Fair Classifier from a Trained Classifier*,” In the proceedings of the 39th AAAI Conference on Artificial Intelligence, 2025. (AAAI’25)
20. Avyukta Manjunatha Vummintala, Shivam Gupta, Shweta Jain, Sujit Gujar, “*FLIGHT: Facility Location Integrating Generalized, Holistic Theory of Welfare*,” In the Proceedings of 24th International Conference on Autonomous Agents and Multiagent Systems, 2025. (AAMAS’25).
21. Rasheed, Parth Desai, Yash Chaurasia, Sujit Gujar, “*Shapley Value-based Approach for Redistributing Revenue of Matchmaking of Private Transactions in Blockchains*,” In the Proceedings of 24th International Conference on Autonomous Agents and Multiagent Systems, 2025. (AAMAS’25)
22. Abhishek Kumar, Andra Siva Sai Teja, Ganesh Ghalme, Sujit Gujar, and Y. Narahari, “*Regret Guarantees for a UCB-based Algorithm for Volatile Combinatorial Bandits*,” In the Proceedings of 23rd International Conference on Autonomous Agents and Multiagent Systems, 2025. (AAMAS’25)
23. Sankarshan Damle, Varul Srivastava, and Sujit Gujar, “*No Transaction Fees? No Problem! Achieving Fairness in Transaction Fee Mechanism Design*,” In the proceedings of 27th European Conference on Artificial Intelligence, 2024. (ECAI’24).
24. Varul Srivastava and Sujit Gujar, “*Towards Rational Consensus in Honest Majority*,” In the Proceedings of 44th IEEE International Conference on Distributed Computing Systems, 2024. (ICDCS’24)
25. Subham Pokhriyal, Shweta Jain, Ganesh Ghalme, Swapnil Dhamal, and Sujit Gujar, “*Simultane-*

- ously Achieving Group Exposure Fairness and Within-Group Meritocracy in Stochastic Bandits,” In the Proceedings of 23rd International Conference on Autonomous Agents and Multiagent Systems, 2024. (AAMAS’24).
26. Archit Sood, Shweta Jain, and Sujit Gujar, “Fairness of Exposure in Online Restless Multi-armed Bandits,” In the Proceedings of 23rd International Conference on Autonomous Agents and Multiagent Systems, 2024. (AAMAS’24).
  27. Sankarshan Damle, Manisha Padala, and Sujit Gujar, “Designing Redistribution Mechanisms for Reducing Transaction Fees in Blockchains,” In the Proceedings of 23rd International Conference on Autonomous Agents and Multiagent Systems, 2024. (AAMAS’24).
  28. Sankarshan Damle and Sujit Gujar, “Analyzing Crowdfunding of Public Projects Under Dynamic Beliefs,” In the Proceedings of 23rd International Conference on Autonomous Agents and Multiagent Systems, 2024. (AAMAS’24).
  29. Sankarshan Damle, Varul Srivastava, and Sujit Gujar, “No Transaction Fees? No Problem! Achieving Fairness in Transaction Fee Mechanism Design,” In the Proceedings of 23rd International Conference on Autonomous Agents and Multiagent Systems, 2024. (AAMAS’24).
  30. Varul Srivastava and Sujit Gujar, “Decent-BRM: Decentralization through Block Reward Mechanisms,” In the Proceedings of 23rd International Conference on Autonomous Agents and Multiagent Systems, 2024. (AAMAS’24).
  31. Sambhav Solanki, Sujit Gujar, and Shweta Jain, “Fairness and Privacy Guarantees in Federated Contextual Bandits,” In the Proceedings of 23rd International Conference on Autonomous Agents and Multiagent Systems, 2024. (AAMAS’24).
  32. Haris Aziz, Sujit Gujar, Manisha Padala, Mashbat Suzuki, and Jeremy Vollen, “Coordinating Monetary Contributions in Participatory Budgeting,” In the Proceedings of 16th International Symposium on Algorithmic Game Theory. (SAGT’23)
  33. Sanjay Chandlekar, Shweta Jain, and Sujit Gujar, “A Novel Demand Response Model and Method for Peak Reduction in Smart Grids – PowerTAC,” In the Proceedings of International Joint Conference on Artificial Intelligence 2023. (IJCAI’23).  
(Extended Version of AAMAS’23)
  34. Anurag Jain, Emmanuelle Anceaume, and Sujit Gujar, “Extending The Boundaries and Exploring The Limits Of Blockchain Compression,” In the Proceedings of 42nd International Symposium on Reliable Distributed Systems, 2023. (SRDS’23).
  35. Sanjay Chandlekar, Arthik Boroju, Shweta Jain and Sujit Gujar, “A Novel Demand Response Model and Method for Peak Reduction in Smart Grids – PowerTAC,” In the Proceedings of International Conference on Autonomous Agents and Multi-agent Systems, 2023. (AAMAS’23).
  36. Sankarshan Damle, Manisha Padala, and Sujit Gujar, “Combinatorial Civic Crowdfunding with Budgeted Agents: Welfare Optimality at Equilibrium and Optimal Deviation,” In the Proceedings of the 37th AAAI Conference on Artificial Intelligence. (AAAI’23).
  37. Sambhav Solanki, Samhita Kanaparth, Sankarshan Damle, and Sujit Gujar, “Differentially Private Federated Combinatorial Bandits with Constraints,” In the Proceedings of the European Conference on Machine Learning and Principles and Practice of Knowledge Discovery in Databases, 2022. (ECML-PKDD’22).
  38. Reza Hadi Mogavi, Ehsan-Ul Haq, Sujit Gujar, Pan Hui, and Xiaojuan Ma, “More Gamification Is Not Always Better: A Case Study of Promotional Gamification in a Question Answering Website,” In the Proceedings of 25th ACM Conference on Computer Supported Cooperative Work 2022. (CSCW’22).

39. Shantanu Das, Swapnil Dhamal, Ganesh Ghalme, Shweta Jain, and Sujit Gujar, “*Individual Fairness in Feature-Based Pricing for Monopoly Markets*,” In the Proceedings of 38th Conference on Uncertainty in Artificial Intelligence 2002. (UAI’22).
40. Sanjay Chandlekar, Bal Suraja Pedasingu, Easwara Subramanian, Sanjay Bhat, Praveen Paruchuri, and Sujit Gujar, “*An Autonomus Intelligent Broker for Smart Grids*,” In the Proceedings of 31st International Joint Conference on Artificial Intelligence. (IJCAI’22).
41. Debojit Das, Shweta Jain, and Sujit Gujar, “*Budgeted Combinatorial Multi-Armed Bandits*,” In the Proceedings of International Conference on Autonomous Agents and Multi-agent Systems, 2022. (AAMAS’22).
42. S V Kanaparth, Sankarshan Damle, and Sujit Gujar, “*REFORM: Reputation Based Fair and Temporal Reward Framework for Crowdsourcin*,” In the Proceedings of International Conference on Autonomous Agents and Multi-agent Systems, 2022. (AAMAS’22).
43. Sanjay Chandlekar, Easwara Subramanian, Sanjay Bhat, Praveen Paruchuri, and Sujit Gujar, “*Multi-unit Double Auctions: Equilibrium Analysis and Bidding Strategy using DDPG in Smart-grids*,” In the Proceedings of International Conference on Autonomous Agents and Multi-agent Systems, 2022. (AAMAS’22).
44. Kritika Prakash, Fiza Hussain, Praveen Paruchuri, and Sujit Gujar, “*How Private Is Your RL Policy? An Inverse RL Based Analysis Framework*,” In the Proceedings of 36th AAAI Conference on Artificial Intelligence. (AAAI’22).
45. Anurag Jain and Sujit Gujar Block Rewards, “*We might walk together, but I run faster: Network Fairness and Scalability in Blockchains*,” In the Proceedings of International Conference on Autonomous Agents and Multi-agent Systems, 2021. (AAMAS’21). (**Best Poster Design Award**)
46. Ayush Deva, Kumar Abhishek and Sujit Gujar, “*A Multi-Arm Bandit Approach To Subset Selection Under Constraints*,” In the Proceedings of International Conference on Autonomous Agents and Multi-agent Systems, 2021. (AAMAS’21).
47. Manisha Padala and Sujit Gujar, “*FNNC: Achieving Fairness through Neural Networks*,” In the Proceedings of 29th International Joint Conference on Artificial Intelligence, pp 2277-2283. (IJCAI’20).
48. Shoeb Siddiqui, Ganesh Vanahalli, Sujit Gujar, “*BitcoinF: Achieving Fairness For Bitcoin In Transaction Fee Only Model*,” In the Proceedings of International Conference on Autonomous Agents and Multi-agent Systems, 2020, pp 2008-2010. (AAMAS’20).
49. Kumar Abhishek, Shweta Jain, Sujit Gujar, “*Designing Truthful Contextual Multi-Armed Bandits based Sponsored Search Auctions*,” In the Proceedings of International Conference on Autonomous Agents and Multi-agent Systems, 2020, pp 1732-1734. (AAMAS’20).
50. Ganesh Ghalme, Swapnil Dhamal, Shweta Jain, Sujit Gujar, Yadati Narahari, “*Ballooning Multi-Armed Bandits*,” In the Proceedings of International Conference on Autonomous Agents and Multi-agent Systems, 2020, pp 1849-1851. (AAMAS’20).
51. Dimitrios Chatzopoulos, Sujit Gujar, Boi Faltings and Pan Hui, “*Mneme: A Mobile Distributed Ledger*,” In the Proceedings of IEEE International Conference on Computer Communications, pp 1897-1906. (INFOCOM’20).
52. Shweta Jain and Sujit Gujar, “*A Multiarmed Bandit Based Incentive Mechanism for a Subset Selection of Customers for Demand Response in Smart Grids*,” To appear in in the Proceedings of the thirty-fourth AAAI conference on AI, 2020, pp 2046-2053. (AAAI’20).
53. Susobhan Ghosh, Easwar Subramanian, Sanjay P. Bhat, Sujit Gujar and Praveen Paruchuri,



*“Bidding in Smart Grid PDAs: Theory, Analysis and Strategy,”* To appear in the Proceedings of the thirty-fourth AAAI conference on AI, 2020, pp 1974-1981. (AAAI’20).

54. Moin Hussain Moti, Dimitris Chatzopoulos, Pan Hui, Sujit Gujar, *“FaRM: Fair Reward Mechanism for Information Aggregation in Spontaneous Localized Settings,”* In the Proceedings of 28<sup>th</sup> International Joint Conference on Artificial Intelligence, pp 506-512, (IJCAI’19).
55. Sankarshan Damle, Moin Hussain Moti, Praphul Chandra and Sujit Gujar, *“Civic Crowdfunding for Agents with Negative Valuations and Agents with Asymmetric Beliefs,”* In the Proceedings of 28<sup>th</sup> International Joint Conference on Artificial Intelligence, pp 208-214, (IJCAI’19).
56. Sankarshan Damle, Boi Falting and Sujit Gujar, *“A Truthful, Privacy-Preserving, Approximately Efficient Combinatorial Auction For Single-minded Bidders,”* In the Proceedings of International Conference on Autonomous Agents and Multi-agent Systems, pp 1916-1918, (AAMAS’19).
57. Sankarshan Damle, Moin Hussain Moti, Praphul Chandra and Sujit Gujar, *“Aggregating Citizen Preferences for Public Projects Through Civic Crowdfunding,”* In the Proceedings of International Conference on Autonomous Agents and Multi-agent Systems, pp 1919-1921, (AAMAS’19).
58. Manisha Padala and Sujit Gujar, *“Thompson Sampling Based Multi-Armed-Bandit Mechanism Using Neural Networks,”* In the Proceedings of International Conference on Autonomous Agents and Multi-agent Systems, pp 2111-2113, (AAMAS’19).
59. Susobhan Ghosh, Easwar Subramanian, Sanjay P. Bhat, Sujit Gujar and Praveen Paruchuri, *“A Reinforcement Learning Based Broker Agent for a Power Trading Competition: Design and Performance,”* In the Proceedings of the 23<sup>th</sup> AAAI conference on AI, 2019, pp 914-921, (AAAI’19).
60. Manisha Padala, C V Jawahar, Sujit Gujar, *“Learning Optimal Redistribution Mechanisms Through Neural Networks,”* To appear in the Proceedings of International Conference on Autonomous Agents and Multi-agent Systems, pp. 345-353, (AAMAS’18).
61. Ganesh Ghalme, Sujit Gujar, Amleshwar Kumar, Shweta Jain and Y Narahari, *“Design of Coalition Resistant Credit Score Functions for Online Discussion Forums,”* In the Proceedings of International Conference on Autonomous Agents and Multi-agent Systems, pp. 95-103, (AAMAS’18).
62. Praphul Chandra, Sujit Gujar and Y. Narahari, *“Referral-Embedded Provision Point Mechanisms for Crowdfunding of Public Projects,”* In the Proceedings of the 2017 International Conference on Autonomous Agents and Multi-agent Systems, pp. 87-95, (AAMAS’17).
63. Ganesh Ghalme, Shweta Jain, Sujit Gujar, Y Narahari, *“Thompson Sampling Based Mechanisms for Stochastic Multi-Armed Bandit Problems,”* In the Proceedings of the 2017 International Conference on Autonomous Agents and Multi-agent Systems, pp 642-650, (AAMAS’17).
64. Dimitrios Chatzopoulos, Sujit Gujar, Boi Faltings and Pen Hui, *“LocalCoin: An Ad-hoc payment scheme for areas with high connectivity,”* In the Proceedings of MobiHoc 2016.
65. Ganesh Ghalme, Shweta Jain, Sujit Gujar, Satyanath Bhat, and Y. Narahari, *“A Deterministic MAB Mechanism for Crowdsourcing with Logarithmic Regret and Immediate Payments,”* In Proceedings of the 2016 International Conference on Autonomous Agents and Multi-agent Systems, pp 86-94, (AAMAS’16).
66. Satyanath Bhat, Shweta Jain, Sujit Gujar and Y Narahari, *“An Optimal Bidimensional Multi-Armed Bandit Auction,”* In Proceedings of the 2015 International Conference on Autonomous Agents and Multi-agent Systems, pp. 1789-1790, (AAMAS’15).
67. Tridib Mukherjee, Partha Dutta, Vinay Hegde and Sujit Gujar *“RISC: Robust Infrastructure over Shared Computing Resources Through Dynamic Pricing and Incentivization,”* In Proceedings of 29<sup>th</sup> IEEE International Parallel & Distributed Processing Symposium 2015. (IPDPS’15).

68. Bhat Satyanath, Swaprava Nath, Sujit Gujar, Onno Zoeter, Y. Narahari and Chris Dance, “A mechanism to optimally balance cost and quality of labeling tasks outsourced to strategic agents,” In Proceedings of the 2014 International Conference on Autonomous Agents and Multi-agent Systems, pp. 917-924, (AAMAS’14).
69. Shweta Jain, Sujit Gujar, Onno Zoeter, and Y. Narahari, “A quality assuring multi-armed bandit crowdsourcing mechanism with incentive compatible learning”. In Proceedings of the 2014 International Conference on Autonomous Agents and Multi-agent Systems, pp. 1609-1610, (AAMAS’14).
70. James Zou, Sujit Gujar and David Parkes, “Tolerable Manipulability in Dynamic Assignment without Money,” In the Proceedings 24th AAAI Conference on Artificial Intelligence, 2010, (AAAI’10).
71. Sujit Gujar and Y Narahari, “Redistribution of VCG Payments in Assignment of Heterogeneous Objects,” In Proceedings of the 4<sup>th</sup> International Workshop on Internet and Network Economics, 2008, pp 438-445, (WINE’08).

### Publications in Other Archival Conferences and Workshops

72. Sambhav Solanki, Shweta Jain, and Sujit Gujar, “Fairness and Privacy Guarantees in Federated Contextual Bandits,” In the proceedings of the 16th Asian Conference of Machine Learning 2024. (ACML’24).
73. Sanjay Chandlekar, Easwar Subramanian, and Sujit Gujar, “Multi-armed Bandit Based Tariff Generation Strategy for Multi-Agent Smart Grid Systems,” In the proceedings of the 11th International Workshop on Engineering Multi-Agent Systems (EMAS’23@AAMAS’23).
74. Samhita Kanaparthi, Manisha Padala, Sankarshan Damle, Ravi Kiran Sarvadevabhatla, and Sujit Gujar, “F3: Fair and Federated Face Attribute Classification with Heterogeneous Data,” In the Proceedings of the Pacific-Asia Conference on Knowledge Discovery and Data Mining. (PAKDD’23).
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76. Reza Hadi Mogavi, Chao Deng, Jennifer Hoffman, Ehsan-Ul Haq, Sujit Gujar, Antonio Bucchiarone, Pan Hui, “Your Favorite Gameplay Speaks Volumes about You: Predicting User Behavior and Hexad Type,” In the Proceedings of the 25th Human-Computer Interaction International Conference, Copenhagen, Denmark, July 2023. (HCI’23). (**Best Paper Award**)
77. Shaily Mishra, Manisha Padala, and Sujit Gujar, “Fair Allocation with Special Externalities,” In the Proceedings of the 19th Pacific Rim International Conference on Artificial Intelligence. (PRICAI’22). (**Best Paper 1st Runner-up Award**)
78. Shaily Mishra, Manisha Padala, and Sujit Gujar, “EEF1-NN: Efficient and EF1 allocations through Neural Networks,” In the Proceedings of the 19th Pacific Rim International Conference on Artificial Intelligence. (PRICAI’22).
79. Manika Sharma, Kishore Kothapalli and Sujit Gujar, “BLOCKVAC: A Universally Acceptable and Ideal Vaccination System on Blockchain,” In the Proceedings of 5th IEEE international conference on Blockchain, 2022. (Blockahin’22).
80. Pradhan, Anindya, Easwar Subramanian, Sanjay Bhat, Praveen Paruchuri, and Sujit Gujar, “Rise of Algorithmic Trading in Today’s Changing Electricity Market,” ISUW 2020: Proceedings of the 6th International Conference and Exhibition on Smart Grids and Smart Cities. Singapore: Springer Nature Singapore, 2022.
81. Anurag Jain, Sanidhay Arora, Sankarshan Damle, and Sujit Gujar, “Tiramisu: Layering Con-

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  88. Manisha Padala, Debojit Das, and Sujit Gujar, “*Effect of Input Noise Dimension in GANs*,” In the Proceedings of the 28th International Conference on Neural Information Processing, December 2021. (ICONIP’21).
  89. Sankarshan Damle, Moin Hussian Moti, Praphul Chandra, and Sujit Gujar, “*Designing Refund Bonus Schemes for Provision Point Mechanism in Civic Crowdfunding*,” In the Proceedings of the 18th Pacific Rim International Conference on Artificial Intelligence. (PRICAI’21).
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  92. Moin Hussain Moti, Dimitris Chatzopoulos, Pan Hui, Boi Faltings and Sujit Gujar, “*Orthos: A Trustworthy AI Framework For Data Acquisition*,” The 8th International Workshop on Engineering Multi-Agent Systems. (EMAS@AAMAS’20).
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  95. Dimitrios Chatzopoulos, Sujit Gujar, Boi Faltings and Pan Hui, “*Privacy Preserving and Cost Optimal Mobile Crowdsensing using Smart Contracts on Blockchain*”. In the Proceedings of 15th IEEE

International Conference on Mobile Ad-hoc and Sensor Systems, pp 442-450, (IEEE MASS'18).

96. Praveen Paruchuri and Sujit Gujar, "*Fusion of Game Theory and Big Data for AI Applications*". In the Proceedings of the 6th International Conference on Big Data Analytics, 2018, pp 55-69, (BDA'18), (Invited Paper).
  97. Sujit Gujar and Boi Faltings, "*Dynamic Task Assignments for Expert Crowdsourcing: Theory and Empirical Evaluation*," In the Proceedings of 22<sup>nd</sup> European Conference on Artificial Intelligence. (ECAI'16).
  98. Praphul Chandra, Sujit Gujar and Y. Narahari, "*Crowdfunding Public Projects with Provision Point: A Prediction Market Approach*," In the Proceedings of 22<sup>nd</sup> European Conference on Artificial Intelligence. (ECAI'16).
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  100. Dutta, Partha, Tridib Mukherjee, Vinay Hegde, and Sujit Gujar. "*C-Cloud: A Cost-Efficient Reliable Cloud of Surplus Computing Resources*". In Cloud Computing (CLOUD), 2014 IEEE 7<sup>th</sup> International Conference on Cloud Computing, pp. 986-987. IEEE, 2014. (CLOUD'14).
  101. Shourya Roy, Chithralekha B and Sujit Gujar, "*Sustainable Employment in India by Crowdsourcing Enterprise Tasks*," In Proceedings of the third annual Symposium on Computing for Development. (ACM DEV'13).
  102. Mukherjee, Koustuv Dasgupta, Sujit Gujar, Gueyoung Jung and Haengju Lee, "*An Economic Model for Green Cloud*," In the Proceedings of 10th International Workshop on Middleware for Grids, Clouds and e-Science. (MGC'12).
  103. Sujit Gujar and David Parkes, "*Dynamic Matching with a Fall-back Option*," In the Proceedings 19<sup>th</sup> European Conference on Artificial Intelligence, pp 263-268, 2010. (ECAI'10).
  104. Sujit Gujar, James Zou and David Parkes, "*Dynamic House Allocation*," In the Proceedings of 5<sup>th</sup> Multidisciplinary Workshop on Advances in Preference Handling, pp 43-48, 2010. (M-PREF'10).
  105. Sujit Gujar and Y. Narahari, "*Optimal Multi-Unit Combinatorial Auctions with Single Minded Bidders*," The 11th IEEE Conference on Commerce and Enterprise Computing, pp 74-81, 2009. (CEC'09).
  106. Sujit Gujar and C E Veni Madhavan, "*Measures for Classification and Detection in Steganalysis*," In Proceedings of 3<sup>rd</sup> Workshop on Computer Vision, Graphics and Image Processing, pp. 210-214, January 2006. (WCGVIP'06).
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#### Non-archival Peer-reviewed Workshop Publications

107. Sankarshan Damle, Manisha Padala, and Sujit Gujar, "*Combinatorial Civic Crowdfunding with Budgeted Agents: Welfare Optimality at Equilibrium and Optimal Deviation*," Games, Agents, and Incentives Workshop at AAMAS'22. (GAIW@AAMAS'22).
108. Jeremy Vollen, Mashbat Suzuki, Haris Aziz, Sujit Gujar and Manisha Padala, "*Coordinating Monetary Contributions in Participatory Budgeting*". 2022 Workshop on AI-based Optimisation. (AI-OPT'22).
109. Samhita Kanaparth, Manisha Padala, Sankarshan Damle, and Sujit Gujar, "*Fair Federated Learning for Heterogeneous Data*," Young Researchers Symposium, 5th Joint International Conference on Data Science & Management of Data, CODS-COMAD'22.

110. Sankarshan Damle, Aleksei Triastcyn, Boi Faltings, and Sujit Gujar, “*Differentially Private Multi-Agent Constraint Optimization*,” Privacy Preserving AI Workshop at AAAI’21.
111. Ayush Deva, Kumar Abhishek and Sujit Gujar, “*A Multi-Arm Bandit Approach To Subset Selection Under Constraints*,” Adaptive and Learning Agents ALA@AAMAS’21.
112. Manisha Padala, Sankarshan Damle, and Sujit Gujar, “*Building Ethical AI: Federated Learning Meets Fairness and Differential Privacy*,” First Indian Conference on Deployable AI, June 2021. (DAI’21). (**Best Paper Award**).
113. Meghana Reddy; Akansha Singh; Zoltan Nagy; Sujit Gujar; Shweta Jain, “*Designing Bounded min-Knapsack Bandits Algorithm for Sustainable Demand Response*,” Tackling Climate Change with Machine Learning, ICML’21.
114. Sanidhay Arora, Anurag Jain, Sankarshan Damle and Sujit Gujar “*ASHWACHain: A Fast, Scalable and Strategy-proof Committee-based Blockchain Protocol*” Workshop on Game Theory in Blockchain at WINE 2020. (GTiB@WINE’20).
115. Anurag Jain and Sujit Gujar, “*Block Rewards, Not Transaction Fees Keep Miners Faithful In Blockchain Protocols*,” Workshop on Game Theory in Blockchain at WINE 2020. (GTiB@WINE’20).
116. Sankarshan Damle, Moin Hussian Moti, Praphul Chandra, and Sujit Gujar, “*Designing Refund Bonus Schemes for Provision Point Mechanism in Civic Crowdfunding*,” The 2nd Games, Agents, Incentives Workshop. (GAIW@AAMAS’20).
117. Ganesh Ghalme, Swapnil Dhamal, Shweta Jain, Sujit Gujar, Yadati Narahari, “*Ballooning Multi-Armed Bandits*,” Adaptive and Learning Agents. (ALA@AAMAS’20).
118. Susobhan Ghosh, Kritika Prakash, Sanjay Chandekar, Easwar Subramanian, Sanjay Bhat P, Sujit Gujar, Praveen Paruchuri, “*Vidyutvanika: An autonomous broker agent for smart grid environment*,” In: Policy, Awareness, Sustainability and Systems Workshop. (PASS’19).
119. Sujit Gujar and Boi Faltings, “*Auction Based Mechanisms for Dynamic Task Assignments in Expert Crowdsourcing*,” International Workshop on on Agent Mediated E-Commerce and Trading Agent Design and Analysis (AMEC/TADA’15), co-located with AAMAS 2015.
120. Sujit Gujar and Boi Faltings, “*Dynamic Task Assignments: An Online Two Sided Matching Approach*,” 3<sup>rd</sup> International Workshop on Matching Under Preferences, 2015. (MATCHUP’15).
121. Sujit Gujar and Y. Narahari, “*Redistribution Mechanisms for Assignment of Heterogeneous Objects*,” Formal Approaches to Multi-Agent Systems, Torino, Italy. (FAMAS’09).
122. Sujit Gujar and Y Narahari, “*An Optimal Multi-Unit Combinatorial Procurement Auction with Single Minded Bidders*,” Managing Complexity in a Distributed World, a Centenary Conference of Division of Electrical Sciences, Indian Institute of Science. (MCDES’08).

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## PATENTS

Granted:

1. Methods And Systems for Regulating Service Layer Agreements for Multiple Cloud Services (US10210468B2)
2. Methods And Systems for Creating Tasks of Digitizing Electronic Document (US9652445B2)
3. Feedback Based Technique Towards Total Completion of Tasks in CrowdSourcing (US9727881B2)
4. Methods And Systems for Determining Computational Resource Requirement (US9678796B2)

5. Method And System For A Text Data Entry From An Electronic Document (US8867838B2)
6. Methods And Systems for Sharing Computational Resources (US9471369B2)

Published:

7. Cloud Computing Infrastructure (US20150134396)
  8. Methods And Systems for Operating A Marketplace for Software Products (US20150088680)
  9. Method and System for Recommending CrowdSourcability of a Business Process (US20140058784)
  10. Method And System For Recommending One or More Crowdsourcing Platforms/Workforces for Business Workflow (US20150120350)
  11. Methods And Systems for Crowdsourcing a Task (US20140358605)
  12. Methods And Systems for Crowdsourcing of Tasks (US20160071048A1)
  13. Method And System for Providing Access to CrowdSourcing Tasks (US20140304833)
  14. Methods And Systems for Offline Processing of Tasks (US20160379315A1)
- 

## SUPERVISION OF STUDENTS

### Post-Doctoral Students

- Anjali Gupta. (Aug'25-)

### Doctoral Students

- Sanjay Chandlekar.  
“*AI-Based Autonomous Broker for Smart Grids: Theory, Design and Practice*,” (July 2025, Applied AIML Associate JP Morgan and Chase)
- Sankarshan Damle.  
“*Privacy-preserving, Fair, and Game-theoretically Sound Multi-agent Systems*” (July 2024, Post-doctoral at EPFL)
- Manisha Padala.  
“*Fairness in Artificial Intelligence based Decision Making*” (July 2023, Faculty Position at IIT Gandhinagar)
- Mohammad Rasheed Ahmed.  
Role of Game Theory in Blockchains. (Just started)

### Master's Students

#### Currently Supervising

- Monosij Roy, Pronoy Patra, Parth Desai.

#### Graduated

Name. “*Thesis title*” (Graduation) (First Position)

- Avyukta Manjunatha Vummintala. (July 2025) “*The Geometry of Fairness: Post-processing through ROC Spaces*,” (Pre-doc at Microsoft Research, India )

- Varul Srivastava. (July 2025) “*Security and Decentralization of Blockchains in the presence of Rational Players* ,” (SDE, Oracle India)
- Sambhav Solanki. (December 2024) ‘*Optimizing Federated Agents For Fairness And Privacy In Bandits*‘ ,” (SDE, Jio India )
- Debojit Das. (December 2023) “*Budget Combinatorial Multi-Armed Bandits*,” (SDE, LimeChat)
- Shaily Mishra. (December 2023) “*Fair and Efficient Resource Allocation*,” (Data Scientist at Microsoft)
- Shantanu Das. “*Achieving Individually Fair Personalized Pricing*,” (July 2023) (Associate Researcher, IIT Hyderabad)
- Anurag Jain. “*Role of Game-Theory and Fairness in Designing Blockchain Protocols*” (March 2023, IIITH) (Developer at AlphaGrep)
- Samhita Kanaparthi. “*Agent Reputation and Reward Fairness in Peer-Based Crowdsourcing Mechanisms*” (January 2023, IIITH) (Sr.Developer at Samsung Research, India)
- Kritika Prakash. “*Privacy Attacks in Reinforcement Learning with Sensitive Rewards*” (April 2022, IIITH) (Pre-doctoral at Google Research)
- Shoeb Siddaqui. “*Blockchain: Ecosystem, Security and Performance*” (June 2021, IIITH) (Developer, Magneta Finance)
- Kumar Abhishek. “*Design and Analysis of Algorithms for Combinatorial Multi-arm Bandit Problems under Complex Environments*” (May 2021, IIITH) (Sr Engineer at Target)
- Moin Hussain Moti. “*Fair, Secure and Trustworthy Crowdsensing in Spontaneous Localized Settings*” (May 2020, IIITH) (Phd student @HKUST)
- Susobhan Ghosh. “*Learning Strategies for Power Trading in Smart Grids*” (July 2019, IIITH) (PhD @Harvard)
- Drissi El Kamili Souleimane. “*Better Patrolling Strategies to Detect Fare Invasion*” (EPFL, Spring 2015)
- Drissi El Kamili Nassim. “*Building Teams: A Co-operative Game Theory Approach And Scalable Solution*” (EPFL, Spring 2015)
- Tasorn Sornnarong. “*Dynamic Matching in Crowdsourcing Platform*” (Optional Thesis at EPFL, Spring 2014)

## Undergraduate Students

- Prabhav Kaula. “*Fair, Unconditional Generative AI*” (January 2023, BITS Pilani)
- Sanidhay Arora. “*ASHWACHain – A Fast, Scalable and Strategy-proof Committee-based Blockchain Protocol*” (IIITH, June19-May21) (Phd @ University of Oregon)
- Ayush Deva “*MAB-based Subset Selection*”(IIITH, May17-May20) (Start-up)
- Ganesh Vanahalli “*Bitcoin Protocol under Transaction Fee Only Model*” (IIITH, July19-Nov19) (PhD @ Boston University)
- Vedant Sareen, Deepanshu Garg. “*Role of Game Theory in NLP*” (IIITH, May-17-Apr19)

- Plancherel Nicolas Bernard Lucien. “*Exploring Pay What You Want Strategy for Pricing A New Product in Monopolistic Market*” (EPFL, Spring 2015)
- Mizraji Thomas. “*Securing Auctions*” (EPFL, Fall 2014)

## Research Interns

- Mayank Bhardwaj (IISc)
- Dimitrios Chatzopoulos (HKUST)
- Sahil Singh (IIT Kharagpur)
- Sneha Maheswari (IIT Roorkee)
- Teja Gowtham (University of Hyderabad)

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## TEACHING EXPERIENCE

*Technical* ( ★ indicates designed and proposed by me)

- ★ Fairness, Privacy and Ethics in AI (IIITH Monsoon 2023,22)
- Data Structures and Algorithms (IIITH Spring 2024,23,22,21)
- ★ CSE512: Distributed Trust and Blockchains (IIITH Monsoon 2022,21,20,19,18, Spring’18)
- CSE435: Advanced Computer Networks (IIITH Monsoon 2020,19,18)
- CSE481: Optimization Methods (IIITH Spring 2018,17)
- ★ CSE498: Introduction to Game Theory (IIITH Spring 2024,23,22,21,20,19, Monsoon 2018,17,16)
- ★ CS715: Advanced Topics in Algorithmic Game Theory and Mechanism Design (EPFL Spring 2015)
- Teaching Assistant for CS430: Intelligent Agents at EPFL (Fall 2014). and CS436: Computational Game Theory and Applications at EPFL (Fall 2014).

*Executive Education*

- Coordinator “*Blockchains and Distributed Ledger Technologies*” (10 Cohorts, all with very high NPS)
- Instructor “*Software Engineering for Data Science*”
- Guest Faculty multiple times “*AI/ML*”

*Non-Technical*

- Human-Values-I (IIITH Monsoon 2020,16)
- Human-Values-II (IIITH Spring 2020,17)



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## COURSE WORK AT IISc

Cryptography	Game Theory	Analysis-I
Network Storage and Security	Design and Analysis of Algorithms	Topology
Data Structures	E-commerce	Linear Algebra
Computational Methods of Optimization	Computer Communication Networks	Topics in Approximation Algorithms
Discrete Structures	Pattern Recognition	

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## INDUSTRY EXPERIENCE

### October 2018 – March 2019

Dunyalabs: Served as an Academic Advisory

### Feb 2018 – June 2018

TCS: Served as Research Advisory

### Sep 2017 – March 2018

Finmee Technologies: Served as Research Advisory

### January 2011 - November 2013

I worked as a **Research Scientist** in **Xerox Research** Center, India (XRCI).

At XRCI, I worked on *Enterprise crowdsourcing* where we explored opportunities for enterprises to leverage the advantages of crowdsourcing proposed methodologies to enable it. This work lead to a pilot on Amazon Mechanical Turk (AMT). I also worked on *Marketplace for Compute Infrastructure* and *Economic Models for Cloud Computing*. My work at XRCI has resulted in six granted patents, eight published patents, and four research publications.

### July 2001 - July 2004

I worked as Software Engineer in PACE Soft Silicon Pvt. Ltd. During this period, I acquired various skills, such as programming for multiprocessor environment, cryptography, network security, and multimedia related technologies. I got exposure to working with various embedded OS/ RTOS (Real Time Operating Systems) on different platforms.

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## APPENDIX: Research Summary and Plan in Detail

My research since I joined IIITH has resulted in 70+ peer-reviewed archival/non-archival publications. These publications include 24 AAMAS (Core A\*), 2 AI Journal, 5 AAAI, 5 IJCAI, 4 ECAI, 5 PRICAI, 4 Wi-IAT, 1 IEEE IoT Journal, 1 INFOCOM.

### Part I – AI based systems

#### A. Fair and Private AI

To build ethical AI systems, we need to ensure fairness in machine learning algorithms as well as the privacy of individuals. In IJCAI'20, we proposed FNNC, how one can build fair neural network-based classifiers. In DAI'21 and ICONIP'21 we proposed a framework to build classifiers that ensure fairness using techniques presented in FNNC and additionally provide privacy through differential privacy (DP) in federated learning settings. Ensuring fairness in federated learning becomes challenging as the data across clients may be heterogeneous. In CODS-COMAD'22 and follow-up work PAKDD'23, we proposed an approach to resolve these issues for face classification.

Differential Privacy (DP) is a quantitative measure of privacy in machine learning tasks. However, just assuring DP on models need not be sufficient. In our AAAI'22 work, we demonstrated this insufficiency through inverse RL attacks.

With the help of DP, we showed how a set of agents could solve an optimization problem wherein each agent has constraints and variables without revealing anything about those. This work appeared in PPAI'21 and Wi-IAT'21a.

In ECML-PKDD'22, we proposed novel MAB-based algorithms in federated settings that preserve the agents' privacy. It involved balancing when to use information from other agents and when not.

#### B. Fair Economic Design through neural networks

We were the early researchers to leverage the success of the neural network to design economic mechanisms such as auctions through neural networks. No analytical solutions to economic mechanisms are available, especially in many complex settings arising in the modern AI world. For example, to be fair, public resource allocation should charge as little as possible to the agents. In economics, such mechanisms are called redistribution mechanisms. Analytically such mechanisms are intricate designs. We showed that neural networks can learn such mechanisms. (AAMAS 2018,19). We also showed that in economic situations such as crowdfunding, where finding equilibria of the underlying games is challenging, neural networks can learn equilibria (Wi-IAT 2021b).

#### C. Fair incentives in AI systems

The systems are becoming autonomous, and the participating agents are becoming more intelligent; strategic manipulations by these agents in the AI system are inevitable if incentives for the agents to behave in a certain manner are not appropriately designed. When the agents are getting incentives, they should receive fair rewards. That is what we designed for one particular application in FaRM IJCAI'19a. In AAMAS'22 we showed in general peer-based incentive mechanism how to offer fair incentives. In Wi-IAT'21c, we showed what different fairness measures can be implemented in a strategy-proof manner.

Crowdfunding of public projects need appropriate incentives are required. In AAMAS'19 and IJCAI'19,b we showed how to design such incentives to make crowdfunding a viable option. In AAMAS'22a, we proposed a generic framework for fair rewards.

#### D. AI Techniques for Power Trading

With AI proliferation in many applications, smart grids are no exception. In AAAI'14, Jain et al. showed that machine learning techniques, namely multi-armed bandit-based algorithms, are

handy. In AAAI'20a and PRICAI'21a, we showed how machine learning and incentive engineering could reduce peak demand in smart grids. We have designed algorithms to learn users' behavior patterns and are robust to manipulations.

In IJCAI'22, AAAI'19, AAAI'20 b, and AAMAS'22b, we showed how AI techniques benefit the distributing companies to bid in wholesale markets and design tariffs in the retail market. Our effort in this direction has been rewarded as runner-up in the PowerTAC Annual Power trading competition and winner in 2021,2022.

In AAMAS'23 and IJCAI'23, we proposed a new model for customer behavior w.r.t. incentives and designed new MAB-based algorithms for reducing peak demands in smart grids.

## **Part II – Blockchain based systems**

Blockchain is one of the most significant technological innovations of this century. Blockchain technology, disruptive innovation is going to revolutionize economic institutions. E.g., blockchain technology has found useful in maintaining land records, e-governance, intellectual property management, supply-chain management, to name a few. Many industry leaders have termed it as the foundation of the fourth industrial revolution.

### **E. Information Aggregation over Blockchains**

The advent of blockchain technology has enabled a plethora of applications that were not envisioned before. In such spur of activity, many intersecting applications can help aggregate information from agents over blockchains to ensure appropriate privacy while keeping transparency in the system. However, the participating agents being strategic, novel game-theoretic mechanisms are needed to incentivize them for honest behavior/reporting. These mechanisms will be helpful in information aggregation, e-governance, etc. For example, a government needs to know whether a specific crop disease is prevalent in a locality for crop insurance settlement or needs which of two projects are more valuable to the citizens; such mechanisms are needed.

We showed how government or private entities can use blockchains to gather certain information and agent preferences in a strategy-proof manner while preserving privacy. (EMAS'19, IJCAI'19, GAIW'20, PRICAI'21 b). We have designed privacy-preserving auctions over blockchain by introducing a novel solution to Yao's Millionaire Problem, suitable for blockchains. (AAMAS'19, Wi-IAT21d). We designed Fasten for voting over a blockchain. (IEEE ICBC'21).

### **F. Fairness in Blockchain Ecosystem – NextGen Blockchains**

The challenge in making the above applications practical is scalability. Bitcoin can handle only 7 transactions per second (TPS). Though Ethereum is much faster, it is not scalable to involve the whole nation. The key idea behind bitcoin/Ethereum achieving consensus across the network is leader selection, who proposes the next block. In ASHWACHain (GTiB@WINE'20), we designed blockchain protocol to have throughput of 700 tps.

In AAMAS'20 we showed that if bitcoin is matured as a currency, in long run, the transaction fee-based model for incentivizing miners may lead to inefficient equilibria. We proposed a minimum transaction fee-based model for bitcoin that is fair to the miners. In AAMAS'21, we were the first one to show with introducing new measures that if we scale blockchain systems, it may become unfair to miners with slower internet access. This work received the best poster at AAMAS21.

## **Ongoing Research Activities**

### **A. Ethical AI**

From the ProPublica's findings about COMPASS, an ML tool developed to assist judges in US, being unfair to non-whites, researchers are worried about fairness in AI. Additionally, there are ethical questions are arising in AI based recommendations, decisions, esp. after Ubers autonomous car hitting a cyclist. I am interested in building ethical AI systems, especially how to do fair classification which does not favor any particular sensitive attributes, ensures privacy. Currently, we are looking into federated settings, where such issues are challenging to address as the existing

ones fail to compute gradients. I am planning to explore this are further.

## **B. Fair Pricing**

With access to historical data, the ECOM platforms distinguish their customers based on their features and offer personalized pricing. It definitely improves revenue for the seller. It may be good to receive personalized discounts, however, at times, it may be unfair for somebody to pay lot higher for the same product as compared to another person having similar features. How one can design fair personalized pricing schemes?

## **C. Fairness in Public Decisions**

If we want to raise funds for public projects, aggregate preferences of citizens, as we proposed, civic crowdfunding (CC) (sometimes referred as participatory budgeting) is an interesting option. We have been working on developing theory and right incentives to design such mechanisms. However, typically, there could be multiple projects available for CC. What are fairness axioms that one should look for? How to select which projects should be funded? How would the strategic agents behave at equilibrium? There are many algorithmic challenges as the underlying combinatorial problems are harder than knapsack. Additionally, incentive design is non-trivial, and fairness is the list explored in this direction. We are currently working towards solving the above challenges. Part of it is in collaboration with Prof Haris Aziz from UNSW, Australia.

## **D. Privacy Preserving Decentralized Optimization**

As we shown in our Wi-IAT21a, multi-agent optimization that preserve individual privacy is possible without getting into cryptographic operation. There are two issues (i) differential privacy (DP) being strong measure, it comes at the cost in performance. Can we use weaker notions of DP such as Bayesian DP to improve the quality of the solutions? This work is in collaboration with Prof Boi Faltings from EPFL. (ii) As we shown in AAAI'22, DP ensures privacy only in certain way and there could be other adversarial attacks and DP may not be able to provide guarantees in other aspects. Can we built algorithms to ensure privacy and protect systems against such attacks? This work is in collaboration with Dr. Praveen in IIITH.

## **E. NextGen Blockchain Protocols**

I am currently working on how much can be thrown away from blockchains and still everybody is convinced the blockchain data is correct. Recent work by Kiyayas et al proposed poly (log n) storage protocols for blockchains where n is number of blocks mined so far. It supports only upto 1/3 rd adversary. We are looking into (a) can we do better than poly (log n)? (b) Can we support up to 50

In a nutshell, I am looking at different aspects of AI and blockchain-based systems. The research is going to impact in making AI systems fairer, ethical, and strategyproof.

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