

Maneesha Papireddygar

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Research Interests

Micro-economic Theory, Algorithmic Economics, Automated Market Makers, Wagering Mechanism, Online Learning Algorithms, Information Elicitation and Aggregation

Education

- 2020 - 2025* **PhD, Theoretical Computer Science**, [University of Colorado Boulder](#), Boulder, Aggregate: 3.76/4.
- Research Advisor : [Prof. Bo Waggoner](#)
- 2018 - 2020 **Master of Arts, Economics**, [Delhi School of Economics](#), (DSE), Delhi, Aggregate: 75.07/100.
- Research Advisor : [Prof. Abhijit Banerji](#)
- 2011 - 2015 **Bachelor of Technology - Major in Computer Science Engineering**, [International Institute of Information Technology \(IIIT\) Hyderabad](#), India, Aggregate: 82.9/100.
- Project Advisor : [Prof. Rajan K.S.](#)
- 2009 - 2011 **Higher Secondary Examination (Standard 12th)**, [Sri Chaitanya Junior College](#), Hyderabad, India, Aggregate: 94/100.

Papers

Contracts with Information Acquisition, via Scoring Rules EC 2022 - Maneesha Papireddygar and Bo Waggoner. Link - <https://dl.acm.org/doi/abs/10.1145/3490486.3538261>

An Axiomatic Characterization of CFMMs and Equivalence to Prediction Markets - Rafael Frongillo, Maneesha Papireddygar and Bo Waggoner. Link - <https://arxiv.org/abs/2302.00196>

Scholastic Merits

- 2022 Recipient of Casey Feldman Memorial Scholarship for volunteer work.
- 2018-2019 Ranked 7th among 250 students (top 3 %) at Delhi School of Economics.
- 2018 Recipient of Smt. Shanti Sharma Memorial Scholarship at Delhi School of Economics.
- 2018 Secured All-India 5th rank in DSE entrance exam, 2018.
- 2012 Recipient of Dean's List of Academic Excellence Award for 2nd semester at IIIT Hyderabad.
- 2011 Ranked All India 84 (top 99.99 %) over a million students in [All India Engineering Entrance Exam \(AIEEE\)](#)
- 2011 Ranked All India 2267 (top 99.56 %) out of about 400k students in [IIT Joint Entrance Exam \(IIT-JEE\)](#)
- 2011 Among the 300 students in India selected for National Physics Olympiad.
- 2011 Among the 300 students in India selected for National Astronomy Olympiad.

Research And Professional Experience

- May - Aug **Summer Research Intern**, *DIMACS, Rutgers University*.
- 2023 Research advisor - Prof. David Pennock

- May - July **Research Intern**, *Indian Statistical Institute(ISI), Kolkata, India.*
 2019 Theoretical research - Did exploratory work on single sided stable matching algorithms, equivalence of these mechanisms(RSD, random TTC etc) under uniform distribution.
- Jan - March **Research Assistant**, *University of York, UK.*
 2019 Applied - Worked with Prof. Anindya Bhattacharya on automating data refinement and scraping
- July 2015 - **Software Developer**, *Citrix R&D India Pvt. Ltd, Hyderabad, India.*
 Nov 2016 Worked on Apache CloudStack - an open source software designed to deploy and manage large networks of virtual machines, as a highly available, highly scalable Infrastructure as a Service (IaaS) cloud computing platform.
- May - July **Undergraduate Summer Intern**, *Progress Software., Hyderabad, India.*
 2013

Service

- Sub-reviewer Symposium on Discrete Algorithms (SODA) 2023.
- Volunteer Economics and Computation (EC) 2022, Boulder, 12-15 July, 2022.
- Volunteer Conference of Learning Theory (COLT) 2021, Boulder, 15-19 August, 2021.
- Volunteer Winter School 2019, Delhi School of Economics, 10-13 December, 2019.
- Volunteer Winter School 2018, Delhi School of Economics, 10-13 December, 2018.

Projects

- March 2022 - **An Axiomatic Characterization of CFMMs and Equivalence to Prediction Markets**, with [Prof. Bo Waggoner](#), [Prof. Rafael Frongillo](#), University of Colorado, Boulder, Wine poster.
 ongoing
- Constant-function market makers (CFMMs), such as Uniswap, are automated exchanges offering trades among a set of assets. We study their technical relationship to another class of automated market makers, cost-function prediction markets. We first introduce axioms for market makers and show that CFMMs with concave potential functions characterize "good" market makers according to these axioms. We then show that every such CFMM on n assets is equivalent to a cost-function prediction market for events with n outcomes. Our construction directly converts a CFMM into a prediction market and vice versa. Conceptually, our results show that desirable market-making axioms are equivalent to desirable information-elicitation axioms, i.e., markets are good at facilitating trade if and only if they are good at revealing beliefs. For example, we show that every CFMM implicitly defines a *proper scoring rule* for eliciting beliefs; the scoring rule for Uniswap is unusual, but known. From a technical standpoint, our results show how tools for prediction markets and CFMMs can interoperate. We illustrate this interoperability by showing how liquidity strategies from both literatures transfer to the other, yielding new market designs.
- March 2022 - **Information Aggregation in wagering mechanisms when agents have immutable beliefs**, with [Prof. Bo Waggoner](#), [Prof. Rafael Frongillo](#), [Robin Bowers](#), University of Colorado, Boulder.
 ongoing
- We look into how to aggregate immutable beliefs of agents in a wagering mechanism when the agents are Bayesian. This model has been previously discussed in Lambert et. al. 2015 but their model doesn't beat the $O(\frac{1}{m})$ worst-case bound for aggregation that just the averaging the truthful reports achieves. In order to achieve perfect aggregation, we look into giving agents a small bonus to overcome no-trade theorem instead of assuming an intrinsic utility to gamble. The hope is to tweak the bonus so agent's best response to wager reveals their confidence in the prediction, which can then be used to aggregate optimally. We also aim to generalize this aggregation mechanism to more information structures.

- May 2020 - **Contracts with Information Acquisition, via Scoring Rules**, with [Prof. Bo Waggoner](#), University of Colorado, Boulder, Appeared in ACM Conference on Economics and Computation (EC), 2022.
- Feb 2022 We consider a principal-agent problem where the agent may privately choose to acquire relevant information prior to taking a hidden action. This model generalizes two special cases: a classic moral hazard setting, and a more recently studied problem of incentivizing information acquisition (IA). We show that all of these problems can be reduced to the design of a proper scoring rule. Under a limited liability condition, we consider the special cases separately and then the general problem. We give novel results for the special case of IA, giving a closed form “pointed polyhedral cone” solution for the general multidimensional problem. We also describe a geometric, scoring-rules based solution to the case of the classic contracts problem. Finally, we give an efficient algorithm for the general problem of Contracts with Information Acquisition.
- June-July 2019 **On Equivalence of Single-Sided Matching Mechanisms**, with [Prof. Souvik Roy](#), Indian Statistical Institute, Kolkata.
- The equivalence of many one-sided matching mechanisms for indivisible objects has been discussed in papers like Pathak(2008), Carroll(2014), Sethuraman & Lee(2011). But the equivalence had only been discussed under the assumption of uniform distribution of priority structures. We looked into the conditions of the distribution for which the equivalence further holds.
- 2015-2016 **Citrix CloudPlatform (powered by Apache CloudStack)**, [Apache CloudStack](#).
- Apache CloudStack is an open source software designed to deploy and manage large networks of virtual machines, as a highly available, highly scalable Infrastructure as a Service (IaaS) cloud computing platform. CloudStack is used by a number of service providers to offer public cloud services, and by many companies to provide an private cloud offering, or as part of a hybrid cloud solution. I had worked on areasscaping across the product like its support for vmware, job monitoring, kubernetes etc..
- 2014 **Distributed Key-Value Store**, with [Prof. Vasudeva Verma](#), IIIT Hyderabad.
- Built a distributed key value store which provides an interface to store data and efficiently search on primary key and/or multiple secondary keys unlike traditional key-value stores which provides search only on primary variables. The system guarantees strong consistency by trading off little of availability. This System works on two basic concepts of Hyperspace Hashing and Value-dependent Chaining.
- 2013-2014 **Behavioural understanding of Spatial Data**, with [Prof. K.S.Rajan](#), IIIT Hyderabad.
- Project involved developing a spatial understanding, by accumulating and analyzing big data related to students’ movement in campus and outside. Aim is to derive social and behavioral patterns from the data, thus converting useless information into meaningful insights such as effects of road blockages, appropriate change in timings to control traffic in frequently used areas etc.

Computer Skills

Scientific Computing - Matlab **Programming** - C, C++, Python, Java.

Others - MySQL, Web2py, HTML **Operating Systems** - MacOS, Linux (Ubuntu), Windows.

Teaching Experience

- Fall 2021 **Teaching Assistant**, [CSCI 3104](#), “Algorithms”, CU Boulder.
- My responsibilities included taking recitation sessions, preparing homework problems and recitation worksheet, holding office hours and grading exams.
- Spring 2014, 2015 **Teaching Assistant**, [CS101](#), “Data Structures”, IIIT - Hyderabad.
- My responsibilities included taking recitation sessions, assisting students in lab sessions, holding office hours, grading homeworks and exams.

Fall 2014 **Teaching Assistant**, [CS102](#), "Algorithms", IIIT - Hyderabad.

My responsibilities included taking recitation sessions, holding office hours, grading homeworks and exams.

■ Languages

Telugu (Native) - Fluent, English - Fluent, Hindi - Fluent

■ Volunteer Work

- Volunteered for local food rescue to serve graduate students with food-insecurities.
- Volunteered for a week (40 hours) at Catalina island conservancy. Participated in conservancy activities like trail building, invasive plant removal, building enclosure etc.
- Volunteer member for resident council which worked to better graduate residents living experience
- Volunteered for a semester with a local non-profit to teach math to underprivileged kids
- Engaged in making baked goods for children in the foster system through the Cakes4kids's North Colorado chapter

■ Extracurricular Activities, Hobbies and miscellaneous

- * Learning pottery and rock climbing
- * Travel and Hiking enthusiast, done several hikes in Colorado, South India and three in the Himalayas.
- * First in women chess and second in carroms at Progress Software.
- * Wildlife photography enthusiast. Clicked 100+ birds of Indian subcontinent.

For more information visit Maneesha Papireddygaru webpage at : [Maneesha Webpage](#)