Soham Phade

University of California, Berkeley
EECS Department
Berkeley, CA 94720
United States

✉ soham_phade@berkeley.edu
http://people.eecs.berkeley.edu/~soham_phade
https://www.linkedin.com/in/soham-phade-a18ba634/

Education

University of California, Berkeley 2015 - present
Ph.D. candidate in Electrical Engineering and Computer Sciences
Advisor: Prof. Venkat Anantharam
Committee Members: Prof. Jean Walrand, Prof. Anant Sahai, Prof. David Aldous

Indian Institute of Technology, Bombay 2011 - 2015
B.Tech in Electrical Engineering (with Honors)
Minor in Computer Science
Advisor: Prof. Vivek Borkar

Research Interests

I am interested in the incentive-centered design of market-based mechanisms and algorithms in social and economic networks for the purpose of increasing human welfare and building efficient commercial systems that interact with humans.

Network Economics	Game Theory	Behavioral Economics
Prospect Theory	No-regret Dynamics	Mechanism Design

Awards and Achievements

Best Paper Award at GameNets, 2019

Undergraduate Research Award, IITB, 2015

IUSSTF Viterbi-India Program Scholarship, USC, 2014

National Board of Higher Education Nurture Scholarship, TIFR, 2012

All India Rank 65 in IIT JEE, 2011

Best Solution Award at International Mathematics Olmpiad Training Camp, HBCSE, 2010

Research Experience

Ph.D. Thesis, UC Berkeley 2015 - present
Title: Behavioral Network Economics
Advisor: Prof. Venkat Anantharam
Goal: Study problems in network economics and game theory using sophisticated behavioral models from psychology, decision theory, and learning theory to design mechanisms and algorithms better aligned with human interaction and welfare.

Designed optimal resource allocation and pricing algorithms for networks and scheduling problems via *lottery-based mechanisms*. Showed applications to improving the design of communication networks and cloud computing services.

Studied game-theoretic models with agents having *cumulative prospect theory* (CPT) preferences. Defined relevant notions of equilibrium - extensions of the traditional notions and new notions. Established properties of theoretical, methodological, and practical interest. Studying implications for mechanism design, such as auctions and matching markets.

Proposed a *novel solution concept* for n-player balanced cooperative games that satisfies *stability* properties - always lies inside the core of the game - and has *fairness* properties similar to the Shapley value.

It has applications to distributing reward, revenue, or budget allocations in collaborative environments, such as academic collaborations, joint ventures, etc.

Studied convergence properties of the action play in repeated games when players adopt no-regret learning based strategies. It provides alternative explanations for equilibirum concepts from a behavioral and evolutionary perspective.

Applied Scientist Intern, Amazon AI and Search, Berkeley Summer 2019
Team: Machine Intelligence and Decision Analytics (MIDAS)
Project: Session-Aware Search Recommendations
Mentors: Prof. Inderjit Dhillon, Daniel N. Hill, Kedarnath Kolluri

Designed and implemented an algorithm to improve Amazon's search recommendations based on customer's past queries, clicks, and purchases. Resulted in improving the relevance of search recommendations. Methods used: extreme multi-label classification, reinforcement learning (Q-learning).

Bachelor's Thesis, IIT Bombay 2014 - 2015
Title: A Distributed Boyle-Dykstra-Han Scheme
Advisor: Prof. Vivek Borkar

Proposed a provably convergent distributed variant of the Boyle-Dykstra-Han scheme for projecting on the intersection of a finite family of convex sets.

Viterbi Internship, USC Summer 2014
Project: A Queuing model for Freeway Traffic
Advisor: Prof. Rahul Jain

Modeled freeway traffic as a queueing process and analyzed its Nash equilibrium under the fluid limit.

Teaching Experience

Graduate Student Instructor, UC Berkeley

CS70: Discrete Mathematics and Probability Theory Fall 2019
Duties: Content creation, weekly discussions, office hours, homework parties, review sessions, Piazza, grading

EE226A: Random Processes in Systems Fall 2017
Duties: Content creation, weekly discussions, office hours, review sessions, grading, class lecture ($\sim$90 mins on non-causal Weiner filter and hypthesis testing)

Teaching Assistant, IIT Bombay

Math205: Complex Analysis Fall 2013
Duties: Weekly discussions, grading

Publications

S. Phade and V. Anantharam (2019). "Optimal Resource Allocation over Networks via Lottery-Based Mechanisms." *International Conference on Game Theory for Networks*, pp. 51–70. Springer, Cham (*Best Paper Award*)

S. Phade and V. Anantharam (2019). "On the Geometry of Nash and Correlated Equilibria with Cumulative Prospect Theoretic Preferences." *Decision Analysis* 16(2), 142-156.

S. Phade and V. Borkar (2017). "A Distributed Boyle-Dykstra-Han Scheme." *SIAM journal on optimization* 27(3), pp.1880-1897

Articles in Progress

V. Gupta, S. Phade, T. Courtade, K. Ramchandran. "Utility-Based Resource Allocation and Pricing for Serverless Computing." *Under review*. arXiv:2008.07793

S. Phade and V. Anantharam. "Learning in Games with Cumulative Prospect Theoretic Preferences." *Under review*. arXiv:1804.08005

S. Phade and V. Anantharam. "Black-Box strategies and Equilibrium in Games with Cumulative Prospect Theory Preferences." *Under review*. arXiv:2004.09592

V. Muthukumar, S. Phade, A. Sahai. "On the Impossibility of Convergence of Mixed Strategies with No-Regret Learning."

S. Phade and V. Anantharam. "A Fair and Stable Solution Concept for Balanced Cooperative Games."

Presentations

9th EAI International Conference on Game Theory for Networks, GameNets 2019, April 25-26, Paris. "Optimal Resource Allocation over Networks via Lottery-Based Mechanisms."

The 29th International Conference on Game Theory, Stony Brook University July 16 - 20, 2018. "Learning in Games with Cumulative Prospect Theoretic Preferences."

55th Annual Allerton Conference on Communication, Control, and Computing, Allerton Oct. 4 - 6, 2017. "On the Geometry of Nash and Correlated Equilibria with Cumulative Prospect Theoretic Preferences."

Service Activities

Reviewer: IEEE Transactions on Control of Network Systems

Student Reviewer for Graduate Admissions: EECS Department at UC Berkeley, Fall 2018, Fall 2019, and Fall 2020.

Mentoring: International Mathematics Olympiad aspirants from India.

Graduate Level Courses

Communication: Stochastic Processes, Coding Theory, Information Theory

Math: Functional Analysis**, Dynamical Systems, Topology

Computer Science: Combinatorial Algorithms and Data Structures, Sum of Squares**, Optimization*, Image Processing*, Computer Vision*, Game Theory*, Graph Theory*

Statistics: Advanced Probability, Statistical Learning Theory

(*completed as part of undergraduate curriculum, **audited)

Skills

Programming languages & Software: C, C++, Python, PyTorch, Matlab, Mathematica, LaTeX, Git

References

Venkat Anantharam
Professor, EECS, UC Berkeley
ananth@eecs.berkeley.edu

Kannan Ramchandran
Professor, EECS, UC Berkeley
kannanr@eecs.berkeley.edu

Thomas Courtade
Associate Professor, EECS, UC Berkeley
courtade@eecs.berkeley.edu

Vivek Borkar
Professor, EE, IIT Bombay
borkar.vs@gmail.com