SIGecom Job Market Candidate Profiles 2018

Edited by VASILIS GKATZELIS and JASON HARTLINE

This is the third annual collection of profiles of the junior faculty job market candidates of the SIGecom community. The eighteen candidates for 2018 are listed alphabetically and indexed by research areas that define the interests of the community. The candidates can be contacted individually or via the moderated mailing list ecom-candidates2018@acm.org.

–Vasilis Gkatzelis and Jason Hartline

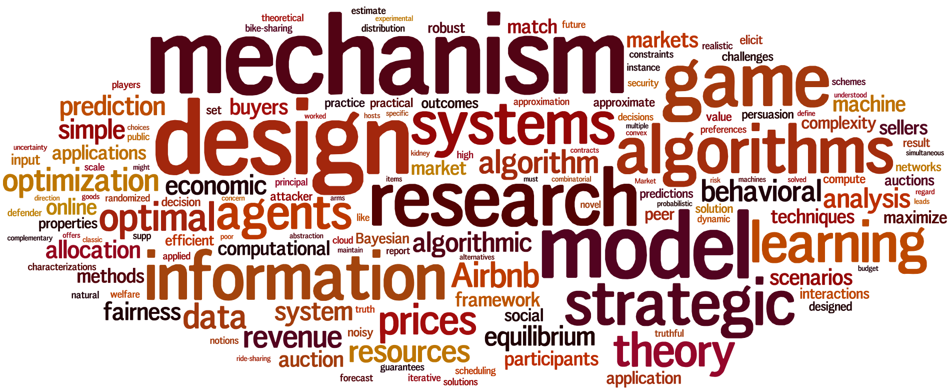

Fig. 1. Generated using the research summaries of the candidates.

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MICHAEL ALBERT

Thesis. Executive Compensation and Firm Leverage (supervised by David Robinson)

Advisor. Vince Conitzer, Duke University

Brief Biography. I am currently a post-doc in the computer science department at Duke University. I started my academic career as a PhD student in the finance group at the Fuqua School of Business at Duke University, supervised by David Robinson. While doing my PhD, I also did a master's in computer science, advised by Vince Conitzer. Following graduation, I took a visiting professorship at the Ohio State University where I taught international finance at the undergraduate and MBA level. At this time, I decided to pursue a research direction that was inconsistent with being in a finance department and I took a one year post-doc position at the University of Texas at Austin working with Peter Stone on tolling mechanisms for routing autonomous vehicles. Following my time at UT-Austin, I rejoined Duke University, but this time as a post-doctoral researcher in the Computer Science department, again working with Vince Conitzer.

Research Summary. I am interested in combining insights and techniques from the mechanism design literature, the robust optimization literature, and the machine learning literature to design systems under which self interested agents can be directed towards a goal specified by the system designer.

While there has been much work demonstrating that in many situations relatively simple mechanisms can perform quite well, there are still significant advantages from incorporating distributional information into the design of mechanisms. Specifically, if the types of agents are correlated, then there exist mechanisms under which a seller of a good can do as well as if she knew all of the private information of the bidders, a setting we fully characterized in a AAAI 16 paper, and there exist mechanisms that are socially efficient and budget balanced, side-stepping existing impossibility results. However, in a AAAI 15 paper, we showed that these mechanisms require very precise information over the distribution of agents, and if this full information assumption is relaxed to allow for situations under which the mechanism designer is estimating the distribution, then existing mechanism design techniques can catastrophically fail. To overcome this, in a paper in AAAI 17, we provide a novel, computationally efficient mechanism design technique that robustly incorporates imprecise estimates of the distribution, both maximizing revenue in an auction setting when the distribution is well estimated, while maintaining robust properties when the estimate is imprecise.

In an AAMAS 17 paper, we designed a real time, adaptive tolling schemes to more efficiently utilize road networks. This was the first such scheme to be demonstrated in micro-simulation to actively and efficiently adapt to changing traffic demand and in doing so reduced travel time by 25% while increasing social welfare by 33% on realistic road networks.

During my PhD, I worked on explaining observed variations in firm debt choices as a consequence of CEO compensation schemes. Specifically, my research demonstrated that CEOs that receive a large portion of their compensation in equity based contracts have an incentive to reduce the leverage of their firm. This is a consequence of the large equity stake creating an increased perception of the risk of defaulting on debt.

Representative Papers.

[1] Automated Design of Robust Mechanisms (AAAI 17)
with V. Conitzer and P. Stone

[2] Mechanism Design with Unknown Correlated Distributions: Can We Learn Optimal Mechanisms? (AAMAS 17) with V. Conitzer and P. Stone

[3] Maximizing Revenue with Limited Correlation: The Cost of Ex-Post Incentive Compatibility (AAAI 16) with V. Conitzer and G. Lopomo

HEDYEH BEYHAGHI

Thesis. Effect of Selfish Choices in Deferred Acceptance with Short Lists

Advisor. Éva Tardos, Cornell University

Brief Biography. Hedyeh Beyhaghi is a Ph.D. candidate in computer science at Cornell University, advised by Éva Tardos. Her research lies in theoretical computer science with a focus on mechanism design. Specifically, she is interested in algorithmic mechanism design, approximately-optimal mechanisms and matching markets. Hedyeh was a long-term visitor at the Simons Institute, UC Berkeley in Fall 2015. During summer 2017, she worked as an intern at Google focusing on Ad exchange. She will be a visiting graduate student at Princeton University in fall 2017.

Research Summary. My research focuses on mechanism design for problems stemming from real-world applications from the aspects of practicality, optimality and simplicity. Considering these aspects, below is a summary of my work in two research areas: Matching markets and approximately-optimal simple mechanisms.

Within matching markets, I have studied real-world problems including: Strategic behavior with limited application lists; strategic grading; and early offers and contracts. For example, in one of my research projects, I evaluated the outcomes of deferred acceptance when applicants can only apply to a limited set of positions. This limitation requires applicants to make a strategic choice about the quality of positions they intend to apply. I studied the effect of these strategic choices on participants' preferences and the overall welfare. We found that applicants' choices in our model mirror the behavior observed in real systems where individuals apply to a mix of positions consisting mostly of positions where they are reasonably likely to get accepted, as well as several "reach" positions that are of very high quality, and several "safe" positions with lower than their expected quality level. In another project, we used a game-theoretic model to study two well-known phenomena in the matching process: strategic grading and early offers and contracts. We analyzed the welfare loss compared to the optimal assignments in markets that deal with these strategic behaviors.

Within another line of research, I am working on designing and analyzing simple auctions with applications to ad exchange. Due to implementation complexity, Myerson's optimal mechanism for heterogeneous bidders is not commonly used in practice. Therefore, designing simple mechanisms with better approximation ratios is of great importance, especially given the huge impact of ad markets on the revenue of ad companies. In this ongoing project, following the trend of designing and analyzing simple mechanisms, I am working on developing new practical mechanisms and compare their performance with existing simple mechanisms.

Representative Papers.

[1] Effect of Selfish Choices in Deferred Acceptance with Short Lists (MATCH-UP 2017) with D. Saban and É. Tardos

[2] Effect of Strategic Grading and Early Offers in Matching Markets (SAGT 2015) with N. Dikkala and É. Tardos

ANDREY FRADKIN

Thesis. The Welfare Effects of Peer Entry in the Accommodations Market: The Case of Airbnb

Advisor. Jonathan Levin, Stanford University

Brief Biography. I am an economist who studies the economics of digitization and the economics of search and matching markets . I've written papers on topics such as the design of Airbnb's search and matching algorithm, reputation systems, online job search, and 401(k) contribution choices by workers. My current position is as a Postdoctoral Fellow at the Initiative on the Digital Economy at MIT. My research has been published in both economics journals (The American Economic Review, The Review of Economics and Statistics) and computer science conferences (ACM-EC). I've provided expert input about the digital economy at the President's Council on Science and Technology and the Federal Trade Commission. Prior to MIT, I worked as a data scientist at Airbnb while completing a Ph.D. in Economics at Stanford University.

Research Summary. My research interests include the design of online platforms, the effects of digitization on economic outcomes, the use of digital data to better understand search and matching. The setting of most of my prior work is Airbnb. My job market paper, "Market Structure with the Entry of Peer-to-Peer Platforms: The Case of Hotels and Airbnb" (with Chiara Farronato), studies the effects of Airbnb on the market for accommodations. We first demonstrate how the effects of Airbnb on the hotel sector vary across cities due to differing levels of supply constraints in those cities. We then estimate a model of competition between Airbnb hosts and hotels and use it quantify consumer surplus, host surplus, and the effects on hotel revenue. We show that the gains from Airbnb are especially large in constrained cities during periods of high demand, due to the fact that Airbnb hosts are highly responsive to prevailing market prices.

In other Airbnb related research, I use both experiments and observational data to study the economic effects of design decisions regarding reputation systems and search engines. In a project called, "The Determinants of Online Review Informativeness: Evidence from Field Experiments on Airbnb", I (along with Airbnb data scientists) study two experimental changes to the reputation system of Airbnb. The first change offered guests a $25 coupon to submit a review. The second change implemented a simultaneous-review system, which prevented strategic reciprocity in reviews, making those reviews more informative. We propose a methodology for measuring reputation system informativeness and use the experimental results to show that the aggregate effect of sorting on average ratings is substantially larger than the effect of strategic reciprocity.

Two of my other papers study search and matching on Airbnb. The first paper, "Search, Matching, and the Role of Digital Marketplace Design in Enabling Trade: Evidence from Airbnb", studies the costs that prevented trade from occurring before the existence of the Airbnb marketplace and the role of search engine design in alleviating these costs. I show that without an appropriately designed search engine, these costs would be far greater. For example, the share of inquiries that are be rejected by hosts would increase by 144% without availability tracking and filtering in the search engine. In a final paper, I design an empirical simulation to study the equilibrium effects of market design.

Representative Papers.

[1] Bias and Reciprocity in Online Reviews: Evidence from Field Experiments on Airbnb (EC 2015) with E. Grewal, D. Holtz

[2] The Welfare Effects of Peer Entry in the Accommodations Market: The Case of Airbnb with C. Farronato (job market paper)

[3] The Welfare Economics of Default Options in 401(k) Plans (American Economic Review 2015) with D. Bernheim and I. Popov

RUPERT FREEMAN

Thesis. Eliciting and Aggregating Information for Public Decision Making

Advisor. Vincent Conitzer, Duke University

Brief Biography. Rupert Freeman is a PhD candidate in the department of computer science at Duke University, advised by Vincent Conitzer. His research focuses on artificial intelligence, particularly topics such as (computational) fair division, voting, game theory, and prediction mechanisms. Freeman is the winner of a 2017-2019 Facebook Fellowship and the Duke Computer Science outstanding preliminary exam award. During his PhD, he was a visiting student at UC Berkeley in 2015, and an intern at the Microsoft Research New York City lab in 2016 and 2017.

Research Summary. In recent work [1, 2], I have been investigating a public decision framework that generalizes the classic problem of fairly allocating indivisible goods among a set of agents. In our setting, there are a set of issues, each with an associated set of alternatives, over which agents have cardinal preferences. For example, issues could correspond to different computational resources, and the alternatives could be different ways to allocate those resources (for instance, which data to store in memory, with different applications having competing preferences). As another interpretation, issues could correspond to new public facilities, with the alternatives for each issue being the viable locations for the facilities. We adopt concepts from the fair division literature to define three novel notions of fairness in our framework, and examine (computationally feasible) ways to satisfy our fairness notions in both the special case of private goods division, where our notions apply equally well, and the general public decisions framework. Building on our analysis of the offline setting, we consider algorithms for fair decision making in the online version of the problem, where issues arrive one at a time and an alternative must be chosen before the next issue is known. In this setting, we find that greedy algorithms that aim to approximate the Maximum Nash Welfare (which satisfies several desirable properties in the offline setting) both perform well in practice, and can be justified via axiomatic methods.

Another line of ongoing work that I am excited about is designing mechanisms for eliciting and aggregating probabilistic predictions (see, e.g., [3]). One such class of mechanisms are known as wagering mechanisms, where the principal elicits reports and facilitates wagers amongst the agents, making it possible to achieve truthful mechanisms that require no subsidy. In our EC17 paper, we define the Double Clinching Auction, which leverages the auction literature to allocate securities to agents. By doing so, we achieve significantly higher stakes than existing incentive compatible wagering mechanisms, which is important for practical participation and effort incentives, while retaining desirable theoretical properties.

Representative Papers.

[1] Fair Public Decision Making (EC 2017)
with V. Conitzer and N. Shah

[2] Fair and Efficient Social Choice in Dynamic Settings (IJCAI 2017)
with V. Conitzer and S. M. Zahedi

[3] The Double Clinching Auction for Wagering (EC 2017)
with D. M. Pennock and J. W. Vaughan

DANIEL FREUND

Thesis. Models and Algorithms for Transportation in the Sharing Economy

Advisor. David B. Shmoys, Cornell University

Brief Biography. Daniel Freund is a PhD Candidate in Cornell's Center for Applied Mathematics. He holds a BSc in Mathematics from the University of Warwick and a MSc in Applied Mathematics from Cornell and is an alumnus of the German National Merit Foundation. His research considers optimization problems that arise at the intersection of transportation and the sharing economy. During his PhD, he spent time as a Data Scientist both at Motivate, the operator of America's largest bike-sharing systems, and at Lyft. His industry experience provided him with the context of the development of tools to cope with operational challenges arising in such systems, that then motivated theoretical models and novel algorithmic advances, which in turn had impact on real-world decision-making. He also aims to bring his industry experiences to the classroom, having TA'ed in Cornell's CS department and taught as an instructor in Operations Research. For the former, he was awarded a Yahoo! Graduate Teaching Award.

Research Summary. The recent (r)evolution of "transportation-as-a-service" has affected commuting patterns in major American cities. Yet the rise of ride-sharing apps, like Uber or Lyft, and bike-sharing systems, like CitiBike or Hubway, not only provided new opportunities for commuters, but also new challenges for operators. Common to all of these challenges are the intricate underlying network effects each ride has on supply in the system. For example, every rental of a bike at a bike-sharing station not only decreases the supply of bikes at that station but simultaneously increases the supply of docks available (for bike returns). The same phenomenon is present in ride-sharing systems. The resulting externalities, both positive and negative, make such systems academically interesting markets in dire need of optimization.

In my research, I aim to combine rigorous mathematical analysis with real data to alleviate these operational challenges. For example, my work with Shmoys and Henderson on capacity allocation in bike-sharing systems applied an inventory model frequently used in routing problems. In our work, we adapted it to the more strategic question of allocating dock-capacity in such systems and proved that the underlying discrete convexity of the corresponding optimization problem admits a provably correct, fast algorithm. Applying our algorithm to data-sets from NYC, Chicago, and Boston, we were able to inform the operators' system design, thus reducing the number of out-of-stock events that customers experience.

In orthogonal work with Banerjee and Lykouris, we studied the question of how to optimally price in queuing-theoretic models of ride-sharing systems. While our results showed that the underlying optimization problem is non-convex, we proved that a novel, elevated, relaxation can be efficiently solved and provides parametric approximation guarantees that are close to 1 in realistic regimes. Surprisingly, our analysis extended far beyond the realm of pricing, unifying parallel results on other controls employed in such systems. At Lyft, I then got to further investigate and optimize the impact pricing can have as a control.

In more traditional work in combinatorial optimization I studied the prize-collecting TSP as a model of repairmen in a bike-sharing system trying to maximize impact given a time budget (or analogously, a tasker on the task rabbit platform), and improved, with Paul, Ferber, Shmoys, & Williamson, the best known approximation guarantee to 2.

Representative Papers.

[1] Minimizing Multimodular Functions and Allocating Capacity in Bike-Sharing Systems (IPCO 2017) with S. G. Henderson and D. B. Shmoys

[2] Pricing and Optimization in Shared Vehicle Systems: An Approximation Framework (EC 2017) with S. Banerjee and T. Lykouris

[3] Prize-Collecting TSP with a Budget Constraint (ESA 2017) with A. Paul, A. Ferber, D. B. Shmoys, and D. P. Williamson

NIKA HAGHTALAB

Thesis. Foundations of Social and Economic Learning and Optimization

Advisors. Avrim Blum and Ariel Procaccia, Carnegie Mellon University

Brief Biography. Nika Haghtalab is a Ph.D. candidate at the Computer Science department of Carnegie Mellon University, co-advised by Avrim Blum and Ariel Procaccia. Her research lies in the intersection of machine learning theory, computational aspects of economics, and algorithms, with a focus on designing machine learning and optimization algorithms that account for a wide range of social and economic interactions. Nika is a recipient of the IBM and Microsoft Research Ph.D. fellowships. She was a research intern at Microsoft Research-Redmond in summer 2015, Microsoft Research-NYC in summer 2016, and a visiting student researcher at Stanford, hosted by Tim Roughgarden, in spring 2017. Nika received Bachelor of Mathematics and Master of Mathematics degrees in Computer Science from the University of Waterloo, Canada in 2011 and 2013.

Research Summary. Traditionally, learning and optimization algorithms achieve their goal by observing an entity. Increasingly, the decisions of these algorithms affect the entities they once observed, therefore causing changes in the entity's behavior. Accounting for these bidirectional interactions is essential for creating solutions that are effective in practice and present an opportunity for gaining information about the entities that we would have otherwise not known. In my research, I develop theoretical foundations for incorporating such bidirectional interactions in the design of learning and optimization algorithms. Below, I give three examples of this in my work.

In a FOCS'17 paper, we consider the problem of designing online auctions when bidder valuations may change based on the outcomes of previous auctions. In recent years, a number of works have developed high-performance tools for optimizing parameters of an auction based on historic data. However, the past is not indicative of the future, e.g., customers who buy a one-year supply of razor blades may have a lower valuation for razor blades and a higher valuation for shaving cream in the near future. Our work provides general-purpose algorithms that use little overhead to tap into existing tools, which work with historical data, thereby achieving robustness to changes in the behavior of customers without the need to build new specialized tools from scratch.

Security games model the interactions between a defender and an attacker as a game in which the defender commits to a deployment of his resources and the attacker responds by maximizing his own payoff. To compute an optimal strategy for the defender, one has to know the preferences of the attacker – information that is seldom available in real-life applications. In a NIPS'14 paper, we address this issue by learning from interactions of the defender and the attacker, i.e., by observing the responses of the attacker to a small number of security deployments.

Kidney exchange allows patients with incompatible donors to swap donors so each can receive a compatible kidney. Traditionally, the goal of a kidney exchange mechanism is to find the largest matching. However, hospitals may choose not to enroll their patients if they can match more patients on their own, as a result, decreasing the overall size of the matching significantly. In a SODA'17 paper, we introduce a near optimal kidney exchange mechanism that incentivizes the hospitals to participate.

Representative Papers.

[1] Oracle-Efficient Learning and Auction Design (FOCS 2017)
with M. Dudìk, H. Luo, R. Schapire, V. Syrgkanis, and J. Wortman Vaughan

[2] Learning Optimal Commitment to Overcome Insecurity (NIPS 2014)
with A. Blum and A. Procaccia

[3] Opting Into Optimal Matchings (SODA 2017)
with A. Blum, I. Caragiannis, A. Procaccia, E. Procaccia, and R. Vaish

SOMAYEH KOOHBORFARDHAGHIGHI

Thesis. Analyzing Socio-Economic Complex Adaptive Networks: A Hybrid Approach

Advisor. Jorn Altmann, Seoul National University

Brief Biography. Somayeh Koohborfardhaghighi is a senior research fellow and a lecturer at the Technology Management, Economics, and Policy Program at the College of Engineering of Seoul National University. She focuses her research on network formation models and economic aspects of social ties among constituents of networks. She received her M.S. degree in Information Systems from Osmania University, India, in 2010, and received her Ph.D. in Computer Science from Dongguk University in 2013, and Technology Management Economy and Policy Program of Seoul National University in 2017.

Research Summary. My main interest is in social and economic networks, and I seek to develop network-based solutions to challenging problems that arise in socio-economic complex systems. Nowadays, the need for the emergence of new systemic social qualities within different industrial sectors and organizations such as our educational systems, health care systems, decision support systems and many others are undeniable. Such systems must be designed and managed to direct the efforts of all their components towards specific goals.

My research objectives are understanding, designing, and managing socio-economic complex systems based on in-depth understanding of the economic behaviors of their agents (i.e., people, process, resources) as well as the social system, which indicates the arrangement of social interactions of their agents. With my combined approach, I expect to have a realistic view of how communities (i.e. societies, organizations) organize themselves. I can design principles for Agile Complex Systems that tradeoff between the leanest possible enterprise and achieving flexible resource use, enabling appropriate responses to contingencies. I can develop proper models of complexity using service value networks so that models with great potentials in decision-support systems can be created. I can deliver rules for managing the complexity within such systems in a way to maintain their benefits. With this approach, I can estimate the range of reasonable possibilities within such systems and I can prepare them for inevitable surprises. I can guide and regulate the evolution of such systems. This way, we can make predictions on the emergence of new systemic social qualities within such systems.

I have made several contributions in the litterateur to address some of the emerging problems in this domain. I have focused on human-centric and object-centric networks and have addressed several concepts such as Strategic Networking [3], Network Visibility [3], Game Theory, Learning and Adaptation [2], Social Capital, Intelligent Information Systems and Software as a Service [1]. I combine techniques of network analysis, complex adaptive system approach and agent-based modeling to address my research questions.

I have also recently expanded my research interests and I performed empirical analysis (using Structural Equation Modeling and Principal Component Analysis) in other research areas such as Urban Planning, Organizational Studies and Happiness Studies.

Representative Papers.

[1] A Network Formation Model for Social Object Networks (LISS 2014) with J. Altmann

[2] How Structural Changes in Complex Networks Impact Organizational Learning Performance (WEIN 2014) with J. Altmann

[3] How Network Visibility and Strategic Networking Leads to the Emergence of Certain Network Characteristics: A Complex Adaptive System Approach (ICEC 2016) with J. Altmann

CHRISTIAN KROER

Thesis. Large-Scale Sequential Imperfect-Information Game Solving: Theoretical Foundations and Practical Algorithms with Guarantees

Advisor. Tuomas Sandholm, Carnegie Mellon University

Brief Biography. Christian is a Ph.D. candidate in the Computer Science Department at Carnegie Mellon University, advised by Tuomas Sandholm. His research lies at the intersection of artificial intelligence, economics, and optimization, with a focus on practical algorithms for large-scale problems. He has worked extensively on developing theoretical foundations for practical techniques for solving large-scale extensive-form games. In addition, he also frequently works on market design problems from an algorithmic perspective. During his PhD he spent a summer as a research intern at Microsoft Research NYC, and worked both as an intern and part-time research scientist at the Facebook Core Data Science group. He is the winner of a 2016-2018 Facebook Fellowship.

Research Summary. My work centers around the application of tools from artificial intelligence, optimization, and data science to problems in games, markets, and machine learning.

Game solving. My thesis work focuses on computing equilibrium concepts in large-scale sequential games. This relies on two complementary techniques: abstraction methods and iterative optimization algorithms. In "Extensive-form Game Abstraction with Bounds", we develop the first practically meaningful bounds on solution quality when performing lossy abstraction with perfect-recall. In "Imperfect-Recall Abstractions with Bounds in Games" we extend these results to imperfect-recall abstraction. In "Theoretical and Practical Advances on Smoothing for Extensive-Form Games" we show state-of-the-art convergence-rate bounds for iterative algorithms that converge to a Nash equilibrium in the limit by developing new strong-convexity results for a class of convex functions. We also show that this leads to practical algorithms that beat state-of-the-art methods. In "Smoothing Method for Approximate Extensive-Form Perfect Equilibrium" and "Regret Minimization in Behaviorally-Constrained Zero-Sum Games" we show how optimization and learning algorithms, respectively, can be extended to the computation of approximate Nash-equilibrium refinements.

Market design. In addition to my thesis work, I also work on practically-inspired market design problems, with a focus on enabling large-scale electronic marketplaces. In "Arbitrage-Free Combinatorial Market Making via Integer Programming" we develop a convex optimization framework for decomposing the pricing of securities in a combinatorial prediction market into a series of manageable mixed-integer programs, and show that this leads to improved performance on real market data. In "Multiplicative Pacing Equilibria in Auction Markets" we develop a new class of equilibria for budget smoothing in large auction markets. We show existence results, and develop optimization methods for computing equilibria. In current work, I am investigating how techniques from market design can be combined with methods from machine learning in order to facilitate the computation of summary statistics of counterfactual outcomes in large-scale online markets.

Representative Papers.

[1] Theoretical and Practical Advances on Smoothing for Extensive-Form Games (EC 2017) with K. Waugh, F. Kilinc-Karzan, and T. Sandholm

[2] Imperfect-Recall Abstractions with Bounds in Games (EC 2016) with T. Sandholm

[3] Arbitrage-Free Combinatorial Market Making via Integer Programming (EC 2016) with M. Dudik, S. Lahaie, and S. Balakrishnan

JIEMING MAO

Thesis. Algorithms in Strategic or Noisy Environments

Advisor. Mark Braverman, Princeton University

Brief Biography. Jieming Mao is a Phd candidate in Computer Science Department at Princeton University, where he is advised by Mark Braverman. Before that, he was an undergraduate student at Tsinghua University. He is now doing a summer internship at Microsoft Research New England, working with Nicole Immorlica, Brendan Lucier and Vasilis Syrgkanis. Jieming's research seeks to understand the power of algorithms in strategic or noisy environments with tools from algorithmic game theory, communication complexity and information theory.

Research Summary. My research focuses on designing algorithms/mechanisms in strategic or noisy environments and also understanding their limits. The problems I considered are usually better understood when they are not in strategic or noisy settings. However, driven by real world applications, I think it is important to take noise and incentives into account.

One example of my work is to study multi-armed bandit (MAB) problems in strategic environments. Traditionally, MAB algorithms are designed for stochastic/adversarial/bayesian arms. However, these algorithms might be used to interact with strategic agents and they may perform poorly in those cases. In a very recent project, we study the scenario when a seller sells one identical item in each round to a buyer for many rounds. We assume the seller strategically sets the menu options and the buyer just use some MAB algorithm to decide which menu option to pick. Not too surprisingly, we show that when the buyer is using some standard MAB algorithm (like EXP3), the strategic seller can get much more than the trivial revenue. We give a full characterization of this revenue. On the other hand, we show that if the buyer is aware of the strategic environments and uses some specific MAB algorithm, then the seller cannot get more than the trivial revenue.

Other examples of my research are understanding the power of truthful mechanisms in combinatorial auctions and studying the rank aggregation with noisy comparisons. For these problems, tools from not only algorithmic game theory but also communication complexity and information theory are used.

Representative Papers.

[1] Interpolating Between Truthful and Non-truthful Mechanisms for Combinatorial Auctions (SODA 16) with M. Braverman and M. Weinberg

[2] Parallel Algorithms for Select and Partition with Noisy Comparisons (STOC 16) with M. Braverman and M. Weinberg

[3] Competitive Analysis of the Top-K Ranking Problem (SODA 17) with X. Chen, S. Gopi, and J. Schneider

BENJAMIN MILLER

Thesis. Simple Bayesian Mechanism Design

Advisor. Shuchi Chawla, University of Wisconsin - Madison

Brief Biography. Benjamin Miller is a PhD candidate in the Department of Computer Sciences at the University of Wisconsin-Madison, advised by Shuchi Chawla.

He completed his B.S. in Computer Science and Engineering Physics at Cornell University. His research focuses on designing and analyzing simple mechanisms. Benjamin was awarded a UW-Madison Cisco Systems Distinguished Graduate Fellowship in 2016 and 2017.

Research Summary. My interests lie in the intersection of algorithm design and game theory. In particular, I am interested in designing mechanisms which are simple—computationally efficient and natural for participants—yet approximately optimal.

Revenue Maximization with Many Buyers. Consider a seller with many goods for sale who wishes to maximize revenue. The optimal auction may require randomized outcomes with sensitive dependence on buyers' bids. Furthermore, running the optimal auction—or even determining the participants' optimal bids—is often computationally intractable. With Shuchi Chawla [CM'16], I showed that a much simpler mechanism which sequentially offers fixed prices (entry fee and item prices) earns a constant fraction of the optimal revenue. Our result belongs to a fruitful line of work on such simple mechanisms; ours was the first for multiple heterogeneous buyers with a broad class of valuations.

Welfare Maximization with Complements. Recent work has shown that simple pricing-based mechanisms can be very effective in allocating limited resources to maximize participants' total value. Unfortunately, strong negative results are known for pricing complements (items for which the buyer's value is superadditive). These settings arise naturally; for example, a user of a cloud resource may have no value for an allocation of compute time which is too short to complete her job. Therefore, in [CMPT], we studied more general mechanisms in which resources may be bundled before sale and buyers' valuations belong to a restricted class suitable for modeling e.g. the cloud computing problem. We showed that pricing can still obtain good guarantees in this context.

Revenue Maximization with Risk-Averse Buyers. Most work in algorithmic mechanism design assumes that buyers are risk-neutral. For example, in the simplest auction setting—one item, one buyer—a deterministic price maximizes the seller's revenue. In recent work [CGMP], we studied auction design under prospect theory, the predominant descriptive model of decision-making in the face of uncertainty. We gave a characterization of the optimal auction, which in general may be randomized. Nevertheless, we showed that a deterministic price recovers a significant fraction of the optimal revenue under a realistic bound on risk aversion. However, in a setting with repeated sales, we showed that no constant approximation is possible unless the seller has detailed knowledge of the buyer's risk attitude.

Representative Papers.

[1] Mechanism Design for Subadditive Agents via an Ex-Ante Relaxation (EC 2016) with S. Chawla

[2] Aversion to Uncertainty and Its Implications for Revenue Maximization (in submission; arXiv:1703.08607) with S. Chawla, K. Goldner, and E. Pountourakis

[3] Pricing for Online Resource Allocation: Beyond Subadditive Values (in preparation) with S. Chawla, D. Paparas, Y. Teng

ILAN NEHAMA

Thesis. Computational Issues in Judgment Aggregation

Advisor. Noam Nisan, Hebrew University of Jerusalem

Brief Biography. Ilan Nehama is currently a post-doctoral research fellow at Tel-Aviv university, hosted by Prof. Michal Feldman and Prof. Yishay Mansour from the computer science department; and Prof. Eilon Solan from the mathematics department. He completed his PhD (with specialization in rationality) at the Federmann center for study of rationality at the Hebrew university under the supervision of Prof. Noam Nisan. Additionally, he received an M.A. in computer science with specialization in rationality at the Hebrew university (supervised by Prof. Gil Kalai; Thesis title: Implementing Social Choice Correspondences using k-Strong Nash Equilibrium), a B.Sc. in CS, and a B.A. in math, both at the Technion. In addition, Ilan both studied and taught graduate microeconomics and game theory courses, studied graduate macroeconomics and graduate behavioral economics courses, and served as a lecturer in a programming course and as a TA in a graduate mathematics for CS course (All in the Hebrew university).

Research Summary. My research interests are on the boundary between microeconomics and CS, and mainly in applying the tools and perspectives, more common in CS, to analyzing real-life economic scenarios.

During my graduate studies, I worked mainly on extensions of economic characterizations to probabilistic perturbations of the properties, modeling and analysis of economic scenarios under extreme ambiguity using the worst-case prior-less approach, and on approximate mechanism design without money for facility location problems.

Approximation & Perturbation of Economic Characterizations: I'm interested in shedding light on classic characterizations in microeconomics (e.g., Arrow's Thm for SWF and von-Neumann-Morgenstern, Savage, and Anscombe-Aumann's characterizations for rational decision making) by studying the way such characterizations change when perturbing the strict properties. For instance, I studied perturbations of 'Doctrinal Paradox' scenarios in judgment aggregation: I proved that for a large family of agendas there is no mechanism that satisfies the perturbed desired properties in a non-trivial way.

Games in the Presence of Ambiguity: The common practice in economics is modeling the agents as having some Bayesian or close to Bayesian belief on the parameters of the world. In this line of research I offer methods to analyze cases in which, not only do the players not know some information on the world, but they cannot even form any kind of belief on it. Hence, this project can be seen as an extension of CS' worst-case approach to interactive scenarios. In my paper, I presented a general framework and two solution concepts - MIN-NE (which corresponds to worst-case analysis) and a refinement of it MINthenMAX-NE. I justified the new solution concepts by presenting a set of desired axioms, and applied them to two common models of interactive scenarios. I hope to continue this line of research by analyzing predictions to more general scenarios in which we expect the agents to have only a partial knowledge on the world, and by introducing information update rules to the model.

In my current postdoctoral fellowship in Tel-Aviv university, I'm working mainly on two projects: Problems of information transmission from experts to a non-expert principal (cheap-talk scenarios) and the ways the principal can utilize an a-priori symmetry in such scenarios. And studying prophet and secretary problems and their application of economic scenarios.

Representative Papers.

[1] Analyzing Games with Ambiguous Players' Types using the MINthenMAX Decision Model (AAMAS 2017)

[2] Mechanism Design on Discrete Lines and Cycles (EC 2012)
with E. Dokow, M. Feldman, and R. Meir

[3] Approximately Classic Judgment Aggregation (Annals of Mathematics and Artificial Intelligence 2013 & WINE 2011)

ALAN ROYTMAN

Thesis. Making Decisions Under Uncertainty for Large Data Domains

Advisor. Mikkel Thorup, University of Copenhagen

Brief Biography. Alan Roytman is a postdoctoral student of computer science at the University of Copenhagen. He is broadly interested in theoretical computer science, and more specifically in game theory, online algorithms, and streaming algorithms. Before coming to the University of Copenhagen, he was a postdoctoral student at Tel Aviv University, where he held the I-CORE Postdoctoral Fellowship. He received his Ph.D. in computer science from the University of California, Los Angeles, where he was advised by Adam Meyerson and Professor Rafail Ostrovsky. His Ph.D. thesis focused on applications dealing with large data that arrives on the fly, particularly online algorithms for load balancing problems and streaming algorithms for clustering problems. He received his B.A. in mathematics and computer science from the University of California, Berkeley.

Research Summary. My research mostly lies within theoretical computer science, and more specifically the area of algorithms, including algorithmic game theory, online algorithms, and streaming algorithms. My research interests in game theory concern measuring the inefficiency of equilibria for various solution concepts, along with mechanism design.

Much of my research in game theory concerns studying notions related to the Price of Anarchy in a variety of settings and algorithmic mechanism design. In particular, we are the first to define the notion of the Price of Mediation, which is the ratio of the worst correlated equilibrium to the worst Nash equilibrium. This ratio aims to quantify how much harm a selfish and inept mediator can cause to society. We give various upper and lower bounds on this ratio for general matrix games and load balancing games. My work also focuses on understanding how the presence of budgets affects the inefficiency of equilibria in simple auction formats, such as simultaneous first price and second price auctions. Moreover, in the context of mechanism design, my work includes designing pricing schemes in scheduling settings where strategic input jobs arrive on the fly and must be assigned to machines so as to keep loads balanced. We give a pricing scheme that matches the best online algorithm (i.e., where the input to the algorithm arrives on the fly and is not strategic) when machines have speeds. We also show a separation result between online algorithms and pricing schemes when jobs have arbitrary processing times on machines.

I also have research interests in the area of online algorithms. Many of my interests concern problems motivated by energy efficiency in the cloud and data centers. For instance, I have results for the setting where tasks in data centers are modeled via multidimensional vectors (where each coordinate corresponds to various components on a machine). In particular, I have studied load balancing problems and bin packing problems within this framework. In the load balancing line of work, we have designed algorithms that are simultaneously competitive against two benchmarks that are at odds with each other: energy efficiency and quality of service. In the context of bin packing, we give tight results for the setting where vectors are small relative to each bin's capacity.

Representative Papers.

[1] Makespan Minimization via Posted Prices (EC 2017)
with M. Feldman and A. Fiat

[2] Packing Small Vectors (SODA 2016)
with Y. Azar, I.R. Cohen, and A. Fiat

[3] Streaming k-means on Well-Clusterable Data (SODA 2011)
with V. Braverman, A. Meyerson, R. Ostrovsky, M. Shindler, and B. Tagiku

JON SCHNEIDER

Thesis. Learning Algorithms in Strategic Environments

Advisor. Mark Braverman, Princeton University

Brief Biography. Jon Schneider is a PhD student at the Department of Computer Science in Princeton University advised by Professor Mark Braverman. He holds a S.B. in Mathematics from MIT with a minor in Economics. He is interested in research questions at the interface between game theory and machine learning.

Research Summary. I am interested broadly in algorithmic game theory, and more specifically in understanding how learning algorithms perform (and when they fail) in a variety of strategic environments.

One line of work I am excited about is understanding how low-regret algorithms for the multi-armed bandit problem behave in strategic settings studied in dynamic mechanism design. Together with Mark Braverman, Jieming Mao, and Matthew Weinberg, we proposed a model for a strategic variant of the multi-armed bandits problem where the arms are strategic agents. In this model, when you pull an arm, instead of directly receiving a reward, the arm receives the reward and can choose how much of the reward to pass along to you. We show that, under this model, classic adversarial low-regret algorithms (such as EXP3) perform particularly poorly - there exists a simple market-sharing equilibrium for the arms where the arm-puller receives close to no revenue - yet there do exist simple mechanisms for the arm-puller which guarantee significant revenue. In more recent work, we have been analyzing the problem of how to design auctions/mechanisms under the assumption that bidders use low-regret strategies to choose their bids, and have some results forthcoming.

Another topic I find interesting is how to learn an underlying ranking of items via pairwise comparisons that may be strategic, non-transitive, or noisy. In work with Xi Chen, Sivakanth Gopi, and Jieming Mao, we developed new $\tilde{O}(\sqrt{N})$-competitive algorithms for identifying the top K out of N items from noisy pairwise comparisons (specifically, where the noise in the comparisons satisfies constraints imposed by the Strong Stochastic Transitivity model). Previous algorithms for this problem were all $\Omega(N)$-competitive at best. On the strategic side of things, with Ariel Schvartzmann and Matthew Weinberg, we examined tournament structures that minimize the incentive for pairs of players to collude, showing that random single-elimination tournaments are optimal in this instance.

I have also done work earlier in my PhD on computational aspects of information theory (ICALP 2016) and dynamical systems (Phys. Rev. Lett. 2015). I am interested in working on problems in game theory where these tools can be applied.

Representative Papers.

[1] Condorcet-Consistent and Approximately Strategyproof Tournament Rules (ITCS 2017) with A. Schvartzman and S. M. Weinberg

[2] Competitive Analysis of the Top-K Ranking Problem (SODA 2017) with X. Chen, S. Gopi, and J. Mao

[3] Multi-armed Bandit Problems with Strategic Arms (preprint, arXiv:1706.09060) with M. Braverman, J. Mao, and S. M. Weinberg

SHAI VARDI

Thesis. Designing Local Computation Algorithms and Mechanisms

Advisor. Adam Wierman, California Institute of Technology

Brief Biography. Shai is a postdoctoral scholar at the Social and Information Sciences Laboratory at the California Institute of Technology, where he works with Adam Wierman and Omer Tamuz. He completed his PhD in Computer Science at Tel Aviv University with Yishay Mansour in 2015, and spent a year at the Weizmann Institute of Science as a postdoctoral researcher working with Uriel Feige. His research interests lie primarily within the realm of algorithm and mechanism design, with a focus on local computation algorithms and fairness in dynamic games. Recently he has been working on applications of the theoretical techniques that he and his coauthors have developed to problems in optimization, learning and algorithmic game theory. He was awarded the Google Europe Fellowship in Game Theory and the I-CORE Algorithms Postdoctoral Fellowship.

Research Summary. My research focuses on developing tools for addressing new algorithmic and economic challenges posed by modern computer systems. For many problems that are considered to be "solved" by traditional standards, the solutions are impractical due to real-world constraints. My work seeks to devise new methodologies that address these issues, using techniques from various disciplines in computer science. Two main examples are the following:

Local Computation Algorithms (LCAs). In classical algorithmic models, an algorithm is given an input and is required to compute an output. When dealing with truly massive data, such as the Internet, just reading the entire input may turn out to be impossible. In 2011, we introduced the LCA framework, in which an algorithm is required to produce only a specified part of the output, and is expected to access only a "small" part of the input (without any pre-processing). For which problems and inputs are there LCAs with provably good complexity guarantees? My research in this area has centered on exploring the possibilities and limitations of LCAs. While most of the work has been theoretic, it is driven by applicability to real-world problems. In [1], we design a local computation mechanism for stable matching, under some conditions that are have been shown to commonly occur in practice. When queried on a man (or woman), we can quickly reply to whom he (she) is matched, such that the combined solution is an almost stable matching. More recently, I have been working on using LCAs to solve to a variety of large-scale problems in convex optimization, machine learning and game-theoretic settings.

Dynamic Fair Resource Allocation. For many (static) fair resource allocation problems, the problem is, for the most part, solved. Real systems, however, are usually dynamic, with users arriving and leaving the system. A major difficulty in maintaining fairness in dynamic settings comes from the price of reallocating resources. In [2], we introduce controlled dynamic fair division', in which the goal is to maximize a natural notion of fairness subject to a hard constraints on the number of disruptions allowed. We present an instance-optimal algorithm (the input to the algorithm is a vector of allowed disruptions) for the single resource case and show that we can achieve surprisingly strong fairness guarantees. I am currently working on applications of these techniques in cloud systems.

Representative Papers.

[1] Local Computation Mechanism Design (ACM TEAC 2016 and EC 2014)
with A. Hassidim and Y. Mansour

[2] Controlled Dynamic Fair Division (EC 2017)
with E. Friedman and C. A. Psomas

[3] On the Probe Complexity of Local Computation Algorithms (in submission)
with U. Feige and B. Patt-Shamir

BO WAGGONER

Thesis. Acquiring and Aggregating Information from Strategic Sources

Advisor. Yiling Chen, Harvard University

Brief Biography. I am a postdoc at the University of Pennsylvania's Warren Center for Network and Data Sciences, where I am hosted by Aaron Roth and Michael Kearns. I received my PhD from Harvard in 2016 and bachelors from Duke in 2011 (CS/math), and have participated in research internships with Google (Mountain View) and Microsoft (New England). Teaching experience at Harvard includes undergraduate theory and graduate AI/EconCS seminar courses. Non-research interests include coding, science fiction, and running.

Research Summary. I am fascinated by (probabilistic) information and its value both to people and to algorithms. Much of my research, and the focus of my thesis, is on mechanisms that coordinate agents to obtain, reveal, and aggregate information. The goal of this aggregation may be to generate an accurate forecast about a future event, produce a hypothesis to approximate a machine-learning objective, or choose a welfare-maximizing allocation under uncertainty. The approaches often incorporate perspectives and tools from game theory, AI, machine learning, privacy, and algorithms.

For example, I am particularly excited about the role of what we call substitutable and complementary information. These turn out to characterize equilibria of prediction markets and may aid in their design; and furthermore, they seem to have useful connections to algorithms and complexity of information acquisition problems. Another basic direction is the study of elicitation. This developing field of research considers the relationship between machine-learning loss functions (which can also be viewed as scoring experts' predictions) and the hypotheses or predictions produced by an algorithm or expert facing those losses.

Along with and complementary to the above, I enjoy a range of topics in AI, theory, and machine learning, e.g. differential privacy and randomized or online algorithms, leading to diverse work at venues such as HCOMP, SODA, and NIPS. In terms of style, my work is mainly theoretical and tends to identify some new problem setting or intuition, then develop theorems (and occasionally experiments) to capture that intuition. I have been fortunate to work with many wonderful researchers to develop these interests, particularly my advisor Yiling Chen, mentors at Google and Microsoft, and current collaborators at Penn.

Representative Papers.

[1] Informational Substitutes (FOCS 2016)
with Y. Chen

[2] Low-Cost Learning via Active Data Procurement (EC 2015)
with J. Abernethy, Y. Chen, and C. Ho

[3] Multi-Observation Elicitation (COLT 2017)
with S. Casalaina-Martin, R. Frongillo, and T. Morgan

JENS WITKOWSKI

Thesis. Robust Peer Prediction Mechanisms

Advisor. David C. Parkes, Harvard University

Brief Biography. Jens Witkowski is a postdoc at the Institute for Machine Learning at ETH Zurich, where he works with Andreas Krause. His research interests lie in the intersection of computer science and economics, with a focus on eliciting and evaluating crowd-sourced information. Jens has worked extensively on theoretical and empirical approaches to peer prediction and probabilistic forecasting. From August 2014 to June 2015, he was a postdoc in the Good Judgment Project at the University of Pennsylvania, developing methods for the early identification of so-called "superforecasters." From 2010–2014, Jens was a Fellow of the School of Engineering and Applied Sciences at Harvard University, where he worked on robust peer prediction mechanisms with David C. Parkes. He received his Ph.D. (2014) and Master's (2009) degrees in Computer Science from Albert-Ludwigs-Universität Freiburg, Germany.

Research Summary. I am interested in principled, robust solutions to practically relevant problems at the intersection of economics and computer science. Within this general area, my research focuses on eliciting and evaluating information that is reported by potentially self-interested participants. I have worked on both forecasting and peer prediction: in forecasting, participants report probabilities about the likelihood of a future event, where the event outcome is eventually publicly observed. Consider eliciting forecasts about the probability that there will be a lethal confrontation between China's military and the military of another country before June 1st, 2018. Eventually, it will be known whether this event materialized, and this can then be used to score the elicited forecasts, incentivizing participants to report their best estimates. In peer prediction, on the other hand, the challenge is to elicit information without ever gaining access to ground truth. Consider a survey that asks members of an academic society to report whether they have ever taken part in questionable research practices, such as p-hacking. The truth is never revealed, so that, to score a participant's report, peer prediction methods can only use the reports of other participants.

In my thesis, I developed peer prediction methods that relax the strong common knowledge assumptions of earlier designs. For example, I developed the first peer prediction method that does not rely on the common prior assumption. Moreover, we showed how machine learning can be used to learn truthful mechanisms across multiple questions. In recent work, we fully characterize the design space of all minimal peer prediction mechanisms using tools from computational geometry. This then allows us to show uniqueness of several well-known mechanisms and to develop a framework for constructing new mechanisms. In my thesis, I also developed the first Bayesian truth serum that is truthful for a finite number of participants. Recently, development economists from MIT successfully applied and positively evaluated this robust Bayesian truth serum in the field in India, where they used it to elicit community information on entrepreneurial ability. In another line of work, we combine forecasting and peer prediction to identify expert forecasters before event outcomes materialize. We also demonstrate our method's effectiveness empirically, using data from the Good Judgment Project.

Representative Papers.

[1] A Robust Bayesian Truth Serum for Small Populations (AAAI 2012) with D. Parkes

[2] A Geometric Perspective on Minimal Peer Prediction (AAAI 2016 and TEAC 2017) with R. Frongillo

[3] Proper Proxy Scoring Rules (AAAI 2017) with P. Atanasov, L. Ungar, and A. Krause

JAMES WRIGHT

Thesis. Modeling Human Behavior in Strategic Settings

Advisor. Kevin Leyton-Brown, University of British Columbia

Brief Biography. James Wright is a postdoctoral researcher at Microsoft Research. He studies problems at the intersection of behavioral game theory and computer science, with a focus on applying both machine learning techniques and models derived from experimental economics to the prediction of human behavior, especially in strategic settings.

He completed his Ph.D. in Computer Science at the University of British

Columbia (2016), where he was advised by Kevin Leyton-Brown. His dissertation won an Honorable Mention for the SIGecom Doctoral Dissertation Award.

Research Summary. A wealth of experimental evidence demonstrates that human behavior in strategic situations is often poorly predicted by classical economic models. Behavioral game theory studies deviations of human behavior from the standard assumptions, and provides many models of these deviations. These models typically focus on explaining a single anomaly. Although understanding individual anomalies is valuable, the resulting models are not always well-suited to predicting how people will behave in generic settings, which limits their application to questions of interest in algorithmic game theory, such as "What is the optimal mechanism for implementing a particular objective?".

I am interested in applying machine learning techniques to construct behavioral game theoretic models that have high predictive accuracy, and in applying these models to problems in algorithmic game theory, as well as economic problems understood more broadly. As an example of the first direction, I previously analyzed and evaluated behavioral models in simultaneous-move games, eventually identifying a specific class of models (iterative models) as the state of the art. I then proposed and evaluated an extension that improves the prediction performance of any iterative model by better incorporating the behavior of nonstrategic agents. In recent work, I have expanded my focus to modeling human learning in repeated play, both at a population level and at the level of individual players.

Despite growing interest in behavioral game theory over the past decade, many important questions about its application remain open. One direction of my current research aims to apply models from behavioral game theory to problems of prediction and analysis in real-world data.

Representative Papers.

[1] Deep Learning for Human Strategic Modeling (NIPS 2016)
with J. Hartford and K. Leyton-Brown

[2] Level-0 Meta-Models for Predicting Human Behavior in Games (EC 2014)
with K. Leyton-Brown

[3] Beyond Equilibrium: Predicting Human Behavior in Normal-Form Games
(AAAI 2010) with K. Leyton-Brown

HAIFENG XU

Thesis. On the Role of Information in Strategic Interactions

Advisors. Shaddin Dughmi and Milind Tambe, University of Southern California

Brief Biography. Haifeng Xu is a PhD candidate in the Computer Science Department at the University of Southern California, advised by Shaddin Dughmi and Milind Tambe. His research interests lie at the intersection of artificial intelligence and algorithmic game theory, with a focus on developing theoretically grounded techniques for solving real-world problems. He has worked extensively on modeling and analyzing how information affects the behavior of self-interested agents from a computational perspective. His work on addressing information leakage in game-theoretic models for security resource allocation has been integrated into the next-generation software for scheduling US federal air marshals. He is a recipient of the 2017 Google PhD fellowship and the USC CAMS prize for mathematical excellence. His work has received the 2016 AAMAS best student paper award and the 2016 SecMas Workshop best paper award.

Research Summary. Strategic interactions are often rife with uncertainty. Players' different information regarding these uncertainties creates information asymmetry, which further complicates players' strategic behavior. Despite recent progress in computational game theory, much remains to be understood with regard to the effects of information in strategic environments and their potential applications. This is the gap that my thesis research aims to bridge.

My research addresses two aspects of information. The first concerns how an agent or system designer might actively utilize an informational advantage when interacting with other agents. One of the foundational models in this space is the Bayesian persuasion (BP) model which studies how a principal with privileged access to information might use her advantage to influence another agent's decisions. We initiate a systematic algorithmic examination of the BP model and its natural generalization to the setting of persuading multiple self-interested agents, and resolve the computational complexity for each. Going beyond theory, I explore the application of persuasion in security games which concern the optimal randomized allocation of security resources to protect critical targets from adversaries' attack. This leads to novel models, new algorithmic challenges (e.g., optimal joint design of resource scheduling and persuasion scheme) and real-world applications (e.g., enhancing rangers' patrolling in conservation areas via strategic UAV signaling). Recently, with collaborators from Google, I started to investigate the application of persuasion in ad auctions to improve revenue.

The second thread of my research seeks to mitigate the harms of "information leakage" (i.e., an informational disadvantage) in games, particularly security games. For example, in the scheduling of federal air marshals for flight protection, the adversary (e.g., a terrorist) may, through surveillance or infiltration, obtain information about the protection status of outgoing flights, and use this information to predict the protection status of returning flights. To address this vulnerability, I propose the design of mixed strategies which are robust to such leakage of information. A scalable implementation has been integrated into the next-generation software for scheduling US federal air marshals. The deployment of this approach to handle similar concerns when designing patrol routes for wildlife protection is an ongoing project.

Representative Papers.

[1] Algorithmic Bayesian Persuasion (STOC 2016)
with S. Dughmi

[2] Algorithmic Persuasion with No Externalities (EC 2017)
with S. Dughmi

[3] Security Games with Information Leakage: Modeling and Computation (IJCAI 2015) with A. X. Jiang, A. Sinha, Z. Rabinovich, S. Dughmi and M. Tambe

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