

Bo An

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Research Interest

Artificial intelligence, multi-agent systems, game theory, automated negotiation, electronic commerce, resource allocation, optimization.

Education

University of Massachusetts Amherst, Amherst, MA, USA. (2006 – 2010)

★ Ph.D in Computer Science, defended in September 2010, conferred in February 2011

★ Advisor: Victor Lesser

★ Thesis: Automated Negotiation for Complex Multi-Agent Resource Allocation

★ Committee: Victor Lesser (chair), Jim Kurose, Shlomo Zilberstein, Michael Zink

Chongqing University, Chongqing, China. (2003 – 2006)

★ M.Sc in Computer Science, June 2006

★ Advisor: Daijie Cheng

Chongqing University, Chongqing, China. (1999 – 2003)

★ B.Sc in Computer Science, June 2003

Research Appointments

Nanyang Assistant Professor
School of Computer Science and Engineering

September 2014 – present
Nanyang Technological University

Assistant Professor
School of Computer Science and Engineering

July 2013 – August 2014
Nanyang Technological University

Associate Professor
Institute of Computing Technology

June 2012 – June 2013
Chinese Academy of Sciences

Postdoctoral Research Associate
Teamcore Research Group (Milind Tambe)

October 2010 – June 2012
University of Southern California

I have been part of the research effort that pioneered the first generation of operational game-theoretic systems for counter-terrorism in many security settings, including for LAX (Los Angeles International Airport), FAMS (US Federal Air Marshals Service), TSA (US Transportation Security Agency), and the US Coast Guard. This research represents the first and only deployed game theoretic systems that provide unpredictability to improve security for key organizations.

Research Assistant
Multi-agent Systems Lab (Victor Lesser)

September 2006 – September 2010
University of Massachusetts, Amherst

I focused on agent-mediated negotiation by extending both theoretical and heuristic bargaining approaches to more realistic settings involving uncertainty, market competition, decommitment, and acquirement of multiple resources. Research results have been applied to sensor networks, distributed streaming processing systems, and cloud computing.

Research Intern
Next Generation Distributed Systems Dept

Summer 2007
IBM T.J.Watson Research Center

I built a negotiation management system for a collaborative stream processing environment (IBM System S).

Awards

Significant Awards:

- ★ **Winner of the Microsoft Collaborative AI Challenge, 2017**, I led the team HogRider (Team members: PhD students Yanhai Xiong, Mengchen Zhao, Haipeng Chen) which won the 2017 Microsoft Collaborative AI Challenge. Microsoft Collaborative AI Challenge asked teams to solve a game using collaborative agents to push the state of the art of collaborative AI. More than 80 teams from 26 countries entered the challenge and HogRider won the first place.
- ★ **Early Career Spotlight Talk, IJCAI'2017**, I was invited by the executive and advisory boards of IJCAI'2017 to give a talk at IJCAI'2017 within the Early Career Spotlight track. The Early Career Spotlight talks are aimed at providing an accessible introduction to the research directions of some of the most active early career researchers in all representative areas of AI.
- ★ **Innovative Application Award, Innovative Applications of Artificial Intelligence (IAAI) 2016**, Our paper “Deploying PAWS: Field Optimization of the Protection Assistant for Wildlife Security” won the Innovative application award at The Twenty-Eighth Annual Conference on Innovative Applications of Artificial Intelligence (IAAI-16).
- ★ **Nanyang Assistant Professorship (NAP)**, Awarded in 2014. The NAP scheme was launched in 2007 as an elite early career award for outstanding young researchers and exceptional scholars worldwide who aspire to research leadership role at NTU. The scheme is targeted at those who are within 10 years of their PhD or equivalent degree in respective field but with established research track records in disciplines strategic to NTU's interest. NAP's awardees receive up to S\$1 million of research start-up grants to establish their research in NTU. NTU received over 2,500 applicants (2007-2012) from over 40 countries worldwide and awarded 37 professorships to date.
- ★ **Daniel H. Wagner Prize for Excellence in Operations Research Practice, INFORMS**, Awarded at the annual meeting of the INFORMS Operations Research society, the Wagner Prize recognizes excellence in Operations Research practice. Our paper entitled “A Deployed Quantal Response Based Patrol Planning System for the US Coast Guard” won this competition for 2012.
- ★ **National 1000 Young Talents Program**, I was selected in the third batch of the “National 1000 Young Talents Program”. The program was started by the Organization Department of the CPC Central Committee and is the national supreme talents recruitment plan. The applicants should be the top-notch talents in their research fields, and have the potential to become future leaders in relevant areas.
- ★ **Best Innovative Application Paper at AAMAS'2012**, Our paper “PROTECT: A deployed game theoretic system to protect the ports of the United States” won the Best Innovative Application Paper award at the 11th International Joint Conference on Autonomous Agents and Multi-Agent Systems (AAMAS'2012).
- ★ **Operational Excellence Award Commander**, First United States Coast Guard District's Operational Excellence Award for my research on the PROTECT scheduling software used to intelligently randomize boat patrols of critical infrastructure around Boston Harbor, 2011.
- ★ **The 2010 IFAAMAS (International Foundation for Autonomous Agents and Multi-Agent Systems) Victor Lesser Distinguished Dissertation Award**. An annual award for the best PhD thesis in the area of autonomous agents and multi-agent systems. Award citation: “for ground-breaking work on negotiation in realistic, dynamic settings including concurrent one-to-many and many-to-many negotiations under market uncertainty”. Award winners receive a certificate signed by the IFAAMAS Chair and a 1500EUR payment. Award winners are also invited to give a talk at the premier International Joint Conference on Autonomous Agents and Multi-Agent Systems (AAMAS).

Other Awards:

- ★ Best Student Paper at CCFAI'2013, Our paper “Online Counterfactual Regret Minimization in Repeated Imperfect Information Extensive Games” won the Best Student Paper award at the 2013 China Artificial Intelligence Conference. Three papers were awarded out of 307 accepted papers.
- ★ Runner-up of the Automated Negotiating Agents Competition (ANAC) 2010 held in conjunction with the 9th International Conference on Autonomous Agents and Multiagent Systems (AAMAS 2010), May 2010.
- ★ Awarded UMASS Graduate School Fellowship for 2009-2010, one of ten graduate students chosen from all schools of the University of Massachusetts, Amherst.

- ★ Passed the Portfolio (PhD candidacy exam) with *distinction*, December 2008, an honor given to 19 computer science students at the University of Massachusetts, Amherst since 1995 (approx one award each year).
- ★ Excellent Student Award of Chongqing, 2006.
- ★ First prize of the Chinese Undergraduate Mathematical Contest in Modelling (CUMCM'2001).

Awards by students:

- ★ URECA Project by TAN Hao Hao leads to one of the top 2 agents in The Eighteenth International Automated Negotiating Agents Competition (Diplomacy Strategy Game League) in August 2017. He will present the agent design at the IJCAI 2017 conference. The winner will be announced at the conference.
- ★ Undergraduate Final Year Project by TAN Yi Xin won the second place in The Seventh International Automated Negotiating Agents Competition held in conjunction with AAMAS 2016, May 2016.

Ph.D Dissertation

- [1] **Bo An**. Automated Negotiation for Complex Multi-Agent Resource Allocation. Ph.D. Dissertation. Department of Computer Science, University of Massachusetts Amherst, MA, defended in September 2010. Committee: Victor Lesser (chair), Jim Kurose, Shlomo Zilberstein, Michael Zink. (Winner of the 2010 IFAAMAS Victor Lesser Distinguished Dissertation Award.)

Rigorously Refereed Journal Publications

- [2] Yanhai Xiong, Jiarui Gan, **Bo An**, Chunyan Miao, Ana Bazzan. Optimal electric vehicle fast charging station placement based on game theoretical framework, *IEEE Transactions on Intelligent Transportation Systems*, accepted.
- [3] Wanyuan Wang, Jiuchuan Jiang, **Bo An**, Yichuan Jiang, Bing Chen. Towards efficient team formation for crowdsourcing in non-cooperative social networks, *IEEE Transactions on Cybernetics*, accepted.
- [4] Galit Haim, Kobi Gal, **Bo An**, Sarit Kraus. Human-computer negotiation in a three player market setting. *Artificial Intelligence*, Vol.246, pp.34-52, 2017.
- [5] **Bo An**, Haipeng Chen, Noseong Park, V.S. Subrahmanian. Data-driven frequency-based airline profit maximization, *ACM Transactions on Intelligent Systems and Technology*, Vol.8, No.4, Article 61, 2017.
- [6] Jiarui Gan, **Bo An**. Game theoretic considerations for optimizing efficiency of taxi systems, *IEEE Intelligent Systems*, Vol.32, No.3, pp.46-52, 2017.
- [7] Haipeng Chen, **Bo An**, Dusit Niyato, Yengchai Soh, Chunyan Miao. Workload factoring and resource sharing via joint vertical and horizontal cloud federation networks, *IEEE Journal on Selected Areas in Communications*, Vol.35, No.3, pp.557-570, 2017.
- [8] **Bo An**, Nicola Gatti, Victor Lesser. Alternating-offers bargaining in one-to-many and many-to-many settings, *Annals of Mathematics and Artificial Intelligence*, Vol.77, No.1, pp.67-103, 2016.
- [9] Yuan Liu, Jie Zhang, **Bo An**, Sandip Sen. A simulation framework for measuring robustness of incentive mechanisms and its implementation in reputation systems, *Journal of Autonomous Agents and Multi-Agent Systems*, Vol.30, No.4, pp.581-600, 2016.
- [10] Yujing Hu, Yang Gao, **Bo An**. Accelerating multi-agent reinforcement learning by equilibrium transfer, *IEEE Transactions on Cybernetics*, Vol.45, No.7, pp.1289-1302, 2015.
- [11] Yujing Hu, Yang Gao, **Bo An**. Multi-agent reinforcement learning with unshared value functions, *IEEE Transactions on Cybernetics*, Vol.45, No.4, pp.647-462, 2015.
- [12] Han Yu, Zhiqi Shen, Chunyan Miao, **Bo An**, Cyril Leung. Filtering trust opinions through reinforcement learning, *Decision Support Systems*, Vol.66, pp.102-113, 2014.
- [13] Matthew Brown, **Bo An**, Christopher Kiekintveld, Fernando Ordonez, Milind Tambe. An extended study on multi-objective security games, *Journal of Autonomous Agents and Multi-Agent Systems*, Vol.28, No.1, pp.31-71, 2014.

- [14] **Bo An**, Fernando Ordonez, Milind Tambe, Eric Shieh, Rong Yang, Craig Baldwin, Joseph DiRenzo, Kathryn Moretti, Ben Maule, Garrett Meyer. A deployed quantal response based patrol planning system for the US Coast Guard, *Interfaces*, Vol.43, No.5, pp.400-420, 2013.
- [15] **Bo An**, Nicola Gatti, Victor Lesser. Bilateral bargaining with one-sided uncertain reserve prices. *Journal of Autonomous Agents and Multi-Agent Systems*, Vol.26, No.3, pp.420-455, 2013.
- [16] **Bo An**, Victor Lesser, Kwang Mong Sim. Strategic agents for multi-resource negotiation. *Journal of Autonomous Agents and Multi-Agent Systems*, Vol.23, No.1, pp.114-153, 2011.
- [17] **Bo An**, Victor Lesser. Characterizing contract-based multi-agent resource allocation in networks, *IEEE Transactions on Systems, Man and Cybernetics, Part B: Cybernetics*, Vol.40, No.3, pp.575-586, June 2010.
- [18] Kwang Mong Sim, **Bo An**. Evolving best-response strategies for market-driven agents using aggregative fitness GA, *IEEE Transactions on Systems, Man and Cybernetics, Part C*, Vol.39, No.3, pp.284-298, May 2009.
- [19] **Bo An**, Kwang Mong Sim, Chunyan Miao, Zhiqi Shen. Decision making of negotiation agents using Markov chains, *Multiagent and Grid Systems Journal*, Vol.4, No.1, pp.5-23, 2008.
- [20] **Bo An**, Zhiqi Shen, Chunyan Miao, Daijie Cheng. Algorithms for coalition formation-based on transitive dependence, *IEEE Transactions on Industrial Informatics*, Vol.3, No.3, pp.234-245, 2007.
- [21] **Bo An**, Kwang Mong Sim, Lianggui Tang, Shuangqing Li, Daijie Cheng. Continuous-time negotiation mechanism for software agents, *IEEE Transactions on Systems, Man and Cybernetics, Part B: Cybernetics*, Vol.36, No.6, pp.1261-1272, Dec. 2006.
- [22] Chunyan Miao, Jianshu Weng, Angela Goh, Zhiqi Shen, **Bo An**. Use of fuzzy cognitive map in dynamic negotiation for Grid services, *Multiagent and Grid Systems*, Vol.2, No.2, pp.101-114, 2006.
- [23] **Bo An**, Chunyan Miao, Daijie Cheng. A coalition formation framework based on transitive dependence, *IEICE Transactions on Information and Systems*, Vol.E88-D, No.12, pp.2672-2680, 2005.

Rigorously Refereed Conference Publications

(In computer science, conferences are considered the primary publication venues and often have $\sim 20\%$ acceptance rates, e.g., AAMAS, IJCAI, AAAI.)

- [24] **Bo An**. Game theoretic analysis of security and sustainability, *Proceedings of the 26th International Joint Conference on Artificial Intelligence (IJCAI'17)*, pp.5111-5115.
- [25] Qingyu Guo, **Bo An**, Long Tran-Thanh. Playing repeated network interdiction games with semi-bandit feedback, *Proceedings of the 26th International Joint Conference on Artificial Intelligence (IJCAI'17)*, pp.3682-3690.
- [26] Qingyu Guo, **Bo An**, Branislav Bosansky, Christopher Kiekintveld. Comparing strategic secrecy and Stackelberg commitment in security games, *Proceedings of the 26th International Joint Conference on Artificial Intelligence (IJCAI'17)*, pp.3691-3699.
- [27] Mengchen Zhao, **Bo An**, Wei Gao, Teng Zhang. Efficient label contamination attacks against black-box learning models, *Proceedings of the 26th International Joint Conference on Artificial Intelligence (IJCAI'17)*, pp.3945-3951.
- [28] Youzhi Zhang, **Bo An**, Long Tran-Thanh, Nicholas R. Jennings, Zhen Wang, Jiarui Gan. Optimal escape interdiction on transportation networks, *Proceedings of the 26th International Joint Conference on Artificial Intelligence (IJCAI'17)*, pp.3936-3944.
- [29] Shuxin Li, Xiaohong Li, Jianye Hao, **Bo An**, Zhiyong Feng, Kangjie chen, Chengwei Zhang. Defending against man-in-the-middle attack in repeated games, *Proceedings of the 26th International Joint Conference on Artificial Intelligence (IJCAI'17)*, pp.3742-3748.
- [30] Xinrun Wang, Qingyu Guo, **Bo An**. Stop nuclear smuggling through efficient container inspection, *Proceedings of the 16th International Joint Conference on Autonomous Agents and Multi-Agent Systems (AAMAS'17)*, pp.669-677.

- [31] Jiang Rong, Tao Qin, **Bo An** and Tie-Yan Liu. Pricing optimization for selling reusable resources, *Proceedings of the 16th International Joint Conference on Autonomous Agents and Multi-Agent Systems (AAMAS'17)*, pp.1719-1721.
- [32] Jiarui Gan, **Bo An**, Yevgeniy Vorobeychik, Brian Gauch. Security games on a plane, *Proceedings of the 31st AAAI Conference on Artificial Intelligence (AAAI'17)*, pp.530-536.
- [33] Jiang Rong, Tao Qin, **Bo An** and Tie-Yan Liu. Revenue maximization for finitely repeated ad auctions, *Proceedings of the 31st AAAI Conference on Artificial Intelligence (AAAI'17)*, pp.663-669.
- [34] Shanshan Feng, Gao Cong, **Bo An** and Yeow Meng Chee. POI2Vec: Geographical latent representation for predicting future visitors, *Proceedings of the 31st AAAI Conference on Artificial Intelligence (AAAI'17)*, pp.102-108.
- [35] Xiaohong Li, Shuxin Li, Jianye Hao, Zhiyong Feng, **Bo An**. Optimal personalized defense strategy against man-in-the-middle attack main information, *Proceedings of the 31st AAAI Conference on Artificial Intelligence (AAAI'17)*, pp.593-599.
- [36] Jiang Rong, Tao Qin, **Bo An**, Tie-Yan Liu. Modeling bounded rationality for sponsored search auctions, *Proceedings of the 22nd European Conference on Artificial Intelligence (ECAI'16)*, pp.515-523.
- [37] **Bo An**, Haipeng Chen, Noseong Park, V.S. Subrahmanian. MAP: Frequency-based maximization of airline profits based on an ensemble forecasting approach, *Proceedings of the 22nd ACM SIGKDD Conference on Knowledge Discovery and Data (KDD'16)*, pp.421-430.
- [38] Yue Yin, **Bo An**. Efficient resource allocation for protecting coral reef ecosystems, *Proceedings of the 25th International Joint Conference on Artificial Intelligence (IJCAI'16)*, pp.531-537.
- [39] Qingyu Guo, **Bo An**, Yair Zick, Chunyan Miao. Optimal interdiction of illegal network flow, *Proceedings of the 25th International Joint Conference on Artificial Intelligence (IJCAI'16)*, pp.2507-2513.
- [40] Yue Yin, Yevgeniy Vorobeychik, **Bo An**, Noam Hazon. Optimally protecting elections, *Proceedings of the 25th International Joint Conference on Artificial Intelligence (IJCAI'16)*, pp.538-545.
- [41] Qingyu Guo, **Bo An**, Yevgeniy Vorobeychik, Long Tran-Thanh, Jiarui Gan, Chunyan Miao. Coalitional security games, *Proceedings of the 15th International Joint Conference on Autonomous Agents and Multi-Agent Systems (AAMAS'16)*, pp.159-167.
- [42] Yanhai Xiong, Jiarui Gan, **Bo An**, Chunyan Miao, Soh Yeng Chai. Optimal pricing for efficient electric vehicle charging station management, *Proceedings of the 15th International Joint Conference on Autonomous Agents and Multi-Agent Systems (AAMAS'16)*, pp.749-757.
- [43] Jinhua Song, Yang Gao, Hao Wang, **Bo An**. Measuring the distance between finite Markov decision processes, *Proceedings of the 15th International Joint Conference on Autonomous Agents and Multi-Agent Systems (AAMAS'16)*, pp.468-476.
- [44] Jiang Rong, Tao Qin, **Bo An**, Tie-Yan Liu. Optimal sample size for adword auctions, *Proceedings of the 15th International Joint Conference on Autonomous Agents and Multi-Agent Systems (AAMAS'16)*, pp.1459-1460.
- [45] Zhen Wang, Yue Yin, **Bo An**. Computing optimal monitoring strategy for detecting terrorist plots, *Proceedings of the 30th AAAI Conference on Artificial Intelligence (AAAI'16)*, pp.637-643, 2016.
- [46] Mengchen Zhao, **Bo An**, Christopher Kiekintveld. Optimizing personalized email filtering thresholds to mitigate sequential spear phishing attacks, *Proceedings of the 30th AAAI Conference on Artificial Intelligence (AAAI'16)*, pp.658-665, 2016.
- [47] Shangdong Yang, Yang Gao, **Bo An**, Hao Wang, Xingguo Chen. Efficient average reward reinforcement learning using constant shifting values, *Proceedings of the 30th AAAI Conference on Artificial Intelligence (AAAI'16)*, pp.2258-2264, 2016.
- [48] Fei Fang, Thanh H. Nguyen, Rob Pickles, Wai Y. Lam, Gopalasamy R. Clements, **Bo An**, Amandeep Singh, Milind Tambe, Andrew Lemieux. Deploying PAWS: Field optimization of the protection assistant for wildlife security, *Proceedings of the 28th Annual Conference on Innovative Applications of Artificial Intelligence (IAAI'16)*, pp.3966-3973, 2016. Winner of Deployed Innovative Application Award.

- [49] Yue Yin, Haifeng Xu, Jiarui Gan, **Bo An**, Albert Jiang. Computing optimal mixed strategies for security games with dynamic payoffs, *Proceedings of the 24th International Joint Conference on Artificial Intelligence (IJCAI'15)*, pp.681-687, 2015.
- [50] Yanhai Xiong, Jiarui Gan, **Bo An**, Chunyan Miao, Ana Bazzan. Optimal electric vehicle charging station placement, *Proceedings of the 24th International Joint Conference on Artificial Intelligence (IJCAI'15)*, pp.2662-2668, 2015.
- [51] Jiarui Gan, **Bo An**, Chunyan Miao. Optimizing efficiency of taxi systems: Scaling-up and handling arbitrary constraints, *Proceedings of the 14th International Joint Conference on Autonomous Agents and Multi-Agent Systems (AAMAS'15)*, pp.523-531, 2015.
- [52] Yujing Hu, Yang Gao, **Bo An**. Learning in multi-agent systems with sparse interactions by knowledge transfer and game abstraction, *Proceedings of the 14th International Joint Conference on Autonomous Agents and Multi-Agent Systems (AAMAS'15)*, pp.753-761, 2015.
- [53] Jiang Rong, Tao Qin, **Bo An**. Computing quantal response equilibrium for sponsored search auctions, *Proceedings of the 14th International Joint Conference on Autonomous Agents and Multi-Agent Systems (AAMAS'15)*, pp.1803-1804, 2015.
- [54] Jiarui Gan, **Bo An**, Yevgeniy Vorobeychik. Security games with protection externality, *Proceedings of the 29th AAAI Conference on Artificial Intelligence (AAAI'15)*, pp.914-920, 2015.
- [55] Yue Yin, **Bo An**, Manish Jain. Game-theoretic resource allocation for protecting large public events, *Proceedings of the 28th AAAI Conference on Artificial Intelligence (AAAI'14)*, pp.826-834, 2014.
- [56] Thanh Nguyen, Amulya Yadav, **Bo An**, Milind Tambe, Craig Boutilier. Regret-based Optimization and preference elicitation for Stackelberg security games with uncertainty, *Proceedings of the 28th AAAI Conference on Artificial Intelligence (AAAI'14)*, pp.756-762, 2014.
- [57] Yevgeniy Vorobeychik, **Bo An**, Milind Tambe, Satinder Singh. Computing solutions in infinite-horizon discounted adversarial patrolling games. *Proceedings of the International Conference on Automated Planning and Scheduling (ICAPS'14)*, pp.314-322, 2014.
- [58] Galit Haim, Kobi Gal, Sarit Kraus, **Bo An**. Equilibrium strategies for human-computer negotiation in 3-player market settings. *Proceedings of the 21st European Conference on Artificial Intelligence (ECAI'14)*, pp.417-422 2014.
- [59] Han Yu, Chunyan Miao, **Bo An**, Shen Zhiqi, Cyril Leung. Reputation-aware task allocation for human trustees, *Proceedings of the 13th International Joint Conference on Autonomous Agents and Multi-Agent Systems (AAMAS'14)*, pp.357-364, 2014.
- [60] Jiarui Gan, **Bo An**, Chunyan Miao. A scalable algorithm for solving taxi system efficiency optimization. *Proceedings of the 13th International Joint Conference on Autonomous Agents and Multi-Agent Systems (AAMAS'14)*, pp.1465-1466, 2014.
- [61] Yue Yin, **Bo An**, Manish Jain. Dynamic allocation of security resources for protecting targets with varying values. *Proceedings of the 13th International Joint Conference on Autonomous Agents and Multi-Agent Systems (AAMAS'14)*, pp.1473-1474, 2014.
- [62] Yuan Liu, Jie Zhang, **Bo An**, Sandip Sen. A simulation framework for measuring robustness of incentive mechanisms, *Proceedings of the 13th International Joint Conference on Autonomous Agents and Multi-Agent Systems (AAMAS'14)*, pp.1379-1380, 2014.
- [63] Qiong Wu, Chunyan Miao, **Bo An**. Modeling curiosity in virtual companions to improve human learners' learning experience, *Proceedings of the 13th International Joint Conference on Autonomous Agents and Multi-Agent Systems (AAMAS'14)*, pp.1401-1402, 2014.
- [64] Ya'akov (Kobi) Gal, Avi Rosenfeld, Sarit Kraus, Michele Gelfand, **Bo An**, Jun Lin. A new paradigm for the study of corruption in different cultures. *Proceedings of the 2014 International Conference on Social Computing, Behavioral-Cultural Modeling, & Prediction (SBP'14)*, pp.261-268, 2014.
- [65] Jiarui Gan, **Bo An**, Haizhong Wang, Xiaoming Sun, Zhongzhi Shi. Optimal pricing for improving efficiency of taxi systems, *Proceedings of the 23rd International Joint Conference on Artificial Intelligence (IJCAI'13)*, pp.2811-2818, 2013.

- [66] Han Yu, Miao Chunyan, **Bo An**. A reputation management model for resource constrained trustee agents, *Proceedings of the 23rd International Joint Conference on Artificial Intelligence (IJCAI'13)*, pp.418-424, 2013.
- [67] **Bo An**, Matthew Brown, Yevgeniy Vorobeychik, Milind Tambe. Security games with surveillance cost and optimal timing of attack execution, *Proceedings of the 12th International Joint Conference on Autonomous Agents and Multi-Agent Systems (AAMAS'13)*, pp.223–230, 2013.
- [68] Han Yu, Shen Zhiqi, Chunyan Miao, **Bo An**. A reputation-aware decision-making approach for improving the efficiency of crowdsourcing systems, *Proceedings of the 12th International Joint Conference on Autonomous Agents and Multi-Agent Systems (AAMAS'13)*, pp.1315-1316, 2013.
- [69] Han Yu, Zhiqi Shen, Chunyan Miao, **Bo An**. Challenges and opportunities for trust management in crowdsourcing, *Proceedings of the 2012 IEEE/WIC/ACM International Conference on Intelligent Agent Technology (IAT'12)*, pp.486-493, 2012.
- [70] Han Yu, Zhiqi Shen, **Bo An**. An adaptive witness selection method for reputation-based trust models, *Proceedings of the 15th International Conference on Principles and Practice of Multi-Agent Systems (PRIMA'12)*, pp.184-198, 2012.
- [71] **Bo An**, David Kempe, Christopher Kiekintveld, Eric Shieh, Satinder Singh, Milind Tambe, Yevgeniy Vorobeychik. Security games with limited surveillance, *Proceedings of the 26th AAAI Conference on Artificial Intelligence (AAAI'12)*, pp.1241-1248, July 2012.
- [72] Eric Shieh, **Bo An**, Rong Yang, Milind Tambe, Craig Baldwin, Joseph DiRenzo, Ben Maule, Garrett Meyer. PROTECT: An application of computational game theory for the security of the ports of the United States, *Proceedings of the 26th AAAI Conference on Artificial Intelligence (AAAI'12)*, Spotlight Track, pp.2173-2179, July 2012.
- [73] Matthew Brown, **Bo An**, Christopher Kiekintveld, Fernando Ordonez, Milind Tambe. Multi-objective optimization for security games, *Proceedings of the 11th International Joint Conference on Autonomous Agents and Multi-Agent Systems (AAMAS'12)*, pp.863-870, June 2012.
- [74] Eric Shieh, **Bo An**, Rong Yang, Milind Tambe, Craig Baldwin, Joseph DiRenzo, Ben Maule, Garrett Meyer. PROTECT: A deployed game theoretic system to protect the ports of the United States, *Proceedings of the 11th International Joint Conference on Autonomous Agents and Multi-Agent Systems (AAMAS'12)*, pp.13-20, June 2012.
- [75] Yevgeniy Vorobeychik, **Bo An**, Milind Tambe. Infinite horizon adversarial patrolling on networks, *Proceedings of the 11th International Joint Conference on Autonomous Agents and Multi-Agent Systems (AAMAS'12)*, pp.1307-1308, June 2012.
- [76] **Bo An**, Milind Tambe, Fernando Ordonez, Eric Shieh, Christopher Kiekintveld. Refinement of strong Stackelberg equilibria in security games, *Proceedings of the 25th AAAI Conference on Artificial Intelligence (AAAI'11)*, pp.587-593, August 2011.
- [77] **Bo An**, Victor Lesser, David Westbrook, Michael Zink. Agent-mediated multi-step optimization for resource allocation in distributed sensor networks, *Proceedings of the 10th International Joint Conference on Autonomous Agents and Multi-Agent Systems (AAMAS'11)*, pp.609-616, May 2011.
- [78] **Bo An**, Victor Lesser. Negotiation over decommitment penalty, *Proceedings of the 10th International Joint Conference on Autonomous Agents and Multi-Agent Systems (AAMAS'11)*, pp.1101-1102, May 2011.
- [79] **Bo An**, Victor Lesser, David Irwin, Michael Zink. Automated negotiation with decommitment for dynamic resource allocation in cloud computing, *Proceedings of the 9th International Joint Conference on Autonomous Agents and Multi-Agent Systems (AAMAS'10)*, pp.981-988, May 2010.
- [80] **Bo An**, Nicola Gatti, Victor Lesser. Searching for pure strategy equilibria in bilateral bargaining with one-sided uncertainty, *Proceedings of the 9th International Joint Conference on Autonomous Agents and Multi-Agent Systems (AAMAS'10)*, pp.1607-1608, May 2010.
- [81] **Bo An**, Nicola Gatti, Victor Lesser. Bilateral bargaining with one-sided two-type uncertainty, *Proceedings of the 2009 IEEE/WIC/ACM International Conference on Intelligent Agent Technology (IAT'09)*, pp.403-410, Sep. 2009.

- [82] **Bo An**, Nicola Gatti, Victor Lesser. Extending alternating-offers bargaining in one-to-many and many-to-many settings, *Proceedings of the 2009 IEEE/WIC/ACM International Conference on Intelligent Agent Technology (IAT'09)*, pp.423-426, Sep. 2009.
- [83] **Bo An**, Fred Dougllis, Fan Ye. Heuristics for negotiation schedules in multi-plan optimization, *Proceedings of the 7th International Joint Conference on Autonomous Agents and Multi-Agent Systems (AAMAS'08)*, pp.551-558, 2008.
- [84] **Bo An**, Victor Lesser, Kwang Mong Sim. Decommitment in multi-resource negotiation, *Proceedings of the 7th International Joint Conference on Autonomous Agents and Multi-Agent Systems (AAMAS'08)*, pp.1553-1556, 2008.
- [85] Michael Krainin, **Bo An**, Victor Lesser. An application of automated negotiation to distributed task allocation. *Proceedings of the 2007 IEEE/WIC/ACM International Conference on Intelligent Agent Technology (IAT'07)*, pp.138-145, 2007.
- [86] **Bo An**, Kwang Mong Sim, Victor Lesser. Evolving the best-response strategy to decide when to make a proposal, *Proceedings of the 2007 IEEE Congress on Evolutionary Computation (CEC'07)*, pp.1035-1042, 2007.
- [87] **Bo An**, Chunyan Miao, Zhiqi Shen. Market based resource allocation with incomplete information, *Proceedings of the 20th International Joint Conference on Artificial Intelligence (IJCAI'07)*, pp.1193-1198, 2007.
- [88] **Bo An**, Zhiqi Shen, Chunyan Miao, Lianggui Tang, Daijie Cheng. Fuzzy constraint based negotiation under time pressure, *Proceedings of the 4th International IEEE Conference on Industrial Informatics*, pp.299-304, Aug 2006.
- [89] **Bo An**, Chunyan Miao, Yuan Miao, Daijie Cheng. Transitive dependence based formation of virtual organizations, *Proceedings of the 2005 International Conference on Computational Intelligence and Security (CIS'05)*, pp.375-380, 2005.
- [90] **Bo An**, Chunyan Miao, Lianggui Tang, Shuangqing Li, Daijie Cheng. A transitive dependence based social reasoning mechanism for coalition formation, *Proceedings of the 6th International Conference on Intelligent Data Engineering and Automated Learning (IDEAL'05)*, pp.507-514, 2005.
- [91] **Bo An**, Chunyan Miao, Lianggui Tang, Shuangqing Li, Daijie Cheng. Toward transitive dependence in MAS, *Proceedings of the 6th International Conference on Intelligent Data Engineering and Automated Learning (IDEAL'05)*, pp.486-493, 2005.
- [92] **Bo An**, Lianggui Tang, Shuangqing Li, Daijie Cheng. A negotiation strategy based on uncompromising degree, *Proceedings of the 2004 IEEE/WIC/ACM International Conference on Intelligent Agent Technology (IAT'04)*, pp.357-360, Sep. 2004.

Refereed Technical Magazine Articles

- [93] Pradeep Varakantham, **Bo An**, Bryan Low and Jie Zhang. Artificial intelligence research in Singapore: Assisting the development of a smart nation, *AI Magazine*, accepted.
- [94] Fei Fang, Thanh H. Nguyen, Rob Pickles, Wai Y. Lam, Gopalasamy R. Clements, **Bo An**, Amandeep Singh, Brian C. Schwedock, Milind Tambe, Andrew Lemieux. PAWS - A deployed game-theoretic application to combat poaching, *AI Magazine*, Vol.38, No.1, pp.23-36, 2017.
- [95] **Bo An**, Eric Shieh, Rong Yang, Milind Tambe, Craig Baldwin, Joseph DiRenzo, Ben Maule, Garrett Meyer. PROTECT C A deployed game theoretic system for strategic security allocation for the United States Coast Guard, *AI Magazine*, Vol.33, No.4, pp.96-110, 2012.
- [96] Manish Jain, **Bo An**, Milind Tambe. An overview of recent application trends at the AAMAS conference: Security, sustainability and safety, *AI Magazine*, Vol.33, No.3, pp.14-28, 2012. Invited Paper.
- [97] Harith Alani, **Bo An**, et al. Reports of the AAAI 2012 Spring Symposia, *AI Magazine*, Vol.33, No.3, pp.109-114, 2012.

- [98] **Bo An**, James Pita, Eric Shieh, Milind Tambe, Christopher Kiekintveld, Janusz Marecki. GUARDS and PROTECT: Next Generation Applications of Security Games. *ACM SIGecom Exchanges*, Vol.10, No.1, pp.31-34, March 2011.

Edited Books

- [1] Longbing Cao, Yifeng Zeng, **Bo An**, Andreas L. Symeonidis, Vladimir Gorodetsky, Frans Coenen, Philip S. Yu, *Agents and Data Mining Interaction*, Lecture Notes in Artificial Intelligence (LNAI), Vol.9145, Springer, 2015.

Refereed Book Chapters

- [1] **Bo An**, Milind Tambe, Arunesh Sinha. Stackelberg Security Games (SSG) Basics and Application Overview, *Improving Homeland Security Decisions*, Cambridge University Press, forthcoming.
- [2] Manish Jain, **Bo An**, Milind Tambe. Security games applied to real-world: Research contributions and challenges, *Moving Target Defense II: Application of Game Theory and Adversarial Modeling*, Springer, pp.15-39, 2012.
- [3] **Bo An**, Milind Tambe. Game theory for security: An important challenge for multiagent systems, *Proceedings of the European Workshop on Multiagent Systems (EUMAS)*, Springer, pp.17-30, 2012.
- [4] Eric Shieh, **Bo An**, Rong Yang, Milind Tambe, Craig Baldwin, Joseph DiRenzo, Ben Maule, Garrett Meyer. PROTECT in the ports of Boston, New York and beyond: Experiences in Deploying Stackelberg Security Games with Quantal Response, *Handbook on Computational Approaches to Counterterrorism*, Springer, 2012.
- [5] **Bo An**, Victor Lesser. Yushu: A heuristic-based agent for automated negotiating competition, *New Trends in Agent-based Complex Automated Negotiations, Series on Studies of Computational Intelligence*, Springer, pp.145-149, 2012.
- [6] **Bo An**, Kwang Mong Sim, Lianggui Tang, Chunyan Miao, Zhiqi Shen, Daijie Cheng. Negotiation agents' decision making using Markov chains, *Rational, Robust, and Secure Negotiations in Multi-Agent Systems*, Springer, pp.3-23, 2008.

Refereed Workshop and Other Publications

- [1] Fei Fang, Thanh H. Nguyen, Rob Pickles, Wai Y. Lam, Gopalasamy R. Clements, **Bo An**, Amandeep Singh, Milind Tambe. Deploying PAWS to Combat Poaching: Game-theoretic Patrolling in Areas with Complex Terrains (Demonstration), *Proceedings of the 30th AAAI Conference on Artificial Intelligence (AAAI'16)*.
- [2] Mengchen Zhao, **Bo An**, Christopher Kiekintveld. An Initial Study on Personalized Filtering Thresholds in Defending Sequential Spear Phishing Attacks, *Proceedings of the 2015 IJCAI Workshop on Behavioral, Economic and Computational Intelligence for Security*, 2015.
- [3] Qingyu Guo, **Bo An**, Andrey Kolobov. Approximation approaches for solving security games with surveillance cost: A preliminary study, *Proceedings of the Issues with Deployment of Emerging Agent-based Systems (IDEAS) Workshop, in conjunction with the 14th International Conference on Autonomous Agents and Multiagent Systems (AAMAS)*, 2015.
- [4] Debarun Kar, Fei Fang, Francesco Delle Fave, Nicole Sintov, Arunesh Sinha, Aram Galstyan, **Bo An**, Milind Tambe. Learning bounded rationality models of the adversary in repeated Stackelberg security games, *Proceedings of the Adaptive and Learning Agents (ALA) Workshop, in conjunction with the 14th International Conference on Autonomous Agents and Multiagent Systems (AAMAS)*, 2015.
- [5] Jiarui Gan, **Bo An**. Game theoretic considerations for optimizing efficiency of taxi systems, *Proceedings of the AAAI-15 Workshop on Computational Sustainability*, 2015.
- [6] Jiang Rong, Tao Qin, **Bo An**. Quantal response equilibrium for sponsored search auctions: Computation and inference, *Proceedings of The 10th workshop on Ad Auctions, in conjunction with the 15th ACM Conference on Electronic Commerce (EC)*, 2014.

- [7] Milind Tambe, Albert Jiang, **Bo An**, Manish Jain. Computational game theory for security: Progress and challenges, *Proceedings of the AAAI Spring Symposium on Applied Computational Game Theory*, 2014.
- [8] Jiarui Gan, **Bo An**. Minimum support size of the defender's strong Stackelberg equilibrium strategies in security games, *Proceedings of the AAAI Spring Symposium on Applied Computational Game Theory*, 2014.
- [9] Yue Yin, **Bo An**, Yevgeniy Vorobeychik, Jun Zhuang. Optimal deceptive strategies in security games: A preliminary study, *Proceedings of the AAAI Spring Symposium on Applied Computational Game Theory*, 2014.
- [10] **Bo An**, David Kempe, Christopher Kiekintveld, Eric Shieh, Satinder Singh, Milind Tambe, Yevgeniy Vorobeychik. Security games with limited surveillance: An initial report, *Proceedings of the AAAI Spring Symposium on Game Theory for Security, Sustainability and Health*, pp.2-8, 2012.
- [11] Milind Tambe, **Bo An**. Game theory for security: A real-world challenge problem for multiagent systems and beyond, *Proceedings of the AAAI Spring Symposium on Game Theory for Security, Sustainability and Health*, pp.69-74, 2012.
- [12] Yevgeniy Vorobeychik, **Bo An**, Milind Tambe. Adversarial patrolling games, *Proceedings of the AAAI Spring Symposium on Game Theory for Security, Sustainability and Health*, pp.91-98, 2012.
- [13] **Bo An**, Manish Jain, Milind Tambe, Christopher Kiekintveld. Mixed-initiative optimization in security games: A preliminary report, *Proceedings of the AAAI Spring Symposium on Help Me Help You: Bridging the Gaps in Human-Agent Collaboration*, pp.8-11, March 2011.
- [14] **Bo An**, Athanasios V. Vasilakos, Victor Lesser. Evolutionary stable resource pricing strategies, *Proceedings of the ACM SIGCOMM 2009 Conference (poster session)*, March 2009.

International Tutorials

- ★ **Advances in Game Theory for Security and Privacy**, The 18th ACM Conference on Electronic Commerce (EC'18), (with Fei Fang and Yevgeniy Vorobeychik).
- ★ **Game Theory for Security**, The Twenty-Eighth Conference on Artificial Intelligence (AAAI'14), (with Albert Xin Jiang, and Manish Jain).
- ★ **Game Theory for Security**, The Twenty-Seventh Conference on Artificial Intelligence (AAAI'13), (with Albert Xin Jiang, and Manish Jain).
- ★ **Computation of Stackelberg equilibria with Applications to security**, The 13th ACM Conference on Electronic Commerce (EC'12), (with Albert Xin Jiang and Christopher Kiekintveld).

Pending Patent

- ★ **Game-theoretic Resource Allocation for Protecting Large Public Events**: Yue Yin, Bo An, Manish Jain.
- ★ **Optimal Strategies in Security Games**: Milind Tambe, Fernando Ordonez, Rong Yang, Zhengyu Yin, Matthew Brown, Bo An, Christopher Kiekintveld. Filed on Apr 1, 2013 in USA, Publication number - WO2013176784 A1. More details at <https://www.google.com/patents/WO2013176784A1>.
- ★ **Method and Apparatus for Negotiation Management in Data Processing Systems**. Bo An, Fred Douglass, Brad Fawcett, Anton Riabov, Fan Ye. Filed on Apr 30, 2008 in USA, Granted on Feb 18, 2014, Publication number - US8656403 B2. More details at <https://www.google.com/patents/US8656403>.

Fielded and Deployed Research

- ★ **PAWS (Protection Assistant for Wildlife Security)**: PAWS is being tested since 2014 in southeast Asia for assistance in protecting endangered wildlife against poachers. PAWS generates patrol routes by solving a large-scale Stackelberg game, while taking complex geographic constraints into account, with payoff uncertainties and behavior models of poachers.
- ★ **PROTECT (Port Resilience Operational / Tactical Enforcement to Combat Terrorism)**: We have successfully demonstrated PROTECT for randomizing schedules for the US Coast Guard in the port of Boston. PROTECT solves Stackelberg games to provide mixed strategies which allows it to randomize patrols for the US Coast Guard, taking into account weights of different targets and reactions of potential adversaries.

- ★ **IRIS (Intelligent Randomization In Scheduling):** IRIS has been deployed since October 2009 for randomizing schedules for allocation of Federal Air Marshals (FAMS) to some sectors of international flights. IRIS uses the fastest known algorithm for solving Stackelberg games to provide mixed strategies which allows it to randomize schedules for the FAMS.
- ★ **CASA (Collaborative Adaptive Sensing of the Atmosphere):** CASA is a new paradigm for detecting and predicting hazardous weather achieved through a distributed, collaborative, adaptive sensing architecture. Our approach of distributed resource allocation based automated negotiation was used in the testbed built in southwestern Oklahoma to allocate sensing resources from 2009.
- ★ **Negotiation based Resource Allocation in Distributed Stream Processing:** I have built a negotiation management system for dynamic resource allocation and the system is used in IBM's collaborative stream processing system (System S).

Selected Invited Talks

Invited Conference Talks:

- ★ Game theoretic analysis of security and sustainability, *Early Career Spotlight Talk at The Twenty-sixth International Joint Conference on Artificial Intelligence (IJCAI'17)*, August 21, 2017, Melbourne, Australia.
- ★ Game theoretic analysis of security and sustainability, *2017 International Workshop on Conflict Resolution in Decision Making at IJCAI'17*, August 21, 2017, Melbourne, Australia.
- ★ Recent Progress on Computational Game Theory for Security, *The 1st International Workshop on AI in Security at IJCAI'17*, August 20, 2017, Melbourne, Australia.
- ★ Multi-agent Systems Research: Current Status and Challenges, *The 2017 China Computer Federation Conference on Artificial Intelligence (CCFAI)*, August 2017, Kunming, China.
- ★ Algorithms for Solving Incomplete Information Games, *2017 Workshop on Evolutionary COmputation and LEarning (ECOLE)*, May 2017, Xian, China.
- ★ Network Flow Interdiction, *The 2017 Workshop on Adversarial Reasoning in Multi-agent Systems (ADVERSE)*, May 2017, Brazil.
- ★ Game Theory Considerations in Computational Sustainability, *The 10th International Workshop on Agent-based Complex Automated Negotiations (ACAN)*, May 2017, Brazil.
- ★ Game Theory to Protect Wild Life, *2017 Winter School on Complexity Science*, 9-15 March 2017, Singapore.
- ★ Computational Game Theory for Security, *The 2017 Joint Korea-Singapore Workshop on Discrete Mathematics*, Feb 17-19, 2017, Singapore.
- ★ Recent Progress on Computational Game Theory for Security, *The 17th International Conference on Intelligent Data Engineering and Automated Learning (IDEAL'2016)*, Yangzhou, October 2016.
- ★ Multi-agent Systems Research: Recent Progresses and Future Directions, *The 2016 International Workshop on Autonomous Agents and Multiagent Systems*, Guilin, May 2016.
- ★ Game Theory Considerations in Computational Sustainability, *2015 International Joint Agents Workshop and Symposium (IJAWS)*, Ishikawa, Japan, October 2015.
- ★ Adversary Behavior Modeling in Security Games: Surveillance and New Application Domains, *The second conference on Validating Models of Adversary Behavior*, August 2015, Buffalo/Niagara Falls, NY, USA.
- ★ Game Theory for Security: Challenges and Progress, *The 2014 IEEE 7th Joint International Information Technology and Artificial Intelligence Conference*, December 2014.
- ★ Multi-agent Systems Research: History and Current Status, *The 2014 China National Computer Congress (CNCC)*, October 2014.
- ★ Game Theory for Age Friendly Computing, *The 1st International Conference on Ageless Aging (ICAA 2013)*, June 2013.
- ★ Applying Game Theory and Data Mining for Improving Efficiency of Taxi Systems, *2013 International Workshop on Agents & Data Mining Interaction (ADMI-13)*, May 2013.

- ★ Application of Game theory for Security, *The 4th Chinese Conference on Agent Theory and Application (Agent2012)*, with Zhongzhi Shi, August 2012.
- ★ Automated Negotiation for Complex Multi-Agent Resource Allocation, *The 10th International Joint Conference on Autonomous Agents and Multi-Agent Systems (AAMAS'11)*, May 2011.

Invited Talks at Universities:

- ★ Computational Game Theory for Security: Recent Progresses and Future Directions, Alibaba, Hangzhou, July 2017.
- ★ Computational Game Theory for Security: Recent Progresses and Future Directions, Sun Yat-sen University, May 2017.
- ★ Computational Game Theory for Security: Recent Progresses and Future Directions, Xidian University, May 2017.
- ★ Computational Game Theory for Security: Recent Progresses and Future Directions, University of Science and Technology of China, March 2017.
- ★ Computational Game Theory for Security: Recent Progresses and Future Directions, Hefei University of Technology, February 2017.
- ★ Computational Game Theory for Security: Recent Progresses and Future Directions, Southwest Jiaotong University, December 2016.
- ★ Computational Game Theory for Security: Recent Progresses and Future Directions, University of Oxford, November 2016.
- ★ Computational Game Theory for Security: Recent Progresses and Future Directions, University of Southampton, November 2016.
- ★ Computing Optimal Monitoring Strategy for Detecting Terrorist Plots, University of Southern California, January 2016.
- ★ Game Theory Considerations in Computational Sustainability, Nagoya Institute of Technology, Japan, September 2015.
- ★ Game Theory Considerations in Computational Sustainability, Microsoft Research Redmond, July 2015.
- ★ Game Theory for Security: Challenges and Recent Progress, Sichuan University, July 2015.
- ★ Game Theory Considerations in Computational Sustainability, Microsoft Research Redmond, July 2015.
- ★ Optimal Electric Vehicle Charging Station Placement, Nanjing University, June 2015.
- ★ Optimal Electric Vehicle Charging Station Placement, Southeast University, June 2015.
- ★ Game Theory for Security: Some Recent Progress, Nanjing University of Aeronautics and Astronautics, June 2015.
- ★ Game Theory for Security: Some Recent Progress, Southeast University, December 2014.
- ★ Game Theory for Security and E-commerce, ALIBABA (Beijing), December 2014.
- ★ Game Theory for Security: Some Recent Progress, Tsinghua University, December 2014.
- ★ Computing Optimal Pricing Schemes to Improve Efficiency of Taxi Systems, Nanjing University, December 2013.
- ★ Game Theory for Solving Societal Challenges: Security and Sustainability, Southeast University, December 2013.
- ★ Game Theory for Solving Societal Challenges: Security and Sustainability, Microsoft Research Asia, August 2013.
- ★ Game Theory for Solving Societal Challenges: Security and Sustainability, HeFei University of Technology, June 2013.
- ★ Game Theory for Solving Societal Challenges: Security and Sustainability, University of Science and Technology of China, June 2013.

- ★ Game Theory for Solving Societal Challenges: Security and Sustainability, Fudan University, June 2013.
- ★ Game Theory for Solving Societal Challenges: Security and Sustainability, Southwest Jiaotong University, May 2013.
- ★ Next Generation Applications of Security Games: Challenges and Progress, Shanghai Jiao Tong University, December 2012.
- ★ Next Generation Applications of Security Games: Challenges and Progress, Tsinghua University, October 2012.
- ★ Next Generation Applications of Security Games: Challenges and Progress, Nanjing University, September 2012.
- ★ Next Generation Applications of Security Games: Challenges and Progress, Suzhou University, September 2012.
- ★ Equilibrium refinement in security games, Peking University, May 2011.
- ★ Equilibrium refinement in security games, University of Electronic Science and Technology of China, May 2011.
- ★ Automated Negotiation for Complex Multi-Agent Resource Allocation, Singapore Management University, June 2010.

Current Research Funding

- ★ “Modelling, Analysis and Computation for Combating Multiple Cooperative Adversaries”, 1/3/17-28/2/2018, MOE AcRF Tier 1 Grant, Principal Investigator.
- ★ “ADL+:A Digital Toolkit for Cognitive Assessment and Intervention”, MOH National Innovation Challenge On Active and Confident Ageing, 15/3/17-14/3/2020, Co-Principal Investigator.
- ★ “Improving Cybersecurity through Optimal Policy Design and Human Behaviour Modelling”, NRF National Cybersecurity R&D (NCR) Programme, 1/1/17-31/12/2019, Principal Investigator.
- ★ “Energy Harvesting Sensors And User Behaviour Use Cases For Smart Living Solutions”, Delta - NTU Corporate Lab, 1/7/16-30/6/2019, Principal Investigator.
- ★ “Optimal Pricing for Competitive Cloud Markets with Incomplete Information”, 2015 Microsoft Research Asia Collaborative Research Program, 1/5/16-30/4/2018, Principal Investigator.
- ★ “Cyber Security Solutions for Smart Traffic Control Systems”, NRF National Cybersecurity R&D (NCR) Programme, 2/3/16-31/3/2018, Principal Investigator.
- ★ “Some Key Research Problems In Multi-Agent Systems”, Nanyang Assistant Professorship (NAP) Grant, 1/10/14-30/9/2019, Principal Investigator.
- ★ “Optimal Security Resource Allocation for Protecting Large Public Events”, 1/3/14-28/2/2017, MOE AcRF Tier 1 Grant, Principal Investigator.
- ★ Start-up Grant from Nanyang Technological University, 1/7/13-31/3/17, Principal Investigator.
- ★ “Automated negotiation theory for resource allocation in complex multiagent systems”, 1/1/13-12/31/2015, National Natural Science Foundation of China, Principal Investigator.
- ★ “Game theory for security”, 1/1/13-12/31/2015, Starting Research Fund, Institute of Computing Technology, Chinese Academy of Sciences, Principal Investigator.

Professional Services

Leadership:

- ★ **International Foundation of Autonomous Agents and Multi-Agent Systems (IFAAMAS)** board of directors, 2014-2021, elected position. Chair of the Award Committee since 2016. The IFAAMAS Board of Directors consists of 27 members, each elected to a six-year term. IFAAMAS is a non-profit organization whose purpose is to promote science and technology in the areas of artificial intelligence, autonomous agents and multiagent systems.

Award Committee Chair:

- ★ **2015 International Foundation of Autonomous Agents and Multi-Agent Systems (IFAAMAS)** Victor Lesser Distinguished Dissertation Award. Committee Members: Elisabeth Andr, Boi Faltings, Maria Gini, Sandip Sen, Makoto Yokoo, Michael Winikoff.

Editorial Boards:

- ★ July 2016- **Journal of Artificial Intelligence Research (JAIR)**, editorial board member.
- ★ 2016- **Future Generation Computer Systems**, Associate editor.
- ★ 2015- **Journal of Autonomous Agents and Multi-agent Systems (JAAMAS)**, Associate editor.

Event Organization:

- ★ Tutorial Co-chair for **The Twenty-Seventh International Joint Conference on Artificial Intelligence (IJ-CAI'18)**, Stockholm, Sweden, July 2018.
- ★ Tutorial Co-chair for **The Seventeenth International Conference on Autonomous Agents and Multiagent Systems (AAMAS'18)**, Stockholm, Sweden, July 2018.
- ★ Program Co-Chair for **The 16th International Conference on Practical Applications of Agents and Multi-Agent Systems (PAAMS'18)**, Toledo, Spain, 13-15 June 2018.
- ★ General Co-Chair for **The 2nd IEEE International Conference on Agents (ICA'17)**, Beijing, China, July 2017.
- ★ Program Co-Chair for **The 8th Conference on Decision and Game Theory for Security (GameSec'17)**, Vienna, Austria, October 2017.
- ★ Program Co-Chair for **The 19th International Conference on Principles and Practice of Multi-Agent Systems (PRIMA'17)**, Nice, France, Nov. 13th - Nov. 17th, 2017.
- ★ Scholarship Co-chair for **The Sixteenth International Conference on Autonomous Agents and Multiagent Systems (AAMAS)**, May 2017.
- ★ Co-chair for **AAAMS'17 Workshop on Issues with Deployment of Emerging Agent-based Systems (IDEAS'2017)**, May 8 - May 12, 2017.
- ★ Program Chair for **The 2016 International Conference on Crowd Science and Engineering (ICCSE16)**, Vancouver, Canada, July 28 - 31 July 2016.
- ★ Exhibition Chair for **The Fifteenth International Conference on Autonomous Agents and Multiagent Systems (AAMAS)**, May 9 - May 13, 2016.
- ★ School Co-chair for **The 19th International Conference on Principles and Practice of Multi-Agent Systems (PRIMA)**, August 22-26, 2016.
- ★ Co-chair for **AAAMS'16 Workshop on Issues with Deployment of Emerging Agent-based Systems (IDEAS'2016)**, May 9 - May 13, 2016.
- ★ Co-chair for **2016 International Summer School on Autonomous Agents and Multiagent Systems**, Singapore, May 6 - May 8, 2016.
- ★ Program co-Chair for **The 2015 IEEE/WIC/ACM International Conference on Intelligent Agent Technology (IAT)**, Singapore, December 6-9, 2015.
- ★ Co-chair for **IJCAI'15 Workshop on Behavioral, Economic and Computational Intelligence for Security**, Buenos Aires, July 25 - 27, 2015.

- ★ Co-chair for **AAAMS'15 Workshop on Issues with Deployment of Emerging Agent-based Systems (IDEAS'2015)**, May 4 - May 8, 2015.
- ★ Co-chair for **AAAI 2015 Spring Symposium on Applied Computational Game Theory**, Stanford University, March 23-25, 2015.
- ★ Workshop Chair for **The International Conference on Behavior, Economic and Socio-Cultural Computing (BESC)**, Shanghai, China, October 30 - November 2, 2014.
- ★ Demonstrations Chair for **The Thirteenth International Conference on Autonomous Agents and Multi-agent Systems (AAMAS)**, Paris, France, May 5 - May 9, 2014.
- ★ Co-chair for **AAAI 2014 Spring Symposium on Applied Computational Game Theory**, Stanford University, March 24-26, 2014.
- ★ PC Co-chair for **2014 International Workshop on Agent & Data Mining Interaction (ADMI14)**, Paris, France, May 5 - May 9, 2014.
- ★ Sole Organizer for 2013 **IFAAMAS Agent and Multiagent System School**. Invited Speakers: Craig Boutilier, Kevin Leyton-Brown, Francesca Rossi, Milind Tambe, Makoto Yokoo, and Shlomo Zilberstein, Beijing, August 10 - August 12, 2013.
- ★ Innovative Applications Chair for **The Twelfth International Conference on Autonomous Agents and Multiagent Systems (AAMAS)**, Minnesota, USA, May 6 - May 10, 2013.
- ★ Poster and Demonstration Chair for **The Sixth Conference on Artificial General Intelligence (AGI)**, Beijing, July 31 - August 3, 2013
- ★ Co-chair for **AAAI 2012 Spring Symposium on Game Theory for Security, Sustainability and Health**, Stanford University, March 26-28, 2012.
- ★ Co-organizer for **Use-inspired Agents and Multiagent Systems Workshop**, University of Southern California, March 2011.

Conference Program Committees:

- ★ 2018 The 31st Conference on Artificial Intelligence (AAAI'18), Senior PC
- ★ 2017 The 13th Conference on Web and Internet Economics (WINE'17)
- ★ 2017 ACM SIGKDD Conference on Knowledge Discovery and Data Mining (KDD'17)
- ★ 2017 The Twenty-Sixth International Joint Conference on Artificial Intelligence (IJCAI'17), Senior PC
- ★ 2017 The 30th Conference on Artificial Intelligence (AAAI'17)
- ★ 2017 The 16th International Joint Conference on Autonomous Agents and Multi-Agent Systems (AAMAS'16)
- ★ 2017 The 15th International Conference on Practical Applications of Agents and multi-agents systems (PAAMS'17)
- ★ 2016 International Conference on Behavioral, Economic and Socio-Cultural Computing (BESC'16)
- ★ 2016 The 7th Conference on Decision and Game Theory for Security (GAMESEC)
- ★ 2016 International Conference on Agents (ICA)
- ★ 2016 The 17th ACM Conference on Electronic Commerce (EC)
- ★ 2016 IEEE/WIC/ACM International Conference on Web Intelligence (WI'16)
- ★ 2016 The 19th international conference on Principles and Practice of Multi-Agent Systems (PRIMA'16), Senior PC
- ★ 2016 The Ninth Conference on Artificial General Intelligence (AGI)
- ★ 2016 The Twenty-Fifth International Joint Conference on Artificial Intelligence (IJCAI'16), Senior PC
- ★ 2016 The 15th International Joint Conference on Autonomous Agents and Multi-Agent Systems (AAMAS'16), Senior PC
- ★ 2016 The Twenty-Ninth Conference on Artificial Intelligence (AAAI'16)

- ★ 2016 The 14th International Conference on Practical Applications of Agents and multi-agents systems (PAAMS'16)
- ★ 2015 The 16th ACM Conference on Electronic Commerce (EC)
- ★ 2015 The Twenty-Fourth International Joint Conference on Artificial Intelligence (IJCAI'15), Senior PC
- ★ 2015 The 14th International Joint Conference on Autonomous Agents and Multi-Agent Systems (AAMAS'15), Senior PC
- ★ 2015 Twenty-Eighth Conference on Artificial Intelligence (AAAI'15)
- ★ 2015 The 18th international conference on Principles and Practice of Multi-Agent Systems (PRIMA'15), Senior PC
- ★ 2015 The 2015 IEEE/WIC/ACM International Conference on Intelligent Agent Technology (IAT) Special Session on Agents in Urban Computing and Engineering
- ★ 2015 International Conference on Behavioral, Economic and Socio-Cultural Computing (BESC'15)
- ★ 2015 The Eighth Conference on Artificial General Intelligence (AGI)
- ★ 2015 Intelligent Robotics and Multi-Agent Systems (IRMAS) track of the ACM Symposium on Applied Computing (SAC'15)
- ★ 2014 Twenty-Eighth Conference on Artificial Intelligence (AAAI'14)
- ★ 2014 The 21st European Conference on Artificial Intelligence (ECAI'14)
- ★ 2014 The 13th International Joint Conference on Autonomous Agents and Multi-Agent Systems (AAMAS'14)
- ★ 2014 The 17th international conference on Principles and Practice of Multi-Agent Systems (PRIMA'14), Senior PC
- ★ 2014 First Annual Symposium and Bootcamp on the Science of Security (HotSoS'14)
- ★ 2014 International Conference on Behavioral, Economic and Socio-cultural Computing (BESC'14)
- ★ 2014 The 8th International Conference on Intelligent Information Processing (IIP'14)
- ★ 2013 Twenty-Seventh Conference on Artificial Intelligence (AAAI'13)
- ★ 2013 Twenty-Third International Joint Conference on Artificial Intelligence (IJCAI'13), Senior PC
- ★ 2013 The 16th international conference on Principles and Practice of Multi-Agent Systems (PRIMA'13), Senior PC
- ★ 2013 The 7th International Conference on Intelligent Information Processing (IIP'13)
- ★ 2012 Twenty-Sixth Conference on Artificial Intelligence (AAAI'12)
- ★ 2012 International Joint Conference on Autonomous Agents and Multi-Agent Systems (AAMAS'12)
- ★ 2011 International Joint Conference on Autonomous Agents and Multi-Agent Systems (AAMAS'11)

Workshop Program Committees:

- ★ 2017 The Twenty-Sixth International Joint Conference on Artificial Intelligence (IJCAI'17, Demo)
- ★ 2017 International Joint Conference on Autonomous Agents and Multi-Agent Systems (AAMAS'17, Doctoral Consortium)
- ★ 2017 The Fourth Workshop on Multiagent Interaction without Prior Coordination (MIPC) @AAMAS'17
- ★ 2017 Joint Workshop on Trading Agent Design and Analysis (TADA) and Agent-Mediated Electronic Commerce (AMEC)
- ★ 2017 The 10th International Workshop on Agent-based Complex Automated Negotiations (ACAN)
- ★ 2017 Workshop on Adversarial Reasoning in Multi-agent Systems (ADVERSE) @AAMAS'17
- ★ 2017 The First Workshop on Transfer in Reinforcement Learning (TIRL) @AAMAS'17
- ★ 2017 Ninth International Workshop on Optimisation in Multi-Agent Systems (OPTMAS)

- ★ 2016 Fifth International Workshop on Human-Agent Interaction Design and Models (HAIDM'16)
- ★ 2016 Eighth International Workshop on Optimisation in Multi-Agent Systems (OPTMAS)
- ★ 2016 The AAMAS 2016 Workshop on Transportation Applications of Equilibrium, Incentives and Game Theory
- ★ 2016 The 9th International Workshop on Agent-based Complex Automated Negotiations (ACAN)
- ★ 2016 Security and Multi-agent Systems (SecMAS) at AAMAS'2016
- ★ 2016 Joint Workshop on Trading Agent Design and Analysis (TADA) and Agent-Mediated Electronic Commerce (AMEC)
- ★ 2016 Twenty-Ninth Conference on Artificial Intelligence (AAAI'16, Doctoral Consortium)
- ★ 2015 International Joint Agents Workshop and Symposium (IJAWS2015)
- ★ 2015 Fourth International Workshop on Human-Agent Interaction Design and Models (HAIDM'15)
- ★ 2015 Joint Workshop on Trading Agent Design and Analysis (TADA) and Agent-Mediated Electronic Commerce (AMEC)
- ★ 2015 The Eighth International Workshop on Agent-based Complex Automated Negotiations (ACAN)
- ★ 2015 Eighth International Workshop on Optimisation in Multi-Agent Systems (OPTMAS)
- ★ 2015 Twenty-Eighth Conference on Artificial Intelligence (AAAI'15, Doctoral Consortium)
- ★ 2015 AAAI workshop on Multiagent Interaction without Prior Coordination (MIPC'15)
- ★ 2014 International Joint Workshop on Optimisation in Multi-Agent Systems and Distributed Constraint Reasoning (OPTMAS-DCR'14)
- ★ 2014 Third International Workshop on Human-Agent Interaction Design and Models (HAIDM'14)
- ★ 2014 Joint Workshop on Trading Agent Design and Analysis (TADA) and Agent-Mediated Electronic Commerce (AMEC)
- ★ 2013 International Joint Conference on Autonomous Agents and Multi-Agent Systems (AAMAS'13, Doctoral Consortium)
- ★ 2013 International Joint Conference on Autonomous Agents and Multi-Agent Systems (AAMAS'13, Demo Track)
- ★ 2013 The 15th International Workshop on Agent-Mediated Electronic Commerce (AMEC)
- ★ 2013 Sixth International Workshop on Optimisation in Multi-Agent Systems (OPTMAS)
- ★ 2013 Second International Workshop on Human-Agent Interaction Design and Models (HAIDM)
- ★ 2013 The Ninth International Workshop on Agents & Data Mining Interaction (ADMI-13)
- ★ 2012 Fifth International Workshop on Optimisation in Multi-Agent Systems (OPTMAS)
- ★ 2012 Joint Workshop on Trading Agent Design and Analysis (TADA) and Agent-Mediated Electronic Commerce (AMEC)
- ★ 2012 First International Workshop on Human-Agent Interaction Design and Models (HAIDM)
- ★ 2012 The Eighth International Workshop on Agents & Data Mining Interaction (ADMI-12)
- ★ 2011 Workshop on Agent-Mediated Electronic Commerce (AMEC XIII)

Chair Sessions at Top Conferences:

- ★ 2017 Twenty-Sixth International Joint Conference on Artificial Intelligence (IJCAI'17)
- ★ 2017 International Joint Conference on Autonomous Agents and Multi-Agent Systems (AAMAS'17)
- ★ 2017 Thirty First Conference on Artificial Intelligence (AAAI'17)
- ★ 2016 Twenty-Fifth International Joint Conference on Artificial Intelligence (IJCAI'16)
- ★ 2016 International Joint Conference on Autonomous Agents and Multi-Agent Systems (AAMAS'16)
- ★ 2016 Thirtieth Conference on Artificial Intelligence (AAAI'16)

- ★ 2015 International Joint Conference on Autonomous Agents and Multi-Agent Systems (AAMAS'15)
- ★ 2013 Twenty-Seventh Conference on Artificial Intelligence (AAAI'13)
- ★ 2013 International Joint Conference on Autonomous Agents and Multi-Agent Systems (AAMAS'13)

Invited Participation in Selected Panels:

- ★ 2017 Panelist at the Ninth International Workshop on Optimisation in Multi-Agent Systems (OPTMAS) at AAMAS'17
- ★ 2015 Panelist at the Doctoral Mentoring Program at the International Joint Conference on Autonomous Agents and Multi-Agent Systems (AAMAS'15)

Award Committee Member:

- ★ 2014 **International Foundation of Autonomous Agents and Multi-Agent Systems (IFAAMAS)** Victor Lesser Distinguished Dissertation Award.

Grant Proposal Reviewing:

- ★ 2014-2017 National Natural Science Foundation of China
- ★ 2016 United States National Science Foundation
- ★ 2016 Israel National Science Foundation
- ★ 2013 Czech Science Foundation

Reviewing:

- ★ ACM Transactions on Autonomous and Adaptive Systems (ACM TAAS)
- ★ ACM Transactions on Intelligent Systems and Technology (ACM TIST)
- ★ Annals of Mathematics and Artificial Intelligence (AMAI)
- ★ Artificial Intelligence Journal (AIJ)
- ★ Games and Economic Behavior (GEB)
- ★ Group Decision and Negotiation
- ★ IEEE Intelligent Systems
- ★ IEEE Transactions on Information Forensics & Security
- ★ IEEE Transactions on Mobile Computing
- ★ IEEE Transactions on Systems, Man and Cybernetics, Part A, Part B, Part C
- ★ Information Systems Frontiers
- ★ Journal of Artificial Intelligence Research (JAIR)
- ★ Journal of Autonomous Agents and Multi-Agent Systems (JAAMAS)
- ★ Journal of Computer Science and Technology
- ★ Journal of Transport Geography
- ★ Multiagent and Grid Systems
- ★ Multimedia Systems
- ★ Naval Research Logistics
- ★ Networks
- ★ Physica A
- ★ The Computer Journal
- ★ Transportation Science
- ★ World Wide Web Journal
- ★ Many conferences including AAMAS, AAAI, IJCAI, EC, WINE, SAGT

Other Service:

- ★ 2017 Mentor at IJCAI 2017 Doctoral Consortium
- ★ 2017 Mentor at AAMAS 2017 Doctoral Consortium
- ★ 2016 Mentor at IJCAI 2016 Doctoral Consortium
- ★ 2016 Mentor for the Doctoral Consortium at the 4th International conference on Computational Sustainability
- ★ 2015 Mentor at AAAI 2015 Doctoral Consortium
- ★ 2014 Mentor at AAAI 2014 Doctoral Consortium
- ★ 2014 Mentor at AAMAS 2014 Doctoral Consortium

Students Supervised**Doctoral Students:**

- ★ Xu He (Fall 2017-), Nanyang Technological University
- ★ Lei Feng (Fall 2017-), Nanyang Technological University
- ★ Youzhi Zhang (Fall 2016-), Nanyang Technological University
- ★ Jiuchuan Jiang (Spring 2016-), Nanyang Technological University
- ★ Xinrun Wang (Fall 2015-), Nanyang Technological University
- ★ Mengchen Zhao (Fall 2014-), Nanyang Technological University
- ★ Yanhai Xiong (Spring 2014-, with Miao Chunyan), Nanyang Technological University
- ★ Haipeng Chen (Spring 2014-, with Soh Yeng Chai), Nanyang Technological University
- ★ Qingyu Guo (Spring 2014-), Nanyang Technological University
- ★ Jiang Rong (Fall 2013-), Institute of Computing Technology, Chinese Academy of Sciences

Postdoc, Research Associates, and Visiting Researchers:

- ★ Wanyuan Wang (Fall 2016-), Postdoc, Nanyang Technological University

PhD students graduated from NTU:

- ★ Matthias Chan (graduated in May 2017), Nanyang Technological University
- ★ Debraj Roy (graduated in May 2017), Nanyang Technological University
- ★ Vaisagh Viswanathan Thattamparambil (graduated in 2014), Nanyang Technological University

Other Alumni:

- ★ Yue Yin (Fall 2012-Winter 2016), PhD student at Institute of Computing Technology, Chinese Academy of Sciences
- ★ Zhen Wang: Fall 2014-Summer 2016, Research Associate, Nanyang Technological University.
- ★ Jiarui Gan: Fall 2012-Summer 2015, Master student at Institute of Computing Technology, Chinese Academy of Sciences; Fall 2015-Summer 2016, Research Associate, Nanyang Technological University. Now PhD student at University of Oxford.

Teaching Experience

- ★ 2017 Fall: Artificial Intelligence, Nanyang Technological University
- ★ 2017 Spring: Intelligent Agents, Nanyang Technological University
- ★ 2016 Fall: Artificial Intelligence, Nanyang Technological University
- ★ 2016 Spring: Intelligent Agents, Nanyang Technological University
- ★ 2015 Fall: Artificial Intelligence, Nanyang Technological University
- ★ 2015 Spring: Intelligent Agents, Nanyang Technological University
- ★ 2014 Fall: Artificial Intelligence, Nanyang Technological University
- ★ 2014 Spring: Intelligent Agents, Nanyang Technological University
- ★ 2013 Fall: Software Engineering, Nanyang Technological University
- ★ 2013 Spring: Algorithms, Nanyang Technological University

References (available upon request)

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