Haifeng Xu

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RESEARCH INTERESTS

Artificial Intelligence, Computational Game Theory, Machine Learning, Optimization, Information Economics, the Design and Analysis of Algorithms

APPOINTMENTS

Alan Batson Assistant Professor   08/2019 – present
Department of Computer Science
University of Virginia, USA

Postdoctoral Fellow   08/2018 – 08/2019
Center for Research on Computation and Society (CRCS)
Harvard University, USA
Hosts: Yiling Chen and David C. Parkes

Lecturer on Computer Science   09/2018 – 12/2018
Harvard John A. Paulson School of Engineering and Applied Sciences (SEAS)

EDUCATION

Ph.D. in Computer Science   08/2013 – 07/2018
University of Southern California, USA
Advisors: Milind Tambe and Shaddin Dughmi
Thesis: Information as a Double-Edged Sword in Strategic Interactions.
ACM SIGecom Doctoral Dissertation Award (honorable mention)
IFAAMAS Victor Lesser Distinguished Dissertation Award (runner-up)

MMath in Computational Mathematics   08/2012 – 08/2013
University of Waterloo, Canada

B.Sc. (honours) in Mathematics   08/2008 – 07/2012
School of Gifted Young, University of Science & Technology of China
I was a member of the HUA Loo-Keng Elite Program in Mathematics

SELECTED HONORS & AWARDS

○ **Google Faculty Research Award**   2020

○ **ACM SIGecom Dissertation Award, honorable mention**   2019

○ **IFAAMAS Victor Lesser Distinguished Dissertation Award, runner-up**   2019

○ **Best Application System Demo Award, AAMAS 2019**.   2019

○ **Google Ph.D. Fellowship**   2017

One of the three recipients worldwide in the category *Algorithms, Optimizations and Markets*

○ **CAMS Prize for Excellence in Research, USC Center for Applied Mathematical Sciences** 2017
    Awarded annually to two graduate students across the university

○ **Best Research Assistant Award, Computer Science Department, USC** 2017

○ **Best Paper Award, AAMAS Workshop on Security and Multi-agent Systems** (SecMas) 2016

○ **Best Student Paper Award, AAMAS 2016** 2016

○ **Shing-Tung Yau Chinese College Student Mathematics Contests** 2011
    A prestigious national contest organized by the famous mathematician Shing-Tung Yau
    – Silver Medal in Applied Mathematics (**Top 4 in the country**)
    – Bronze Team Medal (**Top 4 teams in the country**)

○ **Microsoft Young Fellowship** 2011

INTERNSHIPS AND RESEARCH VISITS

Research Intern, Google Research 06/2016 – 08/2016
    Mentors: Ashwinkumar Badanidiyuru and Kshipra Bhawalkar
    Project: Targeting and strategic signaling in ad auctions [SODA'18]

Visiting Student, Simons Institute for the Theory of Computing 10/2015 – 12/2015
    Program: Economics and Computation
    Project: Signaling in Bayesian Stackelberg games [AAMAS'16]

Research Intern, Yahoo! Lab 06/2015 – 08/2015
    Mentor: Ruggiero Cavallo
    Project: Equilibrium analysis in Ad auctions with asymmetrically informed bidders

Course Member, *Foundations of Social Computing*, University of Waterloo 01/2013 – 04/2013
    Instructor: Kate Larson
    Course Project: Improving the efficiency of crowdsourcing contests [AAMAS'14]

Research Intern, Microsoft Research 07/2011 – 06/2012
    Mentors: Bin Gao and Tieyan Liu
    Project: Predicting advertiser bidding behaviors in ad auctions [WWW'13]

PUBLICATIONS

*For papers appearing at theoretical CS venues, the author order is alphabetical (α-β) by convention.

Manuscripts and Working Papers

[M2]. Ravi Sundaram, Anil Vullikanti, **Haifeng Xu** and Fan Yao. PAC-Learning for Strategic Classification.

[M1]. James Nachbar and Haifeng Xu. The Power of Signaling and its Intrinsic Connection to the Price of Anarchy

Refereed Conference Papers

[C32]. Aditya Mate, Jackson A. Killian, **Haifeng Xu**, Andrew Perrault, Milind Tambe. Collapsing Bandits and Their Application to Public Health Interventions. *Proceedings of the 34th Conference on Neural Information Processing Systems* (**NeurIPS 2020**).

[C31]. (α-β) Zhe Feng, David Parkes, **Haifeng Xu**. The Intrinsic Robustness of Stochastic Bandits to Strategic Manipulation. *Proceedings of the 37th International Conference on Machine Learning* (**ICML 2020**).

[C30]. **Haifeng Xu**. On the Tractability of Public Persuasion with No Externalities. *Proceedings of the 31st ACM-SIAM Symposium on Discrete Algorithms* (**SODA 2020**).

[C29]. (α-β) Yiling Chen, **Haifeng Xu**, Shuran Zheng. Selling Information through Consulting. *Proceedings of the 31st ACM-SIAM Symposium on Discrete Algorithms* (**SODA 2020**).

[C28]. Sarah Keren, **Haifeng Xu**, David Parkes, Kofi Kwapong and Barbara Grosz. Information Shaping for Enhanced Goal Recognition of Partially-Informed Agents. *Proceedings of the 34nd AAAI Conference on Artificial Intelligence* (**AAAI 2020**), oral.

[C27]. Elizabeth Bondi, Hoon Oh, **Haifeng Xu**, Fei Fang, Bistra Dilkina, Milind Tambe. To Signal or Not To Signal: Exploiting Uncertain Real-Time Information in Signaling Games for Security and Sustainability. *Proceedings of the 34nd AAAI Conference on Artificial Intelligence* (**AAAI 2020**), oral.

[C26]. Chao Yan, **Haifeng Xu**, Yevgeniy Vorobeychik, Bo Li, Daniel Fabbri, Bradley Malin. To Warn or Not to Warn: Online Signaling in Audit Games. *Proceedings of the 36th IEEE International Conference on Data Engineering* (**ICDE 2020**), oral.

[C25]. Thanh Nguyen, Andrew Butler and **Haifeng Xu**. Tackling Imitative Attacker Deception in Repeated Bayesian Stackelberg Security Games. *Proceedings of the 24th European Conference on Artificial Intelligence* (**ECAI 2020**).

[C24]. Jiarui Gan, **Haifeng Xu**, Qingyu Guo, Long Tran-Thanh, Zinovi Rabinovich and Michael Wooldridge. Imitative Follower Deception in Stackelberg Games. *Proceedings of the 20th ACM Conference on Economics and Computation* (**EC'19**).

[C23]. (α-β) Thanh H. Nguyen and **Haifeng Xu**. Imitative Attacker Deception in Stackelberg Security Games. *Proceedings of the 28th International Joint Conference on Artificial Intelligence* (**IJCAI'19**).

[C22]. (α-β) Jerry Anunrojwong, Yiling Chen, Bo Waggoner and **Haifeng Xu**. Computing Equilibria of Prediction Markets via Persuasion. *Proceedings of the 15th Conference on Web and Internet Economics* (**WINE'19**).

[C21]. Omkar Thakoor, Milind Tambe, Phebe Vayanos, **Haifeng Xu**, Christopher Kiekintveld, and Fei Fang. Cyber Camouflage Games for Strategic Deception. *Proc. 10th Conference on Decision and Game Theory for Security* (**GameSec 2019**).

[C20]. **Haifeng Xu**, Kai Wang, Phebe Vayanos, Milind Tambe. Strategic Coordination of Human Patrollers and Mobile Sensors with Signaling for Security Games. *Proceedings of the 32th AAAI Conference on Artificial Intelligence* (**AAAI'18**), oral.

[C19]. (α-β) Ashwinkumar Badanidiyuru, Kshipra Bhawalkar, **Haifeng Xu**. Targeting and Signaling in Ad Auctions. *ACM-SIAM Symposium on Discrete Algorithms* (**SODA'18**).

[C18]. **Haifeng Xu**, Shaddin Dughmi, Milind Tambe, Venil Loyd Noronha. Mitigating the Curse of Correlation in Security Games by Entropy Maximization. *Proceedings of the 17th International Conference on Autonomous Agents and Multiagent Systems* (**AAMAS'18**, short paper).

[C17]. Aaron Schlenker, Omkar Thakoor, **Haifeng Xu**, Fei Fang, Milind Tambe, Long Tran-Thanh, Phebe Vayanos, Yevgeniy Vorobeychik. Deceiving Cyber Adversaries: A Game Theoretic Approach. *Proceedings of the 17th International Conference on Autonomous Agents and Multiagent Systems* (**AAMAS'18**).

[C16]. (α-β) Shaddin Dughmi, **Haifeng Xu**. Algorithmic Persuasion with No Externalities. *Proceedings of the 18th ACM Conference on Economics and Computation* (**EC'17**).

[C15]. **Haifeng Xu***, Benjamin Ford*, Fei Fang, Bistra Dilkina, Andrew Plumptre, Milind Tambe, Margaret Driciru, Fred Wanyama, Aggrey Rwetsiba, Mustapha Nsubaga and Joshua Mabonga. Optimal Patrol Planning for Green Security Games with Black-Box Attackers. *Proceedings of the 8th Conference on Decision and Game Theory for Security* (**GameSec'17**). (*Equal Contributions)

[C14]. Aaron Schlenker, **Haifeng Xu**, Mina Guirguis, Christopher Kiekintveld, Arunesh Sinha, Milind Tambe, Solomon Sonya, Darryl Balderas, Noah Dunstatter. Don't Bury your Head in Warnings: A Game-Theoretic Approach for Intelligent Allocation of Cyber-security Alerts. *Proceedings of the 26th International Joint Conference on Artificial Intelligence* (**IJCAI'17**). Highlighted in the press release opening the IJCAI'17 conference.

[C13]. (α-β) Shaddin Dughmi, **Haifeng Xu.** Algorithmic Bayesian Persuasion. *Proceedings of the 48th ACM Symposium on Theory of Computing* (**STOC'16**). Invited to SICOMP Special Issue for STOC 2016.

[C12]. **Haifeng Xu.** The Mysteries of Security Games: Equilibrium Computation Becomes Combinatorial Algorithm Design. *Proceedings of the 17th ACM Conference on Economics and Computation* (**EC'16**). Best paper award at the AAMAS-16 workshop on Security and Multi-agent Systems.

[C11]. **Haifeng Xu**, Rupert Freeman, Vincent Conitzer, Shaddin Dughmi, Milind Tambe. Signaling in Bayesian Stackelberg Games. *Proceedings of the 15th International Conference on Autonomous Agents and Multiagent Systems* (**AAMAS'16**).

[C10]. **Haifeng Xu***, Long Tran Thanh*, Nick Jennings. Playing Repeated Security Games with No Prior Knowledge. *Proceedings of the 15th International Conference on Autonomous Agents and Multiagent Systems* (**AAMAS'16**). (*Equal Contributions)

[C9]. Amulya Yadav, Hau Chan, Albert Jiang, **Haifeng Xu**, Eric Rice, Milind Tambe. Using Social Networks to Aid Homeless Shelters: Dynamic Influence Maximization Under Uncertainty. *Proceedings of the 15th International Conference on Autonomous Agents and Multiagent Systems* (**AAMAS'16**). Best student paper award.

[C8]. **Haifeng Xu**, Albert X. Jiang, Arunesh, Sinha, Zinovi Rabinovich, Shaddin Dughmi, Milind Tambe. Security Games with Information Leakage: Modeling and Computation. *Proceedings of the 24th International Joint Conference on Artificial Intelligence* (**IJCAI'15**).

[C7]. Yue Yin, **Haifeng Xu**, Jiarui Gan, Bo An, Albert X. Jiang. Computing Optimal Mixed Strategies for Security Games With Dynamic Payoffs. *Proceedings of the 24th International Joint Conference on Artificial Intelligence* (**IJCAI'15**).

[C6]. Zinovi Rabinovich, Albert X. Jiang, Manish Jain, **Haifeng Xu**. Information Disclosure as a Means of Security. *Proceedings of the 14th International Conference on Autonomous Agents and Multiagent Systems* (**AAMAS'15**).

[C5]. **Haifeng Xu**, Zinovi Rabinovich, Shaddin Dughmi, Milind Tambe. Exploring Information Asymmetry in Two-Stage Security Games. *Proceedings of the 29th AAAI Conference on Artificial Intelligence* (**AAAI'15**).

[C4]. **Haifeng Xu**, Fei Fang, Albert X. Jiang, Vincent Conitzer, Shaddin Dughmi, Milind Tambe. Solving Zero-Sum Security Games in Discretized Spatio-Temporal Domains. *Proceedings of the 28th AAAI Conference on Artificial Intelligence* (**AAAI'14**).

[C3]. Leandro Marcolino, **Haifeng Xu**, Albert X. Jiang, Milind Tambe, Emma Bowring. Give a Hard Problem to a Diverse Team: Exploring Large Action Spaces. *Proceedings of the 28th AAAI Conference on Artificial Intelligence* (**AAAI'14**).

[C2]. **Haifeng Xu**, Kate Larson. Improving the Efficiency of Crowdsourcing Contests. *Proceedings of the 13th International Conference on Autonomous Agents and Multiagent Systems* (**AAMAS'14**).

[C1]. **Haifeng Xu**, Bin Gao, Diyi Yang, Tieyan Liu. Predicting Advertiser Bidding Behaviors in Sponsored Search by Rationality Modeling. *Proceedings of the 22nd International Conference on World Wide Web* (**WWW'13**).

ADVISING and MENTORING

Doctor of Philosophy

- Minbiao Han (co-advised with Prof. Michael Albert from UVA Darden Business School)
- Jibang Wu
- Fan Yao (co-advised with Prof. Hongning Wang)

Undergrads and Masters

- Chenghan Zhou
- Sijun (Jeffrey) Tan
- Quinlan Dawkins

Visitors

- James Nachbar (summer 2020, from Yale)
- Zhifan Lu (summer 2020, from UVA Mcintire School of Commerce)

TEACHING

Lecturer

- UVA CS 6161: Design and Analysis of Algorithms (graduate)   Fall'20
    Enrollments: 65; Student Evaluation: TBD.

- UVA CS 4710: Artificial Intelligence (undergraduate)   Spring'20
    Enrollments: 98; Student Evaluation: 4.22/5.0.

- UVA CS 6501: Topics in Learning and Game Theory (graduate)   Fall'19
    Enrollments: 28; Student Evaluation: 4.88/5.0.

- Harvard University CS 182: Artificial Intelligence (undergraduate)   Fall'18

PROFESSIONAL SERVICE

Tutorials

- Tutorial on Information, Persuasion and Decision Making at EC 2018.

(Co-)Chair

- Workshop on Strategic Reasoning for Societal Challenges (SRSC) with AAMAS 2019.
- Workshop on AI for Imperfect Information Games with AAAI 2018.
- Workshop on Adversarial Reasoning in Multi-Agent Systems with AAMAS 2017.

Senior Program Committee: AAAI (2021, 2020,2019), IJCAI (2021)

Program Committee: EC(2021, 2020, 2019), AAAI (2018), IJCAI (2020, 2019, 2017, 2016, 2015), AA-MAS (2021, 2020, 2019), GameSec (2019, 2018, 2017)

Journal Reviewing Activities: Management Science, Mathematics of Operation Research, Games and Economic Behavior (GEB), Artificial Intelligence (AIJ), Journal of Artificial Intelligence Research (JAIR), Autonomous Agents and Multi-Agent Systems (JAAMAS), etc.

(SELECTED) INVITED TALKS

○ *The Double-Edged Role of Information in Security Games*
    — Penn State University AI for Social Impact seminar series, Nov 2020
    — Invited guest lecture at CMU for advanced course *AI Methods for Social Good*, Spring 2020

○ *Manipulating Learning Algorithms in Strategic Environments*
    — CMU Special Institute for Software Research Seminar, Feb 2020
    — UVA Bio-complexity Institute Seminar, Nov 2019
    — UVA Seminar on Artificial Intelligence and Machine Learning, Nov 2019
    — UVA Seminar on Human and Machine Intelligence, Oct 2019

○ *Algorithmic Persuasion with No Externalities*
    — Workshop on the Economics of Strategic Communication and Persuasion, Montreal, Nov 2018.

○ *Algorithmic Persuasion*
    — Harvard EconCS Seminar, Nov 2018.

○ *Information as A Double-Edged Sword in Strategic Interactions*
    — The Institute for Interdisciplinary Information Sciences (IIIS), Tsinghua University, June 2018.

○ *Strategic Coordination of Human Patrollers and UAVs with Signaling for Security Games*
    — Computational Sustainability Open Graduate Online Seminar, May 2018.

○ *The Mysteries of Security Games: Equilibrium Computation Becomes Combinatorial Algorithm Design*
    — Southern California Symposium on Network Economics and Game Theory (NEGT), Caltech, Jan 2018.

○ *Strategic Coordination of Human Patrollers and Mobile Sensors with Signaling for Security Games*
    — CMU CyLab, October 2017.