Christian Kroer | Curriculum Vitae

+1 (412) 667 0870 • christian.kroer@columbia.edu
www.christiankroer.com • chrkroer • ChrKroer
US green card holder

Research interests

Fields: artificial intelligence, optimization, game theory.

Specific: equilibrium computation, market design, auctions, first-order methods, online learning, machine learning, robust optimization, prediction markets.

Education

Carnegie Mellon University — **Pittsburgh**
Ph.D. in computer science, PA, USA — *2012–2018*

IT University of Copenhagen — **Copenhagen**
M.Sc. IT - software development and technology, Denmark — *2009–2012*

Aalborg University — **Aalborg**
B.A. human-centered informatics, Denmark — *2006–2009*

Employment and Internships

Assistant Professor
Columbia University — *2019–*

Postdoc
Facebook, Core Data Science — *2018–2019*

Research Assistant
Carnegie Mellon University — *2012–2018*

Research Scientist (part-time position)
Facebook, Core Data Science — *2016–2018*

Research Intern
Facebook, Core Data Science — *Summer 2016*

Research Intern
Microsoft Research New York City — *Summer 2015*

Research Assistant (short-term contractor position)
Aalborg University — *2012*

Teaching Assistant
IT University of Copenhagen — *2011–2012*

Systems Developer
Netmester A/S — *2010–2011*

Honors and Awards

2016 - 2018: Facebook Fellowship in economics and computation. One given worldwide per year. Full tuition, fees, stipend, and travel grant for two years, $183,168.

2017: Runner-up in the Informs Computing Society Student Paper Competition

Publications

Published papers

[1] Yuan Gao and Christian Kroer. First-order methods for large-scale market equilibrium computation. In *NeurIPS*, 2020.

[2] Tom Yan, Christian Kroer, and Alexander Peysakhovich. Evaluating and rewarding teamwork using cooperative game abstractions. In *NeurIPS*, 2020.

[3] Gabriele Farina, Christian Kroer, and Tuomas Sandholm. Stochastic regret minimization in extensive-form games. In *ICML*, 2020.

[4] Duncan Mcelfresh, Christian Kroer, Sergey Pupyrev, Karthik Sankararaman, Zack Chauvin, Neil Dexter, Eric Sodomka, and John Dickerson. Matching algorithms for blood donation. In *EC*, 2020.

[5] Riley Murray, Christian Kroer, Alex Peysakhovich, and Parikshit Shah. Robust market equilibria with uncertain preferences. In *AAAI (oral presentation)*, 2020. oral presentation.

[6] Christian Kroer and Tuomas Sandholm. Limited lookahead in imperfect-information games. *Artificial Intelligence Journal*, 2020.

[7] Christian Kroer, Kevin Waugh, Fatma Kılınç-Karzan, and Tuomas Sandholm. Faster algorithms for extensive-form game solving via improved smoothing functions. *Mathematical Programming Series A*, 2020.

[8] Alex Peysakhovich, Christian Kroer, and Adam Lerer. Robust multi-agent counterfactual prediction. In *NeurIPS*, 2019.

[9] Gabriele Farina, Christian Kroer, and Tuomas Sandholm. Optimistic regret minimization for extensive-form games via dilated distance-generating functions. In *NeurIPS*, 2019.

[10] Christian Kroer, Alexander Peysakhovich, Eric Sodomka, and Nicolas E Stier-Moses. Computing large market equilibria using abstractions. In *EC*, 2019.

[11] Vincent Conitzer, Christian Kroer, Debmalya Panigrahi, Okke Schrijvers, Eric Sodomka, Nicolas E Stier-Moses, and Chris Wilkens. Pacing equilibrium in first-price auction markets. In *EC*, 2019.

[12] Gabriele Farina, Christian Kroer, and Tuomas Sandholm. Regret circuits: Composability of regret minimizers. In *ICML (long oral)*, 2019.

[13] Gabriele Farina, Christian Kroer, Noam Brown, and Tuomas Sandholm. Stable-predictive optimistic counterfactual regret minimization. In *ICML*, 2019.

[14] Gabriele Farina, Christian Kroer, and Tuomas Sandholm. Online convex optimization for sequential decision processes and extensive-form games. In *AAAI*, 2019.

[15] Alberto Marchesi, Gabriele Farina, Christian Kroer, Nicola Gatti, and Tuomas Sandholm. Quasi-perfect stackelberg equilibrium. In *AAAI*, 2019.

[16] Christian Kroer, Gabriele Farina, and Tuomas Sandholm. Solving large sequential games with the excessive gap technique. In *NeurIPS (spotlight presentation)*, 2018.

[17] Christian Kroer and Tuomas Sandholm. A unified framework for extensive-form game abstraction with bounds. In *NeurIPS*, 2018.

[18] Vincent Conitzer, Christian Kroer, Eric Sodomka, and Nicolas E. Stier-Moses. Multiplicative pacing equilibria in auction markets. In *WINE*, 2018.

[19] Gabriele Farina, Alberto Marchesi, Christian Kroer, Nicola Gatti, and Tuomas Sandholm. Trembling-hand perfection in extensive-form games with commitment. In *IJCAI*, 2018.

[20] Christian Kroer, Gabriele Farina, and Tuomas Sandholm. Robust stackelberg equilibria in extensive-form games and extension to limited lookahead. In *AAAI*, 2018.

[21] Gabriele Farina, Christian Kroer, and Tuomas Sandholm. Regret minimization in behaviorally-constrained zero-sum games. In *ICML*, 2017.

[22] Christian Kroer, Kevin Waugh, Fatma Kılınç-Karzan, and Tuomas Sandholm. Theoretical and practical advances on smoothing for extensive-form games. In *EC*, 2017.

[23] Christian Kroer, Gabriele Farina, and Tuomas Sandholm. Smoothing method for approximate extensive-form perfect equilibrium. In *IJCAI*, 2017.

[24] Noam Brown, Christian Kroer, and Tuomas Sandholm. Dynamic thresholding and pruning for regret minimization. In *AAAI*, 2017.

[25] Christian Kroer and Tuomas Sandholm. Imperfect-recall abstractions with bounds in games. In *EC*, 2016.

[26] Christian Kroer, Miroslav Dudík, Sébastien Lahaie, and Sivaraman Balakrishnan. Arbitrage-free combinatorial market making via integer programming. In *EC*, 2016.

[27] Christian Kroer and Tuomas Sandholm. Sequential planning for steering immune system adaptation. In *IJCAI*, 2016.

[28] Christian Kroer, Kevin Waugh, Fatma Kılınç-Karzan, and Tuomas Sandholm. Faster first-order methods for extensive-form game solving. In *EC*, 2015.

[29] Christian Kroer and Tuomas Sandholm. Limited lookahead in imperfect-information games. In *IJCAI*, 2015.

[30] Christian Kroer and Tuomas Sandholm. Discretization of continuous action spaces in extensive-form games. In *AAMAS*, 2015.

[31] Christian Kroer and Tuomas Sandholm. Computational bundling for auctions. In *AAMAS*, 2015.

[32] Christian Kroer and Tuomas Sandholm. Extensive-form game abstraction with bounds. In *EC*, 2014.

[33] Bruce DeBruhl, Christian Kroer, Anupam Datta, Tuomas Sandholm, and Patrick Tague. Power napping with loud neighbors: optimal energy-constrained jamming and anti-jamming. In *WiSec*, 2014.

[34] Christian Kroer, Martin Kjær Svendsen, Rune M Jensen, Joseph Kiniry, and Eilif Leknes. Symbolic configuration for interactive container ship stowage planning. *Computational Intelligence*, 2014.

[35] Paolo Viappiani and Christian Kroer. Robust optimization of recommendation sets with the maximin utility criterion. In *ADT*, 2013.

[36] Kevin Tierney, Amanda Jane Coles, Andrew Coles, Christian Kroer, Adam M Britt, and Rune Møller Jensen. Automated planning for liner shipping fleet repositioning. In *ICAPS*, 2012.

[37] Christian Kroer and Yuri Malitsky. Feature filtering for instance-specific algorithm configuration. In *ICTAI*, 2011.

Workshop papers

[1] Gabriele Farina, Christian Kroer, Noam Brown, and Tuomas Sandholm. Stable-predictive optimistic counterfactual regret minimization. In *AAAI-20 Workshop on Reinforcement Learning in Games*, 2020.

[2] Gabriele Farina, Christian Kroer, and Tuomas Sandholm. Optimistic regret minimization for extensive-form games via dilated distance-generating functions. In *AAAI-20 Workshop on Reinforcement Learning in Games*, 2020.

[3] Gabriele Farina, Christian Kroer, and Tuomas Sandholm. Composability of regret minimizers. In *AAAI-20 Workshop on Reinforcement Learning in Games*, 2020.

[4] Gabriele Farina, Christian Kroer, and Tuomas Sandholm. Optimistic regret minimization for extensive-form games via dilated distance-generating functions. In *7th International Workshop on Strategic Reasoning (SR 2019) at IJCAI*, 2019.

[5] Alexander Peysakhovich and Christian Kroer. Fair division without disparate impact. In *3rd Workshop on Mechanism Design for Social Good at EC*, 2019.

[6] Duncan Mcelfresh, Christian Kroer, Sergey Pupyrev, Eric Sodomka, and John Dickerson. Matching algorithms for blood donation. In *3rd Workshop on Mechanism Design for Social Good at EC*, 2019.

[7] Duncan Mcelfresh, Christian Kroer, Sergey Pupyrev, Eric Sodomka, and John Dickerson. Matching algorithms for blood donation. In *AI for Social Good at IJCAI 2019*, 2019.

[8] Gabriele Farina, Christian Kroer, and Tuomas Sandholm. Regret circuits: Composability of regret minimizers. In *AAAI-19 Workshop on Reinforcement Learning in Games*, 2019.

[9] Alberto Marchesi, Gabriele Farina, Christian Kroer, Nicola Gatti, and Tuomas Sandholm. Quasi-perfect stackelberg equilibrium. In *AAAI-19 Workshop on Reinforcement Learning in Games*, 2019.

[10] Gabriele Farina, Christian Kroer, and Tuomas Sandholm. Online convex optimization for sequential decision processes and extensive-form games. In *AAAI-19 Workshop on Reinforcement Learning in Games*, 2019.

[11] Christian Kroer, Gabriele Farina, and Tuomas Sandholm. Solving large sequential games with the excessive gap technique. In *AAAI-19 Workshop on Reinforcement Learning in Games*, 2019.

[12] Christian Kroer and Tuomas Sandholm. A unified framework for extensive-form game abstraction with bounds. In *AI^3 workshop at IJCAI*, 2018.

[13] Christian Kroer, Nam Ho-Nguyen, George Lu, and Fatma Kılınç-Karzan. Performance evaluation of iterative methods for solving robust convex quadratic problems. In *Optimization for Machine Learning Workshop*, 2017.

[14] Vincent Conitzer, Christian Kroer, Eric Sodomka, and Nicolas E. Stier-Moses. Multiplicative pacing equilibria in auction markets. In *Workshop on Algorithmic Game Theory and Data Science at EC*, 2017.

[15] Gabriele Farina, Christian Kroer, and Tuomas Sandholm. Regret minimization in behaviorally-constrained zero-sum games. In *Algorithmic Game Theory Workshop at IJCAI*, 2017.

[16] Noam Brown, Christian Kroer, and Tuomas Sandholm. Dynamic thresholding and pruning for regret minimization. In *Algorithmic Game Theory Workshop at IJCAI*, 2016.

[17] Christian Kroer and Tuomas Sandholm. Imperfect-recall abstractions with bounds. In *Algorithmic Game Theory Workshop at IJCAI*, 2015.

[18] Christian Kroer and Tuomas Sandholm. Extensive-form game abstraction with bounds. In *Workshop on Computer Poker and Imperfect Information at AAAI*, 2015.

Invited talks

2019: Computing Large Market Equilibria using Abstractions. INFORMS Annual Conference

2019: Competitive Equilibrium without Disparate Impact. INFORMS Annual Conference

2019: AI and ML methods for Market Equilibrium. Machine Learning for Science and Engineering (MLSE)

2017: Multiplicative Pacing Equilibria in Auction Markets. INFORMS Annual Conference

2017: Multiplicative Pacing Equilibria in Auction Markets. Duke University CS-ECON Seminar

2016: Arbitrage-Free Combinatorial Market Making via Integer Programming. INFORMS Annual Conference.

2015: Faster First-Order Methods for Extensive-Form Game Solving. INFORMS Annual Conference.

2015: Faster First-Order Methods for Extensive-Form Game Solving. 22nd International Symposium on Mathematical Programming (ISMP).

2013: Computational Bundling for Auctions. INFORMS Annual Conference.

Other talks

2016: First-Order Methods for Extensive-Form Game Solving. CMU AI Seminar.

2016: Faster First-Order Methods for Extensive-Form Game Solving. INFORMS Annual Conference.

2016: Arbitrage-Free Combinatorial Market Making via Integer Programming. Facebook Operations, Economics and Computation group.

2016: Abstraction and convex optimization in sequential game solving. CMU graduate AI class.

2015: Discretization of Continuous Action Spaces in Extensive-Form Games. INFORMS Annual Conference.

2014: Sequential game solving overview. CMU undergrad AI class.

2014: Extensive-Form Game Abstraction with Bounds. CMU theory lunch.

2014: Extensive-Form Game Abstraction with Bounds. CMU open house.

Teaching

IEOR E4525 Machine Learning for OR & FE — **Columbia University**
MS class, Professor — *2020 Fall*

IEOR E8100 Economics, AI, and Optimization — **Columbia University**
PhD class, Professor — *2020 Spring*

IEOR E4004 Optimization Models and Methods — **Columbia University**
MS class, Professor — *2019 Fall*

Electronic Negotiation — **Carnegie Mellon University**
MS class, Vertical mentor — *2017*

Electronic Negotiation — **Carnegie Mellon University**
MS class, Vertical mentor — *2016*

Graduate Artificial Intelligence — **Carnegie Mellon University**
PhD class, TA — *2016*

Electronic Negotiation — **Carnegie Mellon University**
MS class, Vertical mentor — *2015*

Artificial Intelligence — **Carnegie Mellon University**
BS class, TA, Nominated for TA award — *2015*

Electronic Negotiation — **Carnegie Mellon University**
MS class, Vertical mentor — *2014*

Intelligent Systems Programming — **IT University of Copenhagen**
MS class, TA — *2012*

Algorithm Design — **IT University of Copenhagen**
MS class, TA — *2011*

Service

Thesis committee/review: Jalaj Bhandari, IEOR at Columbia University, 2020, Andrea Celli, Information Technology at Politecnico di Milano, 2019,

Senior Program Committee: AAAI 2020, 2021 Main Track, AAAI 2020, 2021 Social Impact Track

Program Committee: AAAI 2019, DAI 2019, EC 2019, 2020, IJCAI 2016, 2018, 2019, NeurIPS 2020, WEB 2020, Computer Poker Workshop at AAAI 2017

Reviewing: AAAI 2017, ACM Transactions on Economics and Computation, 2013, 2014, 2016, 2018, AISTATS 2017, Artificial Intelligence 2018, 2019, EC 2017, ICML 2016, IJCAI 2016, 2018, Imperfect-Information Games Workshop 2018, IPCO 2020, Operations Research 2018, 2019 JAAMAS 2015, 2016, TARK 2017, Transactions on Computational Intelligence and AI in Games 2014, 2015, WINE 2015, 2019

Societies: INFORMS, AAAI, ACM

2017 - 2018: Member of the CMU CSD Speakers Club

2014 - 2016: CMU CS Ph.D. admissions committee member

2013: CMU CSD Immigration Course coordinator

Programming

Strong experience: Java, Python, C++, C#

Medium experience: R, SQL, C, HTML, CSS

Familiar with: Matlab, Scala, XSLT, Ruby, Javascript

Frameworks

Statistics/ML: pandas, scikit-learn, tidyverse.

Version control: Git, SVN, Mercurial.

Optimization: CPLEX, Gurobi, NumPy, CVXPY.

Web: ASP.NET, React, Bootstrap, Flask.