Christian Kroer | Curriculum Vitae

✉ christian.kroer@columbia.edu   ●   🌐 www.christiankroer.com

in 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–*

Research Scientist (1 day per week)
Facebook, Core Data Science   *2019–2020*

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

Journal papers in progress

[1] Yuan Gao and Christian Kroer. Infinite-dimensional fisher markets and tractable fair division. *Operations Research (under submission)*, 2021.

[2] Vincent Conitzer, Christian Kroer, Debmalya Panigrahi, Okke Schrijvers, Eric Sodomka, Nicolas E Stier-Moses, and Chris Wilkens. Pacing equilibrium in first-price auction markets. *Management Science (minor revision)*, 2021.

Published papers

[1] Vincent Conitzer, Christian Kroer, Eric Sodomka, and Nicolas E. Stier-Moses. Multiplicative pacing equilibria in auction markets. *Operations Research (to appear)*, 2021.

[2] Christian Kroer, Alexander Peysakhovich, Eric Sodomka, and Nicolas E Stier-Moses. Computing large market equilibria using abstractions. *Operations Research (to appear)*, 2021.

[3] Steven Yin, Shatian Wang, Lingyi Zhang, and Christian Kroer. Dominant resource fairness with meta-types. In *IJCAI*, 2021.

[4] Gabriele Farina, Christian Kroer, and Tuomas Sandholm. Faster game solving via predictive Blackwell approachability: Connecting regret matching and mirror descent. In *AAAI*, 2021.

[5] Julien Grand-Clément and Christian Kroer. Scalable first-order methods for robust MDPs. In *AAAI*, 2021.

[6] Yuan Gao, Christian Kroer, and Donald Goldfarb. Increasing iterate averaging for solving saddle-point problems. In *AAAI*, 2021.

[7] Yuan Gao and Christian Kroer. Infinite-dimensional Fisher markets: Equilibrium, duality and optimization. In *AAAI*, 2021.

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

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

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

[11]   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.

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

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

[14]   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.

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

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

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

[18]   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.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

[40] 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.

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

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

[43] 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.

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

Workshop papers

[1] Gabriele Farina, Christian Kroer, and Tuomas Sandholm. Faster game solving via predictive blackwell approachability: Connecting regret matching and mirror descent. In *AAAI-21 Workshop on Reinforcement Learning in Games*, 2021.

[2] 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.

[3] 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.

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

[5] 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.

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

[8] 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.

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

[10] 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.

[11] 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.

[12] 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.

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

[14] 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.

[15]   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.

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

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

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

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

Invited talks

2021: A Computational Lens on Auction Markets with Budgets. NYU Stern Operations Management Research Seminar

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

Ph.D. Advisor: Yuan Gao, Rachitesh Kumar,

Thesis committee/review:
- IEOR at Columbia University: Jalaj Bhandari, Yunhao Tang, Yi Ren, Sai Mali Ananth
- Andrea Celli, Information Technology at Politecnico di Milano, 2019,

Area Chair: NeurIPS 2021

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

Program Committee: AAAI 2019, DAI 2019, EC 2019, 2020, 2021 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, Games and Economic Behavior, 2021, ICML 2016, IJCAI 2016, 2018, Imperfect-Information Games Workshop 2018, Information Systems Research 2021, IPCO 2020, Management Science, 2020, 2021, Operations Research 2018, 2019, 2020, 2021 JAAMAS 2015, 2016, TARK 2017, Transactions on Computational Intelligence

and AI in Games 2014, 2015, WINE 2015, 2019
Societies: INFORMS, AAAI, ACM
2020 - : Columbia IEOR Ph.D. admissions committee member
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.