# Christian Kroer | Curriculum Vitae

+1 (412) 667 0870 • ckroer@cs.cmu.edu
www.christiankroer.com • chrkroer • ChrKroer
US green card holder

## Research interests

**Fields**: Artificial intelligence, algorithms, operations research, economics.

**Specific**: Equilibrium computation, mechanism design, auctions, prediction markets, convex optimization, machine learning, robust optimization, and practical applications.

## Education

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

**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

**Research Assistant**
*Carnegie Mellon University* — *2012–present*

**Research Scientist (short-term contractor position)**
*Facebook, Operations, Economics and Computation team* — *2016–2017*

**Research Intern**
*Facebook, Operations, Economics and Computation team* — *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

### Working papers

[1] Christian Kroer, Kevin Waugh, Fatma Kılınç-Karzan, and Tuomas Sandholm. Faster algorithms for extensive-form game solving via improved smoothing functions. In *submission to Mathematical Programming Serias A*, 2018.

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

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

[4] Christian Kroer, Nam Ho-Nguyen, George Lu, and Fatma Kılınç-Karzan. Performance evaluation of iterative methods for solving robust convex quadratic problems. In *submission to Optimization for Machine Learning Workshop and work-in-progress*, 2018.

### Published papers

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

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

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

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

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

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

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

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

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

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

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

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

[13] 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.

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

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

[16] 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.

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

Workshop papers

[1] 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.

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

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

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

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

## Invited talks

**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

**Electronic Negotiation** — **Carnegie Mellon University**
*Vertical mentor* — *2017*

**Electronic Negotiation** — **Carnegie Mellon University**
*Vertical mentor* — *2016*

**Graduate Artificial Intelligence** — **Carnegie Mellon University**
*TA* — *2016*

**Electronic Negotiation** — **Carnegie Mellon University**
*Vertical mentor* — *2015*

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

**Electronic Negotiation** — **Carnegie Mellon University**
*Vertical mentor* — *2014*

**Intelligent Systems Programming** — **IT University of Copenhagen**
*TA* — *2012*

**Algorithm Design** — **IT University of Copenhagen**
*TA* — *2011*

## Service

**Reviewing**: TARK 2017, EC 2017, AAAI 2017, AISTAT 2017, ICML 2016, WINE 2015, JAAMAS 2015, 2016, ACM Transactions on Economics and Computation, 2013, 2014, Transactions on Computational Intelligence and AI in Games 2014, 2015.

**Societies**: INFORMS, AAAI, ACM

**2017**: Member of the CMU CSD Speakers Club.

**2017**: Program committee member for the Computer Poker Workshop at AAAI.

**2016**: Program committee member for IJCAI.

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

**2013**: CMU CSD Immigration Course coordinator.

## Programming

**Strong experience**: Java, Python, C++, C#.
**Medium experience**: SQL, C, HTML, CSS.
**Familiar with**: R, Matlab, Scala, XSLT, Ruby, Javascript.

## Frameworks

**OS**: Linux, OS X, Windows.
**Statistics/ML**: pandas, scikit-learn, tidyverse.
**Version control**: Git, SVN, Mercurial.
**Optimization**: CPLEX, Gurobi, NumPy, CVXPY.
**Web**: ASP.NET, React, Bootstrap, Flask.

## References

**Tuomas Sandholm**
Professor, Computer Science
Carnegie Mellon University
Pittsburgh, PA
sandholm@cs.cmu.edu

**Vincent Conitzer**
Professor, Computer Science
Duke University
Durham, NC
conitzer@cs.duke.edu

**Michael P. Wellman**
Professor, Computer Science
University of Michigan
Ann Arbor, MI
wellman@umich.edu

**Fatma Kılınç-Karzan**
Assoc. Professor of Operations Research
Tepper School of Business
Carnegie Mellon University
Pittsburgh, PA
fkilinc@andrew.cmu.edu

**Nicolas E. Stier-Moses**
Research Scientist Manager
Business and Operations
Facebook Core Data Science
Menlo Park, CA
nstier@fb.com