

Akshat Kumar

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- EDUCATION
- ◇ **University of Massachusetts**, Amherst, MA, USA. (Aug. 2007 – May 2013)
Ph.D. in Computer Science.
 - ◇ **University of Massachusetts**, Amherst, MA, USA. (Aug. 2007 – Feb. 2010)
M.S. in Computer Science
 - ◇ **Indian Institute of Technology (IIT)**, Guwahati, India. (2001 – 2005)
Bachelor of Technology in Computer Science and Engineering
- EMPLOYMENT /
INTERNSHIPS
- ◇ **Assistant Professor** (Tenure track), School of Information Systems,
Singapore Management University, Singapore
(Mar. 2014 – Present)
 - ◇ **Research Scientist**, IBM Research, New Delhi, India
(Oct. 2012 – Feb. 2014)
Business Analytics and Mathematical Sciences (BAMS) Department
 - ◇ **Research Assistant**, University of Massachusetts, Amherst
(Aug. 2007 – Sep. 2012)
Resource bounded reasoning lab, advisor – Prof. Shlomo Zilberstein
 - ◇ **Internship**, Swiss Federal Institute of Technology (EPFL), Lausanne, Switzerland
(July 2006 – June 2007)
Advisor – Prof. Boi Faltings at the Artificial Intelligence Lab
 - ◇ **Subject Matter Expert**, Amdocs Development Center, Pune, India
(Sept. 2005 – June 2006)
- RESEARCH
INTERESTS
- Artificial intelligence and machine learning – decision theoretic planning, multiagent coordination, reinforcement learning, graphical models, probabilistic inference, mathematical optimization.
- AWARDS
- ◇ Invite to give **Early Career Spotlight talk** at the International Joint Conference on Artificial Intelligence (IJCAI), 2019 (<https://www.ijcai19.org/early-career.html>)
 - ◇ Selected as one of **IEEE AI 10 to Watch**, IEEE Intelligent Systems, 2018 (<https://www.computer.org/web/pressroom/ieee-intelligent-systems-ai-10-to-watch>) for significant contributions in the area of AI. The call sought nominations worldwide, with the requirement that nominees must have received their PhDs in the past five years.
 - ◇ **Lee Kong Chian Fellowship** for research excellence, Singapore Management University, 2017–18
 - ◇ **Best Paper Award**, AAI Conference on Artificial Intelligence (computational sustainability track), 2017, <https://goo.gl/PFy2Zx>
 - ◇ **Outstanding Application Paper Award**, International Conference on Automated Planning and Scheduling (ICAPS), 2014, <http://icaps14.icaps-conference.org/technical/papers.html>

- ◇ **Outstanding Dissertation Award**, ICAPS 2014, <http://www.icaps-conference.org/index.php/Main/Awards>
- ◇ **Outstanding Dissertation Award**, School of Computer Science, UMass Amherst, 2013, <https://www.cics.umass.edu/oa2014>
- ◇ **IFAAMAS Victor Lesser Distinguished Dissertation Runner-up Award** at the International Conference on Autonomous Agents and Multiagent Systems (AAMAS), 2013, <http://aamas2013.cs.umn.edu/node/16>
- ◇ Awarded UMass graduate school fellowship, academic year 2010-11.
- ◇ Passed Ph.D. candidacy with *distinction* (Fall-09), awarded to only two students per year in the department.
- ◇ Phi Kappa Phi honor society member (2010-11).

GRANT
PROPOSALS

- ◇ Akshat Kumar (PI), “Data Driven Collective Decision Making For Urban System Optimization”, Ministry of Education (MOE) Tier-2 Grant, January 2019 - December 2021. Amount S\$468700
- ◇ Pradeep Varakantham (PI Project Level); Akshat Kumar (Co-PI Project Level), “Moving Beyond Data Insights: Optimizing Dynamics in Safety and Security Networks”. Academic Research Fund (AcRF) Tier 2, Ministry of Education (MOE), 2016, S\$674,046.
- ◇ Hc Lau (PI Programme Level); SF Cheng; Pradeep Varakantham; Akshat Kumar (PI Project Level), Urban Computing and Engineering Centre of Excellence, Corporate Laboratory @ University, National Research Foundation (NRF) & Fujitsu (Multiple Funding Sources), 2014, S\$18,500,000.
- ◇ Major contributor to a three-year National Science Foundation (NSF) proposal titled *Planning Algorithms for Large Decentralized Multiagent Settings* that was funded by NSF, Sep 2011 – Aug 2014.

JOURNAL
ARTICLES

- ◇ **A. Kumar**, S. Zilberstein, M. Toussaint, *Probabilistic Inference Techniques for Scalable Multiagent Decision Making*. In Journal of Artificial Intelligence Research (JAIR), 2015, volume 53:223-270.
- ◇ P. Varakantham, **A. Kumar**, HC Lau and W. Yeoh, *Risk-Sensitive Stochastic Orienteering Problems for Trip Optimization in Urban Environments*. Forthcoming, In ACM Transactions on Intelligent Systems and Technology (TIST), 2017.

REFEREED
CONFER-
ENCE
PAPERS

- ◇ **A. Kumar**, *Multiagent Decision Making and Learning in Urban Environments* (Early Career Invited Paper). In International Joint Conference on Artificial Intelligence (IJCAI), 2019.
- ◇ A. Singh, **A. Kumar**, *Graph Based Optimization For Multiagent Cooperation*. In International Conference on Autonomous Agents and Multiagent Systems (AAMAS), 2019, pages 1497–1505.
- ◇ A. Bhatia, P. Varakantham, **A. Kumar**, *Resource Constrained Deep Reinforcement Learning*. In International Conference on Automated Planning and Scheduling (ICAPS), 2019.
- ◇ S. Bhatnagar, **A. Kumar**, HC Lau, *Decision Making for Improving Maritime Traffic Safety Using Constraint Programming*. In International Joint Conference on Artificial Intelligence (IJCAI), 2019.
- ◇ T. Gupta, **A. Kumar**, P. Paruchuri, *Successor Features Based Multi-Agent RL for Event-Based Decentralized MDPs*. In AAAI Conference on Artificial Intelligence, 2019
- ◇ A. Singh, T. Nguyen, **A. Kumar**, HC Lau, *Multiagent Decision Making For Maritime Traffic Management*. In AAAI Conference on Artificial Intelligence, 2019
- ◇ T. Nguyen, **A. Kumar**, HC Lau, *Credit Assignment For Collective Multiagent RL With Global Rewards*. In Advances in Neural Information Processing Systems (NIPS), 2018

- ◇ T. Gupta, **A. Kumar**, P. Paruchuri, *Planning and Learning For Decentralized MDPs with Event Driven Rewards*. In AAAI Conference on Artificial Intelligence, 2018
- ◇ K.H. Wray, **A. Kumar**, S. Zilberstein, *Integrated Cooperation and Competition in Multi-Agent Decision-Making*. In AAAI Conference on Artificial Intelligence, 2018
- ◇ L. Agussurja, **A. Kumar**, HC Lau, *Resource Constrained Scheduling for Maritime Traffic Management*. In AAAI Conference on Artificial Intelligence, 2018
- ◇ T. Nguyen, **A. Kumar**, HC Lau, *Policy Gradient With Value Function Approximation For Collective Multiagent Planning*. In International Conference on Neural Information Processing Systems (NIPS), 2017, pages 3036–3043.
- ◇ T. Nguyen, **A. Kumar**, HC Lau, *Collective Multiagent Sequential Decision Making Under Uncertainty*. In AAAI Conference on Artificial Intelligence (AAAI), 2017, pages 3036–3043.
- ◇ X. Wu, **A. Kumar**, D. Sheldon, and S. Zilberstein, *Robust Optimization for Tree-Structured Stochastic Network Design*. In AAAI Conference on Artificial Intelligence (AAAI), 2017, pages 4545–4551. (**Best paper award, sustainability track**).
- ◇ R. Kumar, P. Varakantham and **A. Kumar**, *Decentralized Planning in Stochastic Environments with Submodular Rewards*. In AAAI Conference on Artificial Intelligence (AAAI), 2017, pages 3021–3028.
- ◇ T. Hou, HC Lau and **A. Kumar**, *Coordinating Vessel Traffic To Improve Safety and Efficiency*. In International Conference on Autonomous Agents and Multiagent Systems (AAMAS), 2017, pages 141–149.
- ◇ T. Hou, HC Lau and **A. Kumar**, *A Multi-Agent System for Coordinating Vessel Traffic* (demo paper). In International Conference on Autonomous Agents and Multiagent Systems (AAMAS), 2017, pages 1814–1816.
- ◇ A. Singh, **A. Kumar**, *Multiagent Coordination Using Graph Structured Mathematical Optimization*. In International Conference on Autonomous Agents and Multiagent Systems (AAMAS), 2017, pages 1739–1741.
- ◇ T. Nguyen, **A. Kumar**, HC Lau, D. Sheldon, *Approximate Inference Using DC Programming For Collective Graphical Models*. In International Conference on Artificial Intelligence and Statistics (AISTATS), 2016, pages 685–693.
- ◇ **A. Kumar**, *Shortest Path Based Decision Making Using Probabilistic Inference*. In AAAI Conference on Artificial Intelligence (AAAI), 2016, pages 3849–3856.
- ◇ **A. Kumar**, A.J. Singh, P. Varakantham, D. Sheldon, *Robust Decision Making for Stochastic Network Design*. In AAAI Conference on Artificial Intelligence (AAAI), 2016, pages 3857–3863.
- ◇ **A. Kumar**, H. Mostafa, S. Zilberstein, *Dual Formulations for Optimizing Dec-POMDP Controllers*. In International Conference on Automated Planning and Scheduling (ICAPS), 2016, pages 202–210.
- ◇ M. Lowalekar, P. Varakantham, **A. Kumar**, *Robust Influence Maximization*. In International Conference on Autonomous Agents and Multiagent Systems (AAMAS), 2016, pages 1395–1396.
- ◇ **A. Kumar**, S. Zilberstein, *History-Based Controller Design and Optimization for Partially Observable MDPs*. In International Conference on Automated Planning and Scheduling (ICAPS), 2015, pages 156–164.
- ◇ P. Agrawal, **A. Kumar**, P. Varakantham, *Near-Optimal Decentralized Power Supply Restoration in Smart Grids*. In International Conference on Autonomous Agents and Multiagent Systems (AAMAS), 2015, pages 1275–1283.
- ◇ T. Sun, D. Sheldon, **A. Kumar**, *Message Passing for Collective Graphical Models*. In International Conference on Machine Learning (ICML), 2015, pages 853–861.

- ◇ S. Ghosh, **A. Kumar**, P. Varakantham, *Probabilistic Inference Based Message-Passing for Resource Constrained DCOPs*. In International Joint Conference on Artificial Intelligence (IJCAI), 2015, pages 411-417.
- ◇ D.T. Nguyen, HC. Lau, **A. Kumar**, *Decomposition techniques for urban consolidation problems*. In IEEE International Conference on Automation Science and Engineering (CASE), 2015, 57–62.
- ◇ J. Du, P. Varakantham, **A. Kumar**, SF. Cheng, *Learning and Controlling Network Diffusion in Dependent Cascade Models*. In International Conference on Intelligent Agent Technology (IAT), 2015, pages 336–343
- ◇ **A. Kumar**, S. Singh, P. Gupta, G. Parija, *Near-Optimal Nonmyopic Contact Center Planning Using Dual Decomposition*. In International Conference on Automated Planning and Scheduling (ICAPS), 2014, pages 395–403 (**Best application paper award**).
- ◇ J. Du, **A. Kumar**, P. Varkantham, *On Understanding Diffusion Dynamics of Patrons at a Theme Park*. In International Conference on Autonomous Agents and Multiagent Systems (AAMAS), 2014, pages 1501–1502.
- ◇ P. Varkantham, **A. Kumar**, *Optimization Approaches for Solving Chance Constrained Stochastic Orienteering Problems*. In International Conference on Algorithmic Decision Theory (ADT), 2013, pages 387–398.
- ◇ **A. Kumar**, D. Sheldon, B. Srivastava, *Collective Diffusion Over Networks: Models and Inference*. In International Conference on Uncertainty in Artificial Intelligence (UAI), 2013, pages 351–360.
- ◇ D. Sheldon, T. Sun, **A. Kumar**, T. Dietterich, *Approximate Inference in Collective Graphical Models*. In International Conference On Machine Learning (ICML), 2013, pages 1004–1012.
- ◇ W. Yeoh, **A. Kumar**, S. Zilberstein, *Automated Generation of Interaction Graphs for Value-Factored Decentralized POMDPs*. In International Joint Conference on Artificial Intelligence (IJCAI), 2013, pages 411–417.
- ◇ X. Wu, **A. Kumar**, D. Sheldon, S. Zilberstein, *Parameter Learning For Latent Network Diffusion*. In International Joint Conference on Artificial Intelligence (IJCAI), 2013, pages 2923–2930.
- ◇ **A. Kumar**, X. Wu, S. Zilberstein, *Lagrangian Relaxation Techniques for Scalable Spatial Conservation Planning*. In AAAI Conference on Artificial Intelligence (AAAI), 2012, pages 309–315.
- ◇ **A. Kumar**, S. Zilberstein, M. Toussaint, *Message Passing Algorithms for MAP Estimation Using DC Programming*. In International Conference on Artificial Intelligence and Statistics (AISTATS), 2012, pages 656–664.
- ◇ **A. Kumar**, S. Zilberstein, M. Toussaint, *Scalable Multiagent Planning using Probabilistic Inference*. In International Joint Conference on Artificial Intelligence (IJCAI), 2011, pages 2140–2146.
- ◇ **A. Kumar**, S. Zilberstein, *Message-Passing Algorithms for Quadratic Programming Formulations of MAP Estimation*. In International Conference on Uncertainty in Artificial Intelligence (UAI), 2011, pages 428–435.
- ◇ X. Wu, **A. Kumar**, S. Zilberstein, *Influence Diagrams With Memory States: Representation and Algorithms*. In International Conference on Algorithmic Decision Theory (ADT), 2011, pages 306–319.
- ◇ **A. Kumar**, S. Zilberstein, *Message-Passing Algorithms for Large Structured Decentralized POMDPs (extended abstract)*. In International Conference on Autonomous Agents and Multiagent Systems (AAMAS), 2011, pages 1087–1088.
- ◇ **A. Kumar**, S. Zilberstein, *MAP Estimation for Graphical Models by Likelihood Maximization*. In Neural Information Processing Systems (NIPS), 2010, pages 1180–1188.
- ◇ **A. Kumar**, S. Zilberstein, *Anytime Planning for Decentralized POMDPs using Expectation Maximization*. In International Conference on Uncertainty in Artificial Intelligence (UAI), 2010, pages 294–301.

- ◇ **A. Kumar**, S. Zilberstein, *Point-Based Backup for Decentralized POMDPs: Complexity and New Algorithms*. In International Conference on Autonomous Agents and Multiagent Systems (AAMAS), 2010, pages 1315–1322.
- ◇ **A. Kumar**, S. Zilberstein, *Event-Detecting Multi-Agent MDPs: Complexity and Constant-Factor Approximation*. In International Joint Conference on Artificial Intelligence (IJCAI), 2009, pages 201–207.
- ◇ **A. Kumar**, S. Zilberstein, *Constraint-Based Dynamic Programming for Decentralized POMDPs with Structured Interactions*. In International Conference on Autonomous Agents and Multiagent Systems (AAMAS), 2009, pages 561–568.
- ◇ **A. Kumar**, B. Faltings, and A. Petcu, *Distributed Constraint Optimization with Structured Resource Constraints*. In International Conference on Autonomous Agents and Multiagent Systems (AAMAS), 2009, pages 923–930.
- ◇ **A. Kumar**, S. Zilberstein, *Dynamic Programming Approximations for Partially Observable Stochastic games*. In Florida Artificial Intelligence Research Society Conference (FLAIRS), 2009, pages 547–552.
- ◇ **A. Kumar**, A. Petcu, and B. Faltings, *H-DPOP: Using Hard Constraints for Search Space Pruning in DCOP*. In AAAI Conference on Artificial Intelligence (AAAI), 2008, pages 325–330.
- ◇ **A. Kumar**, S. Nair, *An Artificial Immune System based Approach for English Grammar Correction*. In International Conference on Artificial Immune Systems (ICARIS), 2007, pages 348–357.
- ◇ S. Legg, M. Hutter and **A. Kumar**, *Tournament versus Fitness Uniform Selection*. In IEEE Congress on Evolutionary Computation (CEC), 2004, pages 2144–2151.

WORKSHOP PUBLICATIONS

- ◇ A. Kumar, W. Yeoh, and S. Zilberstein, *On Message-Passing, MAP Estimation in Graphical Models and DCOPs*. In Distributed Constraint Reasoning Workshop, 2011, pages 57–70.
- ◇ A. Kumar, A. Petcu, and B. Faltings, *H-DPOP: Using Hard Constraints to Prune the Search Space*. In Distributed Constraint Reasoning Workshop, 2007, pages 40–55.

STUDENTS

- ◇ Duc Thien Nguyen (Ph.D., co-advised with HC Lau, 2014-2018)
- ◇ Arambam James Singh (Ph.D., 2017 - present)
- ◇ Jiajing Ling (Ph.D., started 2018)
- ◇ Tarun Gupta (research engineer, started 2018)
- ◇ Kushagra Chandak (research engineer, started 2019)
- ◇ Chaithanya B S (research engineer, started 2019)
- ◇ Saumya Bhatnagar (Masters in IS, graduated 2017)
- ◇ Lucas Agussurja (research engineer, 2016-2018)

TEACHING

- ◇ Undergraduate: IS 102: Computer as an Analysis Tool. University-wide IS core elective on spreadsheet modeling, delivered in 14+ sections (~40 students/section). Taught: Term 1, 2014, 2015, 2016, 2017, 2018
- ◇ Undergraduate: IS 448: Introduction to Artificial Intelligence, Taught: Term 1, 2018
- ◇ Masters: IS 601: Introduction to Artificial Intelligence, Taught: Term 1, 2018

COMMUNITY SERVICE

- ◇ Organization
 - Co-Chair, Doctoral Consortium, International Conference on Automated Planning and Scheduling (ICAPS), 2019
 - Co-Chair, Planning and Learning track, International Conference on Automated Planning and Scheduling (ICAPS), 2018

- Co-organizer, Workshop on Planning and Inference, at AAAI Conference on Artificial Intelligence, 2018.
 - Local organizing committee for the International Conference on Autonomous Agents and Multiagent Systems (AAMAS), 2016 held in Singapore.
 - Co-organizer for 2016 International Summer school on autonomous agents and multiagent systems, Singapore.
 - Co-organizer of AAMAS 2012 Workshop on Multiagent Sequential Decision Making in Uncertain Domains (MSDM)
 - Co-organizer of the tutorial *AI-Driven Analytics In Traffic Management* at International Joint Conference On Artificial Intelligence (IJCAI), 2013
- ◇ Program Committee
- International Conf. on Automated Planning and Scheduling (ICAPS), 2013, 2014, 2015, 2016, 2017
 - International Conf. on Autonomous Agents and Multiagent Systems (AAMAS), 2013, 2014, 2015, 2016, 2017
 - International Joint Conf. on Artificial Intelligence (IJCAI), 2011, 2013, 2016, 2017
 - International Conf. on Uncertainty in Artificial Intelligence (UAI), 2012
 - International Workshop on Optimization in Multi-Agent Systems (OPTMAS), 2012, 2013
 - International Workshop on Multiagent Sequential Decision Making in Uncertain Domains (MSDM), 2013