

Marek Petrik

CONTACT	Department of Computer Science University of New Hampshire Durham, NH	<i>Tel:</i> (+1)-603-862-2682 <i>Email:</i> mpetrik@cs.unh.edu <i>Web:</i> http://cs.unh.edu/~mpetrik
RESEARCH INTERESTS	Reinforcement learning, robust and risk-averse optimization, machine learning, natural resource management, pest management.	
EMPLOYMENT	<ul style="list-style-type: none">◇ Assistant Professor, Computer Science Department, University of New Hampshire, Durham, NH (August 2016 – present)◇ Research Staff Member, IBM T.J. Watson Research Center, Yorktown, NY (December 2011 – August 2016) <i>(Business Analytics/Solutions) and Mathematical Sciences</i><ul style="list-style-type: none">· Precision agriculture, forecasting and optimization· Online recommender and personalization system· Robust supply chain optimization, revenue management, customer models◇ Postdoctoral Researcher, IBM T.J. Watson Research Center, Yorktown, NY (July 2010 – November 2011) <i>Department of Business Analytics and Mathematical Sciences</i><ul style="list-style-type: none">· Supply chain optimization and disaster response <i>Department of Business Analytics and Mathematical Sciences</i>◇ Research/Teaching Assistant, University of Massachusetts Amherst (September 2005 – June 2010) Resource bounded reasoning lab◇ Researcher and Developer, Whitestein Technologies (October 2003 – August 2005) Optimization of large-scale production and transport processes.<ul style="list-style-type: none">· Research on Multi-agent systems and optimization· Combinatorial optimization for production planning and vehicle routing◇ Programmer, OneTwoTech (June 2001 – June 2003) Design, implementation and evaluation of new technologies for a web-application server, using: Advanced .NET Framework, COM+, MS SQL Server, Web Services◇ Programmer SWTeam (July 2000 – July 2001) Implementation of high performance components for client-side data management for multi-dimensional (OLAP) databases using: C++, MS SQL.	
EDUCATION	<ul style="list-style-type: none">◇ University of Massachusetts Amherst, Amherst, MA, USA. (2005 – 2010) Ph.D. in Computer Science: September 1, 2010, GPA: 4.0/4.0 <i>Advisor:</i> Shlomo Zilberstein <i>Thesis:</i> Optimization-based Approximate Dynamic Programming <i>Committee:</i> Shlomo Zilberstein, Andrew Barto, Sridhar Mahadevan, Ana Muriel, Ronald Parr	

- ◇ **University of Massachusetts Amherst**, Amherst, MA, USA. (2005 – 2008)
M.Sc. in Computer Science, May 2008, GPA: 4.0/4.0
- ◇ **Univerzita Komenskeho**, Bratislava, Slovakia. (2000 – 2005)
B.Sc. in Computer Science, graduated: June 2005
Major in *Artificial Intelligence and Parallel Algorithms*
GPA: 3.84/4.0 Graduation thesis: *Learning Parallel Portfolios of Algorithms*

JOURNAL
ARTICLES

- ◇ Dan Iancu, Marek Petrik, Dharmashankar Subramanian, *Tight approximations of dynamic risk measures*, *Mathematics of Operations Research* 40(3), 2015.
- ◇ Amit Dhurandhar, Marek Petrik, *Efficient and accurate methods for updating generalized linear models with multiple feature additions*, *Journal of Machine Learning Research* 15:2607–2627, 2014.
- ◇ Markus Ettl, Prateek Jain, Ronny Luss, Marek Petrik, Rajesh Ravi, Chitra Venkatramani, *Combining social media and customer behavior analytics for personalized customer engagements*, *IBM Journal of Research and Development* 58(5/6):7:1-7:12, 2014.
- ◇ Marek Petrik and Shlomo Zilberstein, *Robust approximate bilinear programming for value function approximation*, *Journal of Machine Learning Research* 12:3027–3063, 2011
- ◇ Marek Petrik, *Optimization-based Approximate Dynamic Programming*, Ph.D. Dissertation 2010, University of Massachusetts Amherst.
- ◇ Marek Petrik and Shlomo Zilberstein, *A bilinear programming approach for multiagent systems*, *Journal of Artificial Intelligence Research* 35:235–274, 2009.
- ◇ Jeff Johns, Marek Petrik, and Sridhar Mahadevan, *Hybrid Least-Squares Algorithms for Approximate Policy Evaluation*, *Machine Learning* 76(2):243–256 and *European Conference on Machine Learning (ECML)*, 2009.
- ◇ Marek Petrik and Shlomo Zilberstein, *Learning parallel portfolios of algorithms*, *Annals of Mathematics and Artificial Intelligence*, 48(1-2):85–106, 2006.

REFEREED
CONFERENCE
PUBLICATIONS

- ◇ Andrea Tirinzoni, Xiangli Chen, Marek Petrik and Brian Ziebart, *Policy-Conditioned Uncertainty Sets for Robust Markov Decision Processes*, *Neural Information Processing Systems (NIPS)*, 2018, (Acceptance rate: 20%, spotlight 3%)
- ◇ Ching Pang Ho, Marek Petrik, Wolfram Wiesemann, *Fast Bellman Updates for Robust MDPs*, *International Conference on Machine Learning (ICML)*, 2018, (Acceptance rate: 24%)
- ◇ Bence Cserna, Marek Petrik, Reazul Hasan Russel, Wheeler Ruml, *Value Directed Exploration in Multi-Armed Bandits with Structured Priors*, *Uncertainty in Artificial Intelligence (UAI)*, 2017. (Acceptance rate: 31%)
- ◇ Adam N. Elmachtoub, Ryan McNellis, Marek Petrik, *A Practical Method for Solving Contextual Bandit Problems Using Decision Trees*, *Uncertainty in Artificial Intelligence (UAI)*, 2017. (Plenary presentation, Acceptance rate: 31%)
- ◇ Stephen Becker, Ban Kawas, Karthikeyan N. Ramamurthy, Marek Petrik, *Robust Partially-Compressed Least-Squares*, *National Conference of AAAI*, 2017 (Acceptance rate: 25%)

- ◇ Marek Petrik, Yinlam Chow, Mohammad Ghavamzadeh, *Safe Policy Improvement by Minimizing Robust Baseline Regret*, Advances in Neural Information Processing Systems (NIPS) 2016, (Acceptance rate: 22%)
- ◇ Marek Petrik, Ronny Luss, *Interpretable Policies for Dynamic Product Recommendations*, Uncertainty in Artificial Intelligence (UAI) 2016, (Acceptance rate: 31%).
- ◇ Bo Liu, Ji Liu, Mohammad Ghavamzadeh, Sridhar Mahadevan, Marek Petrik, *Finite-Sample Analysis of Proximal Gradient TD Algorithms*, Uncertainty in Artificial Intelligence (UAI), 2015, (Best Student Paper Award) (Acceptance rate: 25 %)
- ◇ Marek Petrik, Xiaojian Wu, *Optimal Threshold Control for Energy Arbitrage with Degradable Battery Storage*, Uncertainty in Artificial Intelligence (UAI), 2015, (Acceptance rate: 25%)
- ◇ Marek Petrik, Dharmashankar Subramanian, *RAAM: The benefits of robustness in approximating aggregated MDPs in reinforcement learning*, Neural Information Processing Systems (NIPS), 2014. (Acceptance rate: spotlight 4.8%)
- ◇ Francisco Barahona, Markus Ettl, Marek Petrik, Peter Rimshnick, *Optimizing deliveries in agile supply chains with demand shocks*, Winter Simulation Conference, 2013.
- ◇ Janusz Marecki, Marek Petrik, Dharmashankar Subramanian, *Solution methods for constrained Markov decision process with continuous probability modulation*, Conference on Uncertainty in Artificial Intelligence (UAI), 2013. (Acceptance rate: 31%)
- ◇ Marek Petrik and Dharmashankar Subramanian, *An approximate solution method for large risk-averse Markov decision processes*, Conference on Uncertainty in Artificial Intelligence (UAI), 2012. (Acceptance rate: 31%)
- ◇ Marek Petrik, *Approximate dynamic programming by minimizing distributionally robust bounds*, International Conference on Machine Learning (ICML), 2012. (Acceptance rate: 27%)
- ◇ Marek Petrik and Shlomo Zilberstein, *Resource management using point-based dynamic programming*, Proceedings of the 25th Conference on Artificial Intelligence (AAAI), 2011. (Acceptance rate 24.8%)
- ◇ Marek Petrik, Gavin Taylor, Ron Parr, and Shlomo Zilberstein, *Feature selection using regularization in approximate linear programs for Markov decision processes*, Proceedings of the International Conference on Machine Learning (ICML) 27, 2010. (Acceptance rate: 26%)
- ◇ Marek Petrik and Shlomo Zilberstein, *Robust value function approximation using bilinear programming*, Proceedings of the Advances in Neural Information Processing Systems (NIPS) 22, 2009. (Acceptance rate — spotlight: 8%)
- ◇ Marek Petrik and Shlomo Zilberstein, *Constraint relaxation in approximate linear programs*, Proceedings of the International Conference on Machine Learning (ICML), 2009. (Acceptance rate 26%)
- ◇ Marek Petrik and Bruno Scherrer, *Biasing approximate dynamic programming with a lower discount factor*, Proceedings of the Advances in Neural Information Processing Systems (NIPS) 21, 2008. (Acceptance rate 27%)
- ◇ Marek Petrik and Shlomo Zilberstein, *Learning heuristic functions through approximate linear programming*, Proceedings of the International Conference on Automated Planning and Scheduling (ICAPS), 2008. (Acceptance rate 34%)

- ◇ Martin Allen, Marek Petrik, and Shlomo Zilberstein, *Interaction structure and dimensionality in decentralized problem solving*, Proceedings of the Conference on Artificial Intelligence (AAAI) (Short Paper), 2008. (Acceptance rate 26%)
- ◇ Marek Petrik and Shlomo Zilberstein, *Anytime coordination using separable bilinear programs*, Proceedings of the Conference on Artificial Intelligence (AAAI), 2007. (Acceptance rate 27%)
- ◇ Marek Petrik *An analysis of Laplacian methods for value function approximation in MDPs*, Proceedings of the International Joint Conference on Artificial Intelligence (IJCAI), 2007 (Acceptance rate 16%)
- ◇ Marek Petrik and Shlomo Zilberstein, *Average-reward decentralized Markov decision processes*, Proceedings of the International Joint Conference on Artificial Intelligence (IJCAI), 2007 (Acceptance rate 16%)

PEER-
REVIEWED
SYMPOSIA

- ◇ Bahram Behzadian, Marek Petrik, *Feature Selection by Singular Value Decomposition for Reinforcement Learning*, Prediction and Generative Modeling in Reinforcement Learning Workshop, IJCAI/ICML 2018.
- ◇ Andrea Tirinzoni, Xiangli Chen, Marek Petrik and Brian Ziebart, *Policy-Conditioned Uncertainty Sets for Robust Markov Decision Processes*, Planning and Learning Workshop, IJCAI/ICML 2018.
- ◇ Andreas Lydakis, Jenica Allen, Marek Petrik, Tim Szewczyk, *Computing Robust Strategies for Managing Invasive Plants*, AI for Wildlife Conservation Workshop at IJCAI/ICML, 2018.
- ◇ Talha Siddique, Shadi S. Atallah, Marek Petrik, *Farm spatial configurations for increased pest resistance*, Northeastern Agricultural and Resource Economics Association, 2018.
- ◇ Talha Siddique, Shadi S. Atallah, Marek Petrik, *Optimal farm spatial configurations for increased pest resistance: a bio-economic application to apple orchards*, Southern Economic Alliance meeting, 2018.
- ◇ Bahram Behzadian, Marek Petrik, *Low-rank Feature Selection for Reinforcement Learning*, International Symposium on Artificial Intelligence and Mathematics, 2018.
- ◇ Amit Dhurandhar, Sechan Oh, Marek Petrik, *Building an Interpretable Recommender via Loss-Preserving Transformation*, ICML Workshop on Human Interpretability in Machine Learning (WHI 2016), 2016.
- ◇ Marek Petrik, Yinlam Chow, Mohammad Ghavamzadeh, *Safe Policy Improvement by Minimizing Robust Baseline Regret*, ICML Workshop on Reliable Machine Learning in the Wild, 2016.
- ◇ Marek Petrik, Dharmashankar Subramanian, *RAAM: The Benefits of Robustness in Approximating Aggregated MDPs in Reinforcement Learning*, From Bad Models to Good Policies (Sequential Decision Making under Uncertainty), NIPS Workshop, 2014.
- ◇ Marek Petrik, *Distributionally Robust Approach to Approximate Dynamic Programming*, European Workshop on Reinforcement Learning, 2012.
- ◇ Brenda Dietrich, Markus Ettl, Roger D. Lederman, Marek Petrik, *Optimizing the end-to-end value chain through demand shaping and advanced customer analytics*, 11th International Symposium on Process Systems Engineering, 2012.

- ◇ Marek Petrik, *Robust Approximate Optimization for Large Scale Planning Problems*. AAAI Doctoral Consortium, Pasadena, CA, 2009.
- ◇ Marek Petrik and Shlomo Zilberstein, *A Successive approximation algorithm for coordination problems*. In Proceedings of the International Symposium on Artificial Intelligence and Mathematics, Fort Lauderdale, FL, 2008
- ◇ Marek Petrik and Shlomo Zilberstein, *Learning static parallel portfolios of algorithms*. In Proceedings of the International Symposium on Artificial Intelligence and Mathematics, Fort Lauderdale, FL, 2006.
- ◇ Marek Petrik, *Statistically optimal combination of algorithms*. In Proceedings of the International Conference on Current Trends in Theory and Practice of Computer Science (SOFSEM), 2005.

BOOK
CHAPTERS

- ◇ Marek Petrik and Shlomo Zilberstein, *Learning Feature-Based Heuristic Functions*. In Y. Hamadi, E. Monfroy, and F. Saubion (Eds.), *Autonomous Search*, Springer, June, 2011.

INVITED
TALKS &
PRESENTATIONS

- ◇ Marek Petrik, *Using Prior Knowledge in Reinforcement Learning*, Imperial College, 2018.
- ◇ Marek Petrik, *Robust Reinforcement Learning*, Oracle Research, 2017.
- ◇ Marek Petrik, *Robust Reinforcement Learning*, Lehigh University, 2017.
- ◇ Marek Petrik, Mohammad Ghavamzadeh, Yinlam Chow, *Computing Safe Policies with Inaccurate Models*, SIAM Conference on Optimization, 2017.
- ◇ Marek Petrik, Mohammad Ghavamzadeh, Yinlam Chow, *Computing Safe Policies with Inaccurate Models*, Data Learning and Inference (DALI), 2016.
- ◇ Marek Petrik, Ronny Luss, Rajesh Ravi, Markus Ettl, *Strategic Interpretable Online Recommendations*, NIPS eCommerce workshop 2015.
- ◇ Marek Petrik, *Threshold Policies for Energy Arbitrage*, INFORMS Annual Meeting, 2015.
- ◇ Marek Petrik, *Robust Approximate Dynamic Programming*, INFORMS Annual Meeting, 2015.
- ◇ Marek Petrik, *Benefits of Robust Optimization*, University of Massachusetts, Amherst, 2015.
- ◇ Stephen Becker, Marek Petrik, Ban Kawas, Karthikeyan N. Ramamurthy, *Robust Compressed Least Squares Regression*, Out of the Box: Robustness in High Dimension, NIPS Workshop, 2014.
- ◇ Marek Petrik, Dharmashankar Subramanian, *Using Robustness in Approximate Dynamic Programming*, INFORMS Annual Meeting, 2014.
- ◇ Marek Petrik, *Using Robust Optimization for Solving Large Data-driven Problems*, CS Colloquium, University of Colorado, Boulder, 2014.
- ◇ Marek Petrik, *Using Robustness in Value Function Approximation*, Modeling and Optimization: Theory and Applications (MOPTA), 2014
- ◇ Marek Petrik, *Distributionally Robust Approach to Approximate Dynamic Programming*, OR & OM Seminar, Tepper School of Business, Carnegie Mellon University, 2012
- ◇ Marek Petrik, Dharmashankar Subramanian, *Feature Selection in Linear Dynamical Systems*, INFORMS Annual Meeting, 2012

- ◇ Marek Petrik, *Distributionally Robust Approach to Approximate Dynamic Programming*, INFORMS Annual Meeting, 2011
- ◇ Marek Petrik, Dharmashankar Subramanian, *Risk Sensitive Resource Management in Dynamic Settings*, INFORMS Annual Meeting, 2011
- ◇ Dan Iancu, Marek Petrik, Dharmashankar Subramanian, Pu Huang, *The Price of Dynamic Inconsistency for Distortion Risk Measures*, INFORMS Annual Meeting 2011
- ◇ Marek Petrik, *Optimization-based Methods for Approximate Dynamic Programming*, INFORMS Annual Meeting, 2010.
- ◇ Marek Petrik, *Approximate Dynamic Programming for Resource Management*, IBM T.J. Watson Research Center, 2010
- ◇ Marek Petrik, *Approximate Dynamic Programming for Resource Management*, Robotics Institute, Carnegie-Mellon University, 2010
- ◇ Marek Petrik and Shlomo Zilberstein, *Value Function Approximation for Reservoir Management*, 2nd International Conference on Computational Sustainability, 2010
- ◇ Marek Petrik and Shlomo Zilberstein, *Blood Inventory Management Using Approximate Linear Programming* Marek Petrik and Shlomo Zilberstein. Presented at INFORMS Computing Society Meeting, Charleston, SC, 2009
- ◇ Marek Petrik and Shlomo Zilberstein, *Constraint Relaxation in Approximate Linear Programs*. Dagstuhl Seminar 09181: “Sampling-based Optimization”, Dagstuhl, Germany, 2009
- ◇ Marek Petrik, *Aggregation in MDPs: Policy iteration and linear programming*. Presented at New England Student Colloquium on Artificial Intelligence, 2007.
- ◇ Marek Petrik, Shlomo Zilberstein, *Coordination in multi-agent systems*. Presented at MAIA research group in INRIA 2007.
- ◇ Marek Petrik *Basis construction using Krylov method*. Presented at TAM 2006, Bratislava, Slovakia.
- ◇ Marek Petrik, *Knowledge representation for expert systems*. Presented at International Conference for Undergraduate and Graduate Students of Applied Mathematics 2004.

TECHNICAL
REPORTS

- ◇ Stephen Becker, Ban Kawas, Marek Petrik, Karthikeyan N. Ramamurthy, *Robust Partially-Compressed Least-Squares*, arXiv:1510.04905, 2015.
- ◇ Yinlam Chow, Marek Petrik, Mohammad Ghavamzadeh, *Robust Policy Optimization with Baseline Guarantees*, arXiv:1506.04514, 2015.
- ◇ Pu Huang, Dan Iancu, Marek Petrik, Dharmashankar Subramanian, *The Price of Dynamic Inconsistency for Distortion Risk Measures*, arXiv 2011.
- ◇ Marek Petrik and Shlomo Zilberstein, *Global Optimization for Value Function Approximation*, arXiv 2010.
- ◇ Marek Petrik, Gavin Taylor, Ron Parr, and Shlomo Zilberstein, *Feature selection using regularization in approximate linear programs for Markov decision processes*, arXiv 1005.1860.
- ◇ Marek Petrik and Shlomo Zilberstein, *Robust Value Function Approximation Using Bilinear Programming*. University of Massachusetts Technical Report UM-CS-2009-052, 2009.

- ◇ Martin Allen, Marek Petrik, and Shlomo Zilberstein, *Interaction Structure and Dimensionality Reduction in Decentralized MDPs*. University of Massachusetts Technical Report UM-CS-2008-11, 2008.

FUNDING

- ◇ NSF RI 1815275: *Robust Reinforcement Learning Using Bayesian Models*, 2018–2021, \$437,753. (PI)
- ◇ NSF III 1717368: *Robust Reinforcement Learning for Invasive Species Management*, 2017–2020, \$497,335. (PI, co-PI: Jenica Allen)
- ◇ IBM Faculty Award 2017, \$30,000
- ◇ Served on 2 NSF CISE panels, 2017
- ◇ Co-authored a funded AFOSR proposal “Adaptive Optimization Techniques for Large-Scale Stochastic Planning”, FA9550-08-1-0171

AWARDS

- ◇ IBM Faculty Award, 2017
- ◇ (Co-author) Best Student Paper Award, UAI 2015
- ◇ IBM Research Division Award, “DataCenter Risk Resiliency Rationalization Analysis”, 2013
- ◇ IBM First Patent Application Invention Achievement Award, “Robust Inventory Management in Multi-Stage Inventory Networks with Demand Shocks”, 2012
- ◇ Awarded Graduate School Fellowship, University of Massachusetts Amherst, 2008-2009
- ◇ Passed portfolio (Ph.D. candidacy exam) with distinction, University of Massachusetts Amherst 2008
- ◇ Received: “Outstanding Synthesis Project” award for “A linear programming approach to bounds and basis construction for Markov decision processes”, 2007-2008
- ◇ 2nd Place in Tetris Domain in Reinforcement Learning Competition 2008 (with Jeff Johns and Colin Barringer)
- ◇ Invited to Dagstuhl seminar 09181: “Sampling-based Optimization”
- ◇ Final Round of Microsoft Fellowship 2007/2008

PROGRAMMING EXPERIENCE

- ◇ Python, C/C++, R, F#, Java, Scala, C#, Matlab, SQL, GDAL, Stan, WinBugs

PROFESSIONAL SERVICE

- ◇ **Local (co)chair of ICML 2016**
- ◇ **Journal Reviewing**
 - SIAM Journal on Optimization 2016, 2017
 - Machine Learning 2016, 2017
 - Mathematics of Operations Research 2012–2016
 - Operations Research 2013–2018
 - Journal of Artificial Intelligence Research 2008–2018
 - Artificial Intelligence 2017

- Journal of Machine Learning Research 2010–2016
- European Journal of Operations Research 2017
- Computational Optimization and Applications 2017
- AdHoc Networks Journal 2015
- A Quarterly Journal of Operations Research 2015
- Information Processing Letters 2011
- International Journal of Approximate Reasoning 2011
- Journal of Autonomous Agents and Multi-Agent Systems 2007–2010
- IEEE Transactions on Automatic Control 2009–2010, 2016–2017
- Annals of Mathematics and Artificial Intelligence 2006, 2010
- Applied Stochastic Models in Business and Industry 2015
- ◇ **Senior Program Committee of Conferences**
 - International Joint Conference on Artificial Intelligence (IJCAI) 2018
 - Conference on Artificial Intelligence (AAAI) 2019
- ◇ **Program Committee of Conferences**
 - International Conference on Machine Learning (ICML) 2011–2015, 2017, 2018
 - Advances in Neural Information Processing Systems (NIPS) 2011–2017
 - Conference on Artificial Intelligence (AAAI) 2008, 2012–2018
 - International Conference on Automated Planning and Scheduling (ICAPS) 2017, 2018
 - Uncertainty in Artificial Intelligence (UAI) 2010, 2013–2016
 - Conference on Knowledge Discovery and Data Mining (KDD) 2016
 - International Conference on Acoustics, Speech and Signal Processing (ICASSP) 2016
 - Artificial Intelligence and Statistics (AI-STATS) 2011, 2012, 2016, 2017, 2018, 2019
 - International Symposium on Artificial Intelligence and Mathematics 2011
 - International Joint Conference on Artificial Intelligence (IJCAI) 2009, 2011, 2013, 2016, 2018
 - Autonomous Agents and Multiagent Systems (AAMAS) 2010, 2016, 2017
- ◇ **Conference Reviewing**
 - Neural Information Processing Systems (NIPS) 2018
 - North–East Student Colloquium on Artificial Intelligence (NESCAI) 2010
 - International Conference on Automated Planning and Scheduling (ICAPS) 2007–2009
 - National Conference on Artificial Intelligence (AAAI) 2006
 - International Symposium on Artificial Intelligence and Mathematics 2006
- ◇ **Panels and Reviewing**

- NSF CISE 2017
- NSF CISE 2017
- UNH Core 2018

◇ **Other Reviewing**

- Judge for SIAM Moody's Mega Math Challenge 2014, 2015