

# CHRISTIAN R. SHELTON

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## EDUCATION

<b>Massachusetts Institute of Technology</b> PhD, Computer Science	1998 – 2001
<b>Massachusetts Institute of Technology</b> SM, Computer Science	1996 – 1998
<b>Stanford University</b> BS, Computer Science (with honors)	1993 – 1996

## EMPLOYMENT

<b>University of California, Riverside</b> , Professor Department of Computer Science and Engineering (Assistant Professor, 2003–2010, Associate Professor, 2010–2016)	2003 – present
<b>Children’s Hospital Los Angeles</b> , Visiting Researcher 1-year sabbatical, machine learning for ICU data	2012 – 2013
<b>Intel</b> , Visiting Faculty Applications of machine learning to microprocessor fabrication	2003 – 2004
<b>Stanford University</b> , Research Associate Reinforcement learning, game theory, stochastic processes	2001 – 2003

## AWARDS

DARPA Computer Science Study Group	2009
AFOSR Young Investigator Award	2006
Member, ΦBK	1996 – present
Member, TBP	1996 – present

## PUBLICATIONS

### Journals

- [1] Zhen Qin and Christian R. Shelton. Social Grouping for Multi-target Tracking and Head Pose Estimation in Video. *IEEE Transactions on Pattern Analysis and Machine Intelligence*, 38(10), 2082–2095, 2016.
- [2] Philip Toltzis, Gerardo Soto-Campos, Christian R. Shelton, Evelyn M. Kuhn, Ryan Hohn, Robert K. Kanter, and Randall C. Wetzel. Evidence-Based Pediatric Outcome Predictors to Guide the Allocation of Critical Care Resources in a Mass Casualty Event. *Pediatric Critical Care Medicine*, 16(7), 2015.
- [3] Christian R. Shelton and Gianfranco Ciardo. Tutorial on Continuous-Time Markov Processes. *Journal of Artificial Intelligence Research*, 51, 725–778, 2014.
- [4] Robinder G. Khemani, E. Busra Celikkaya, Christian R. Shelton, Dave Kale, Patrick A. Ross, Randall C. Wetzel, and Christopher J. L. Newth. Algorithms to estimate PaCO<sub>2</sub> and pH using non-invasive parameters for children with Hypoxemic Respiratory Failure. *Respiratory Care*, 59(8), 1248 – 1257, 2014.

- [5] Juan I. Casse, Christian R. Shelton, and Robert A. Hanneman. A new criterion function for exploratory blockmodeling for structural and regular equivalence. *Social Networks*, 35(1), 31 – 50, 2013.
- [6] Pamela Bhattacharya, Iulian Neamtiu, and Christian R. Shelton. Automated, Highly-Accurate, Bug Assignment Using Machine Learning and Tossing Graphs. *Journal of Systems and Software*, 85(10), 2275 – 2292, 2012.
- [7] Alec C. Gerry, G. E. Higginbotham, N. Periera, A. Lam, and C. R. Shelton. Evaluation of surveillance methods for monitoring house fly abundance and activity on large commercial dairy operations. *Journal of Economic Entomology*, 104(3), 1087 – 1092, 2011.
- [8] Robert A. Hanneman and Christian R. Shelton. Applying modality and equivalence concepts to pattern-finding in social process-produced data. *Social Network Analysis and Mining*, 1, 59 – 72, 2011.
- [9] Jing Xu and Christian R. Shelton. Intrusion detection using continuous time Bayesian networks. *Journal of Artificial Intelligence Research*, 39, 745 – 774, 2010.
- [10] Yu Fan, Jing Xu, and Christian R. Shelton. Importance sampling for continuous time Bayesian networks. *Journal of Machine Learning Research*, 11(Aug), 2077 – 2102, 2010.
- [11] Kevin Horan, Christian R. Shelton, and Thomas Girke. Predicting conserved protein motifs with sub-HMMs. *BMC Bioinformatics*, 11(205), 1471 – 2105, 2010.
- [12] Christian R. Shelton, Yu Fan, William Lam, Joon Lee, and Jing Xu. Continuous time Bayesian network reasoning and learning engine. *Journal of Machine Learning Research*, 11(Mar), 1137 – 1140, 2010.
- [13] Xiaoyue Wang, Lexiang Ye, Eamonn Keogh, and Christian Shelton. Annotating historical archives of images. *International Journal of Digital Library Systems*, 1(2), 59 – 80, 2010.
- [14] Adriano Macchietto, Victor Zordan, and Christian R. Shelton. Momentum control for balance. *ACM Transactions on Graphics / SIGGRAPH*, 28(3), 2009.
- [15] Kevin Horan, Charles Jang, Julie Bailey-Serres, Ron Mittler, Christian Shelton, Jeff F Harper, Jian-Kang Zhu, John JC Cushman, Martin Gollery, and Thomas Girke. Annotating genes of known and unknown function by large-scale co-expression analysis. *Plant Physiology*, 147(1), 41 – 57, 2008.
- [16] Ben Blum, Christian R. Shelton, and Daphne Koller. A continuation method for Nash equilibria in structured games. *Journal of Artificial Intelligence Research*, 25:457 – 502, 2006.
- [17] Charles L. Isbell, Michael Kearns, Satinder Singh, Christian R. Shelton, Peter Stone, and David Kormann. Cobot in LambdaMOO: An adaptive social statistics agent. *Autonomous Agents and Multi-Agent Systems*, 13(3):327 – 354, 2006.
- [18] Christian R. Shelton. Morphable surface models. *International Journal of Computer Vision*, 38(1):75 – 91, 2000.
- [19] Tomaso Poggio and Christian R. Shelton. Learning in brains and machines. *Spatial Vision*, 13(2,3), 287 – 296, 2000.
- [20] Dan Halperin and Christian R. Shelton. A perturbation scheme for spherical arrangements with application to molecular modeling. *Computational Geometry: Theory and Applications*, 10(4):273 – 288, 1998.
- [21] P. W. Finn, L. E. Kavradi, J.-C. Latombe, R. Motwani, C. Shelton, S. Venkatasubramanian, and A. Yao. RAPID: Randomized pharmacophore identification for drug design. *Computational Geometry: Theory and Applications*, 10(4):263 – 272, 1998.

### Refereed Conferences

- [22] Kazi T. Islam and Christian R. Shelton. Marked Point Process for Severity of Illness Assessment In *Proceedings of the 2017 Conference on Machine Learning for Healthcare*, 2017.

- [23] Mike Izbicki, Sajjad Amini, Christian R. Shelton, and Hamed Mohsenian-Rad. Identification of Destabilizing Attacks in Power Systems. In *Proceedings of the 2017 American Control Conference*, 2017.
- [24] Zhen Qin and Christian R. Shelton. Auxiliary Gibbs Sampling for Inference in Piecewise-Constant Conditional Intensity Models. In *Proceedings of the Thirty-First Conference on Uncertainty in Artificial Intelligence (UAI)*, 2015.
- [25] Mike Izbicki and Christian R. Shelton. Faster Cover Trees. In *Proceedings of the Thirty-Second International Conference on Machine Learning (ICML)*, 2015.
- [26] E. Busra Celikkaya and Christian R. Shelton. Deterministic Anytime Inference for Stochastic Continuous-Time Markov Processes. In *Proceedings of the Thirty-First International Conference on Machine Learning (ICML)*, 2014.
- [27] Zhen Qin, Christian R. Shelton, and Lunshao Chai. Social Grouping for Target Handover in Multi-View Video. In *IEEE International Conference on Multimedia and Expo*, 2013. **Best Paper Candidate**
- [28] Zhen Qin and Christian R. Shelton. Improving Multi-target Tracking via Social Grouping. In *IEEE Conference on Computer Vision and Pattern Recognition (CVPR)*, 2012.
- [29] Lunshao Chai, Zhen Qin, Honggang Zhang, Jun Guo, and Christian R. Shelton. Re-Ranking using Compression-based Distance Measure for Content-based Commercial Product Image Retrieval. In *IEEE International Conference on Image Processing (ICIP)*, 2012.
- [30] E. Busra Celikkaya, Christian R. Shelton, and William Lam. Factored Filtering of Continuous-Time Systems. In *Proceedings of the Twenty-Seventh International Conference on Uncertainty in Artificial Intelligence (UAI)*, 2011.
- [31] Teddy N. Yap, Jr., Mingyang Li, Anastasios I. Mourikis, and Christian R. Shelton. A particle filter for monocular vision-aided odometry. In *Proceedings of the 2011 IEEE International Conference on Robotics and Automation (ICRA)*. 2011.
- [32] Antony Lam, Amit K. Roy-Chowdury, and Christian R. Shelton. Interactive event search through transfer learning. In *Proceedings of the Tenth Asian Conference on Computer Vision (ACCV)*, 2010.
- [33] Yu Fan and Christian R. Shelton. Learning continuous-time social network dynamics. In *Proceedings of the Twenty-Fifth International Conference on Uncertainty in Artificial Intelligence (UAI)*, 2009.
- [34] Teddy N. Yap, Jr. and Christian R. Shelton. SLAM in large indoor environments with low-cost, noisy, and sparse sonars. In *Proceedings of the 2008 IEEE International Conference on Robotics and Automation (ICRA)*. pages 1395 – 1401, 2009.
- [35] Guobiao Mei and Christian R. Shelton. Unsupervised image embedding using nonparametric statistics. In *International Conference on Pattern Recognition (ICPR)*, 2008.
- [36] Antony Lam and Christian R. Shelton. Face recognition and alignment using support vector machines. In *Automatic Face and Gesture Recognition*, 2008.
- [37] Kin Fai Kan and Christian R. Shelton. Catenary support vector machines. In *Knowledge Discovery in Databases (ECML/PKDD)* (LNAI, vol 5211), pages 597 – 610, 2008.
- [38] Jing Xu and Christian R. Shelton. Continuous time Bayesian networks for host level network intrusion detection. In *Knowledge Discovery in Databases (ECML/PKDD)* (LNAI, vol 5212), pages 613 – 627, 2008.
- [39] Xiaoyue Wang, Lexiang Ye, Eamonn Keogh, and Christian Shelton. Annotating historical archives of images. In *Joint Conference on Digital Libraries*, pages 341 – 350, 2008.

- [40] Teddy N. Yap, Jr. and Christian R. Shelton. Simultaneous learning of motion and sensor model parameters for mobile robots. In *Proceedings of the 2008 IEEE International Conference on Robotics and Automation (ICRA)*, pages 2091 – 2097, 2008.
- [41] Kin Fai Kan and Christian R. Shelton. Solving structured continuous-time Markov decision processes. In *Proceedings of the Tenth International Symposium on Artificial Intelligence and Mathematics (ISAIM)*, 2008.
- [42] Yu Fan and Christian R. Shelton. Sampling for approximate inference in continuous time Bayesian networks. In *Proceedings of the Tenth International Symposium on Artificial Intelligence and Mathematics (ISAIM)*, 2008.
- [43] Christian R. Shelton, Wesley Huie, and Kin Fai Kan. Chained boosting. In *Advances in Neural Information Processing Systems (NIPS)*, pages 1281 – 1288, 2007.
- [44] Titus Winters, Christian R. Shelton, and Tom Payne. Investigating generative factors of score matrices. In *Proceedings of the Thirteenth International Conference on Artificial Intelligence in Education*, pages 479 – 486, 2007.
- [45] Guobiao Mei and Christian R. Shelton. Collaborative visualization. In *Proceedings of the Twenty-Second International Conference on Uncertainty in Artificial Intelligence (UAI)*, pages 341 – 348, 2006.
- [46] Xiaopeng Xi, Eamonn Keogh, Christian Shelton, Li Wei, and Chotirat Ann Ratanamahatana. Fast time series classification using numerosity reduction. In *Proceedings of the Twenty-Third International Conference on Machine Learning (ICML)*, pages 1033 – 1040, 2006.
- [47] Uri Nodelman, Christian R. Shelton, and Daphne Koller. Expectation maximization and complex duration distributions for continuous time Bayesian networks. In *Proceedings of the Twenty-First International Conference on Uncertainty in Artificial Intelligence (UAI)*, pages 411 – 430, 2005.
- [48] Uri Nodelman, Daphne Koller, and Christian R. Shelton. Expectation propagation for continuous time Bayesian networks. In *Proceedings of the Twenty-First International Conference on Uncertainty in Artificial Intelligence (UAI)*, pages 431 – 440, 2005.
- [49] Uri Nodelman, Christian R. Shelton, and Daphne Koller. Learning continuous time Bayesian networks. In *Proceedings of the Nineteenth International Conference on Uncertainty in Artificial Intelligence (UAI)*, pages 451 – 458, 2003. **Best Student Paper Award** (student: Uri Nodelman).
- [50] Ben Blum, Christian R. Shelton, and Daphne Koller. A continuation method for Nash equilibria in structured games. In *Proceedings of the Eighteenth International Joint Conference on Artificial Intelligence (IJCAI)*, pages 757 – 764, 2003.
- [51] Uri Nodelman, Christian R. Shelton, and Daphne Koller. Continuous time Bayesian networks. In *Proceedings of the Eighteenth International Conference on Uncertainty in Artificial Intelligence (UAI)*, pages 378 – 387, 2002.
- [52] Christian R. Shelton. Reinforcement learning with partially known world dynamics. In *Proceedings of the Eighteenth International Conference on Uncertainty in Artificial Intelligence (UAI)*, pages 461 – 468, 2002.
- [53] Leonid Peshkin and Christian R. Shelton. Learning from scarce experience. In *Proceedings of the Nineteenth International Conference on Machine Learning (ICML)*, pages 498 – 505, 2002.
- [54] Charles L. Isbell, Christian R. Shelton, Michael Kearns, Satinder Singh, and Peter Stone. A social reinforcement learning agent. In *Proceedings of the Fifth International Conference on Autonomous Agents (AGENTS)*, 2001. **Best Paper Award**.
- [55] Christian R. Shelton. Policy improvement for POMDPs using normalized importance sampling. In *Proceedings of the Seventeenth International Conference on Uncertainty in Artificial Intelligence (UAI)*, pages 496 – 503, 2001.

[56] Christian R. Shelton. Balancing multiple sources of reward in reinforcement learning. In *Advances in Neural Information Processing Systems (NIPS)*, pages 1082 – 1088, 2000.

[57] Dan Halperin and Christian R. Shelton. A perturbation scheme for spherical arrangements with application to molecular modeling. In *Proceedings of the Thirteenth Symposium on Computational Geometry*, pages 183 – 192, 1997.

[58] P. W. Finn, L. E. Kavradi, J.-C. Latombe, R. Motwani, C. Shelton, S. Venkatasubramanian, and A. Yao. RAPID: Randomized pharmacophore identification for drug design. In *Proceedings of the Thirteenth Symposium on Computational Geometry*, pages 324 – 333, 1997.

[59] Paul W. Finn, Dan Halperin, Lydia E. Kavradi, Jean-Claude Latombe, Rajeev Motwani, Christian Shelton, and Suresh Venkatasubramanian. Geometric manipulation of flexible ligands. In M. C. Lin and D. Manocha, editors, *Applied Computational Geometry: Towards Geometric Engineering*, pages 67 – 78. Springer, 1996.

#### FUNDED EXTERNAL GRANTS

<b>NRT-DESE: NRT in Integrated Computational Entomology (NICE)</b> \$2,721,142, NSF, <b>co-PI</b>	<b>9/2016 – 8/2021</b>
<b>Machine Learning for Agricultural and Medical Entomology</b> \$1,100,000, NSF, <b>co-PI</b>	<b>10/2015 – 9/2019</b>
<b>REU Site: RE-ICE: Research Experiences in Integrated Comp. Entomology</b> \$389,550, NSF, <b>co-PI</b>	<b>4/2015 – 3/2018</b>
<b>DynamicData: A Hier. Appr. to Dyn. Big Data Analysis in Power Infra. Sec.</b> \$185,000, NSF, <b>co-PI</b>	<b>10/2015 – 9/2017</b>
<b>Inference for Continuous-Time Probabilistic Programming</b> \$706,513, DARPA, <b>sole PI</b>	<b>10/2013 – 8/2017</b>
<b>Estimating Models of Patient Response to Ventilation</b> \$156,146, sub-award from Children’s Hospital Los Angeles, <b>sole PI</b>	<b>10/2011 – 9/2014</b>
<b>Modular CS1 from the Inside Out: Comp. Thinking for STEM Students</b> \$25,000 (UCR’s component), NSF CPATH, Senior Personnel (Harvey Mudd lead institution)	<b>10/2010 – 9/2011</b>
<b>Reasoning in Dynamic Real Time Systems</b> \$100,000, DARPA, Computer Science Study Group (CSSG), <b>sole PI</b>	<b>4/2009 – 4/2010</b>
<b>Continuous Time Structured Stochastic Processes</b> \$346,729, US Air Force (AFOSR) <b>Young Investigator Program (YIP)</b> , <b>sole PI</b>	<b>12/2006 – 11/2009</b>
<b>Continuous Time Models for Malicious Net. Traffic Detection</b> \$86,500 (= \$55,000 from Intel Research + \$31,500 from UC MICRO), <b>sole PI</b>	<b>10/2006 – 12/2007</b>
<b>Adaptive Decision Making for Silicon Manufacturing</b> \$159,646 (= \$95,000 from Intel Research + \$64,646 from UC MICRO), <b>sole PI</b>	<b>10/2004 – 12/2006</b>

#### GRADUATE STUDENTS

<b>UC Riverside</b> (10 PhD, 8 MS graduated)	<b>2003 – present</b>
Busra Celikkaya, PhD, 2016, currently at Amazon	
Zhen Qin, PhD, 2015, currently at Live Nation	
Juan Casse, PhD, 2014, currently at InAuth	
Kevin Horan, PhD, 2011, currently at Global Recordings Network	
Antony Lam, PhD, 2010, currently an Assistant Professor, Saitama University, Japan	
Jing Xu, PhD, 2010, currently at Mathworks	
Teddy Yap, Jr., PhD, 2009, currently at Scotiabank	

Yu Fan, PhD, 2009, currently at Google  
 Kin Fai Kan, PhD, 2008, currently at LinkedIn  
 Guobiao Mei, PhD, 2008, currently at Google  
 Anthony Williams, MS, 2017, currently PhD student at Oregon State  
 Gaurav Jhaveri, MS, 2017  
 Chandini Shetty, MS, 2017  
 Matthew Zarachoff, MS, 2015, currently PhD student at Leeds-Beckett  
 Louisa Kim, MS, 2015, currently at Eurofins Scientific  
 Suraj Narayana, MS, 2014, currently at Knightscope  
 Jeff Price, MS, 2011, currently at Osprey Data  
 Wesley Huie, MS, 2005, currently at DIRECTV

## PROFESSIONAL SERVICE

**Conference Co-Chair** 2015  
 MUCMD: Meaningful Use of Complex Medical Data

**Editorial Board** 2009 – 2012  
 Journal of Artificial Intelligence Research (JAIR)

**Managing Editor** 2003 – 2008  
 Journal of Machine Learning Research (JMLR)

**Conference Senior PC Member:**

- Uncertainty in Artificial Intelligence (UAI): 2011, 2012, 2013
- Conference on Artificial Intelligence (AAAI): 2016, 2017, 2018

**Conference PC Member:**

- International Conference on Artificial Intelligence and Statistics (AISTATS): 2017
- International Joint Conferences on Artificial Intelligence (IJCAI): 2007, 2009, 2015
- International Conference on Machine Learning (ICML): 2006, 2007, 2008, 2010, 2012, 2013, 2014
- Conference on Artificial Intelligence (AAAI): 2008
- Uncertainty in Artificial Intelligence (UAI): 2003, 2005, 2006, 2007
- International Conference on Knowledge Discovery and Data Mining (KDD): 2006, 2007

## UNIVERSITY SERVICE

UC System-wide Senate Committee on Planning & Budget 2016 – present  
 Riverside representative

Campus Senate Committee on Planning & Budget 2015 – present  
 chair, 2016 – present  
 vice chair, 2015 – 2016

Department School and Community Outreach Chair 2016 – present

Campus Linguistics Major Steering Committee 2016 – present

Department Graduate Admissions Committee 2009 – 2012, 2015 – 2016

College IT Committee 2015 – present

Campus Non-Senate Faculty Excellence Review Committee 2011 – 2015  
 chair, 2013 – 2015

Department Colloquium Committee 2013 – 2014  
 chair

College TBII faculty advisor 2005 – present  
 chief advisor, 2007 – 2012

Department Honor Society Advisor 2011 – present

Academic Senate Writing Across the Curriculum Advisory Council	2011 – 2012
College Undergraduate Admissions Review Committee, chair	2012
Academic Senate Preparatory Education Committee	2010 – 2012
UCR Undergraduate Research Journal Advisory Board chair, 2011 – 2012	2009 – 2012
College Executive Committee	2008 – 2011
College Breadth Requirement Review Committee chair	2011
Department Faculty Search Committee	2008 – 2010
ACM Programming Competition Coach	2009
College ABET committee	2005 – 2007

## TEACHING

<b>UC Riverside</b>	2003 – present
CS260 (grad seminar): Deep Learning	
CS229 (grad): Machine Learning	
CS227 (grad): Probabilistic Models for Artificial Intelligence	
CS205 (grad): Artificial Intelligence	
CS181 (ugrad): Principles of Programming Languages	
CS179M (ugrad): Senior Project in Artificial Intelligence	
CS171 (ugrad): Introduction to Data Mining and Machine Learning	
CS170 (ugrad): Introduction to Artificial Intelligence	
CS14 (ugrad): Introduction to Data Structures and Algorithms	

## INVITED TALKS

<b>Marked Point Processes in Intensive Care Data and Video Activity Recognition</b> Electrical Engineering Department, UCLA	August 2016
<b>Two Medical Informatics Applications of Machine Learning</b> Electrical Engineering Department Colloquium, UCLA	January 2016
<b>Deterministic Anytime Inference for Continuous-Time Markov Processes</b> Computer Science Colloquium, ISU	April 2015
<b>Machine Learning and Critical Care Pediatrics</b> Machine Learning Seminar, UCSD	February 2014
<b>Continuous-Time Models: Why &amp; How</b> Seminar, eHarmony	September 2013
<b>Continuous-Time Models: Why &amp; How</b> AI Seminar, ISI/USC	June 2013
<b>Machine Learning for Critical Care Medicine</b> AI/ML Weekly Seminar, UCI	January 2013
<b>Tutorial on Continuous-Time Markov Processes</b> International Conference on Uncertainty in Artificial Intelligence, Catalina Island	August 2012
<b>Inference and Learning for Continuous Time Stochastic Systems</b> Asilomar Conference on Signals, Systems and Computers	November 2011
<b>Anyway you slice it, time is continuous</b> Southern California Machine Learning Workshop, UCI	September 2011
<b>Inferring Time-Varying Hidden Social Links</b> ID Analytics, San Diego	September 2011

<b>Applications of Dynamic-System Modeling</b> Virtual Pediatric Intensive Care Unit, Childrens Hospital Los Angeles	August 2011
<b>Modeling Stochastic Dynamic Systems in Continuous Time</b> AI/ML Weekly Seminar, UCI	May 2010
<b>Uncertainty in Artificial Intelligence: Visual Odometry</b> Invited Lunch Speaker at Measurement Science Conference, Pasadena	March 2010
<b>Structured Models of Continuous-Time Dynamic Processes</b> Information Theory and Applications Workshop, UCSD	February 2009
<b>Reasoning about Social Network Dynamics</b> Workshop on Socio-Cultural Modeling, Santa Barbara	September 2008
<b>Continuous Time Bayesian Networks and Network Traffic Monitoring</b> Machine Learning Seminar, UCSD	April 2007
<b>Continuous Time Bayesian Networks and Network Traffic Monitoring</b> Intel Research, Santa Clara, California	March 2006
<b>Computing Equilibria in Compact Structured Game Representations</b> HRL Laboratories, Malibu, California	July 2004
<b>Structured Game Representations and Nash Calculation</b> 8th International Symposium on A.I. and Math., Fort Lauderdale, Florida	January 2004
<b>Continuous Time Bayesian Networks</b> Brains and Machines Seminar Series, CBCL, MIT	September 2003
<b>Compact Structured Game Representations</b> Complexity in Economic Theory, Cowles Foundation Workshop, Yale	September 2003
<b>Compact Structured Game Representations</b> 14th International Conference on Game Theory, Stony Brook, New York	August 2003