

Michael C. Hughes

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Research Expertise

Machine Learning 2012-

- Unsupervised learning, Semi-supervised learning, Supervised learning
- Probabilistic models: Bayesian nonparametrics, topic models, hidden Markov models, deep generative models
- Posterior estimation methods: variational methods, Markov chain Monte Carlo

Clinical Informatics 2017-

- Psychiatry Applications: treatment prediction, phenotype discovery
- Intensive Care Applications: treatment prediction, phenotype discovery

Human Activity Analysis 2012-

- Sensor time-series, motion capture, video, images

Education

Brown University
Ph.D., Computer Science. 2016

Brown University
M.S., Computer Science. 2012

Olin College of Engineering
B.S. Electrical & Computer Engineering 2010

Research Experience

Assistant Professor of Computer Science

Tufts University, Medford, MA 2018 - present

- Research on statistical machine learning methods and applications to health informatics.
- Advised Ph.D., M.S., and B.S. students in machine learning research projects.
- Taught advanced undergraduate courses: [COMP 135 Intro to ML](#) and [COMP 136 Statistical Pattern Recog.](#)
- Developed new course for graduate students with research interests: [COMP 150 Bayesian Deep Learning](#).
- Appointed as the [Ann W. Lambertus and Peter Lambertus Assistant Professor](#) in 2019

Postdoctoral fellow: Machine learning to improve clinical decisions in healthcare

Adviser: Prof. Finale Doshi-Velez (Harvard) 2016 - 2018

- Developed semi-supervised models for characterizing and treating depression (with [Dr. Perlis](#) and [Dr. McCoy](#)).
- Applied time-series models to predict ventilator interventions in the ICU for [public dataset](#) of >36,000 patients.
- Created methods for training deep models so they are more interpretable to clinicians or other users.

Postdoc project: Estimating carbon biomass from LiDAR waveforms

Adviser: [Prof. Erik Sudderth](#) & [Prof. Jim Kellner](#) (Brown U., Ecology & Evolutionary Biology) 2016

- Predicted forest biomass from LiDAR waveforms to better understand land use and climate change.
- Modeled waveforms and biomass predictions jointly via nonparametric regression using our [BNPy toolbox](#).
- Intended for use in NASA's upcoming [Global Ecosystem Dynamics Investigation \(GEDI\)](#).

Ph.D. thesis: [Reliable and scalable variational inference for Bayesian nonparametrics](#)

Adviser: [Prof. Erik Sudderth](#)

2016

- Thesis Title: Reliable and scalable variational inference for nonparametric mixtures, topics, and sequences
- Developed optimization algorithms for Bayesian nonparametric models that scale to millions of examples.
- Optimized lower bound on marginal likelihood, thus penalizing too simple and too complex explanations.
- Escaped local optima via data-driven proposals that add useful new clusters and remove redundant ones.
- Applied to topic models of 2 million NY Times articles and sequential models of the whole human genome.
- Implemented algorithms in [open-source package: Bayesian Nonparametrics for Python \(BNPy\)](#).

Master's project: Sequential Models for Video and Motion Capture

Adviser: [Prof. Erik Sudderth](#)

2012

- Developed methods to discover common actions from many videos of humans performing household exercises.
- Improved existing inference algorithms with data-driven Metropolis-Hastings proposals.

Highlighted Publications

1. "[Assessment of a Prediction Model for Antidepressant Treatment Stability Using Supervised Topic Models.](#)" Michael C. Hughes, Melanie F. Pradier, Andrew Slavin Ross, Thomas H. McCoy Jr, Roy H. Perlis, Finale Doshi-Velez. JAMA Network Open, 2020.
2. "[MIMIC-Extract: A Data Extraction, Preprocessing, and Representation Pipeline for MIMIC-III.](#)" Shirly Wang^m, Matthew B. A. McDermott, Geeticka Chauhan, Marzyeh Ghassemi, Michael C. Hughes, and Tristan Naumann. CHIL 2020: The ACM Conference on Health, Inference, and Learning, 2020.
3. "[POPCORN: Partially Observed Prediction-Constrained Reinforcement Learning.](#)" Joseph Futoma, Michael C. Hughes, and Finale Doshi-Velez. AISTATS 2020, 2020.
4. "[Optimal Transport Based Change Point Detection and Time Series Clustering.](#)" Kevin Cheng^d, Shuchin Aeron, Michael C. Hughes, Erika Hussey, and Eric Miller. IEEE ICASSP 2020, 2020.
5. "[Regional Tree Regularization for Interpretability in Deep Neural Networks.](#)" Mike Wu^d, Sonali Parbhoo, Michael C. Hughes, Ryan Kindle, Leo Celi, Maurizio Zazzi, Volker Roth, and Finale Doshi-Velez. AAAI 2020, 2020.
6. "[Rapid Model Comparison by Amortizing Across Models.](#)" Lily H. Zhang^b, and Michael C. Hughes. Second Symposium on Advances in Approximate Bayesian Inference (AABI 2019), 2019.
7. "[Feature Robustness in Non-stationary Health Records: Caveats to Deployable Model Performance in Common Clinical Machine Learning Tasks.](#)" Bret Nestor^d, Matthew B. A. McDermott, Willie Boag, Gabriela Berner, Tristan Naumann, Michael C. Hughes, Anna Goldenberg, and Marzyeh Ghassemi. Machine Learning for Healthcare, 2019.
8. "[Supervised Machine Learning Algorithms Using Patient Related Factors to Predict in-Hospital Mortality Following Acute Myeloid Leukemia Therapy.](#)" Nauman Saleem Siddiqui^c, Andreas Klein, Amandeep Godara, Cindy Varga, Rachel J. Buchsbaum, and Michael C. Hughes. Proceedings of

61st Annual Meeting of the American Hematology Society, 2019.

9. "[Semi-Supervised Prediction-Constrained Topic Models](#)." Michael C. Hughes, Gabriel Hope^d, Leah Weiner^d, Thomas H. McCoy Jr, Roy H. Perlis, Erik B. Sudderth, and Finale Doshi-Velez. Artificial Intelligence and Statistics (AISTATS), 2018.
10. "[Beyond Sparsity: Tree Regularization of Deep Models for Interpretability](#)." Mike Wu^u, Michael C. Hughes, Sonali Parbhoo, Maurizio Zazzi, Volker Roth, and Finale Doshi-Velez. Association for Advancement of Artificial Intelligence (AAAI), 2018.
11. "[From Patches to Images: A Nonparametric Generative Model](#)." Geng Ji^d, Michael C. Hughes, and Erik B. Sudderth. International Conference on Machine Learning (ICML), 2017.

Superscripts indicate mentored student's status: u = undergraduate, m = masters, d = Ph.D. student, b = post-bacc, c = medical student. Complete publication list at end of this document.

Highlighted Preprints

1. "[Prediction-Constrained Training for Semi-Supervised Mixture and Topic Models](#)." Michael C. Hughes, Leah Weiner^d, Gabriel Hope^d, Thomas H. McCoy, Roy H. Perlis, Erik B. Sudderth, and Finale Doshi-Velez. arXiv, 2017.
2. "[Fast Learning of Clusters and Topics via Sparse Posteriors](#)." Michael C. Hughes and Erik B. Sudderth. arXiv, 2016.

Honors and Awards

Top 10 Percent Reviewer Award, [NeurIPS 2020](#) 2020

- o Recognized as one of top 10 percent of more than 3500 expert reviewers at the top international machine learning conference.

Top 400 Reviewer Award, [NeurIPS 2019](#) 2019

- o Recognized as one of top 400 of more than 3500 expert reviewers at the top international machine learning conference.

Top 200 Reviewer Award, [NeurIPS 2018](#) 2018

- o Recognized as one of top 200 of more than 3500 expert reviewers at the top international machine learning conference.

Best Paper Award, [SoCal NLP Symposium 2018](#) 2018

- o Awarded for [2 page summary](#) of our [AISTATS 2018 paper](#).

Nominee for AMIA Clinical Informatics Research Award 2017

- o 1 of 7 papers nominated at [AMIA's 2017 Joint Summits on Translational Science](#), out of >50 papers.

NSF Graduate Research Fellowship Award 2011

- o Three year award to fund Ph.D. studies. Covers tuition and provides research stipend.

NDSEG Graduate Research Fellowship Award 2011

- o Three year funding award. Declined to accept NSF fellowship.

Current Funding Support

ACT-NOW: Autonomous Cognitive Technologies for Novelty in Open Worlds

DARPA SAIL-ON Program

11/15/19 - 8/31/22

- [SAIL-ON Program: Science of Artificial Intelligence and Learning for Open-world Novelty](#)
- Team at Tufts: Matthias Scheutz (PI, CS), Liping Liu (CS), Jivko Sinapov (CS)
- Team at Arizona State: Chitta Baral (CSE), Subbarao Kambhampati (CSE)

Amortized Inference for Large-Scale Graphical Models

NSF CISE: Robust Intelligence: Small

9/1/19 - 8/31/22

- Co-Investigators: Liping Liu (PI, Tufts CS) and Thomas Stopka (Tufts Public Health)
- Total Amount: \$399,923

Machine Learning Models for Human Performance Prediction

U.S. Army NSRDEC, Natick, MA (via Tufts CABCS)

9/1/20 - 8/31/20

- Full title: Statistical and Machine Learning Models for Data Reduction and Human Performance Prediction
- Co-Investigators: Eric Miller (PI, Tufts ECE) and Shuchin Aeron (Tufts ECE)
- Total Amount: \$496,098
- Part of larger cross-institution [MASTR-E project](#) funded by US Army

The value of predictive analytics during the COVID epidemic

Tufts Springboard Award (Tufts Univ. Provost's Office)

8/1/20 - 7/30/20

- Full title: Demonstrating the value of a proposed Tufts-led predictive analytics and comparative effectiveness research network during the COVID epidemic
- Co-Investigators: David Kent (Tufts Medical) and Jessica Paulus (Tufts Medical)
- Total Amount: \$50,000

Past Funding Support

Machine Learning Models for Human Performance Prediction

U.S. Army NSRDEC, Natick, MA (via Tufts CABCS)

6/24/19 - 6/23/20

- Full title: Statistical and Machine Learning Models for Data Reduction and Human Performance Prediction
- Co-Investigators: Eric Miller (PI, Tufts ECE) and Shuchin Aeron (Tufts ECE)
- Total Amount: \$252,348
- Part of larger cross-institution [MASTR-E project](#) funded by US Army

Estimating Individual Treatment Effects

Tufts Collaborates Award (Internal)

7/1/19 - 6/30/20

- Title: 'Estimating Individual Treatment Effects from Randomized Clinical Trials using Machine Learning'
- Co-Investigators: David Kent (Tufts Medical Center)
- Total Amount: \$50,251

Invited Talks

Invited Talk at "I Can't Believe it's not Better" workshop at NeurIPS 2020 12/2020

- Title: [I Can't Believe Supervision for Latent Variable Models is not Better: The Case for Prediction constrained training](#)
- Event: [I Can't Believe It's Not Better! Workshop \(ICBINB at NeurIPS 2020\)](#)
- Workshop summary: Bridging the gap between theory and empiricism in probabilistic machine learning
- Talk summary: Makes case for our recent work on prediction constrained training, from AISTATS 2018, AISTATS 2020, and in preparation work

Invited Talk at Northwell Health ML group 07/2020

- Title: [Optimizing Machine Learning Models for Interpretable, Actionable Predictions on Electronic Health Records](#)
- Event: Regular virtual meeting of a ML research working group at Northwell Health (large healthcare provider in NYC)
- Summarizes recent MLHC 2019, CHIL 2020, AISTATS 2020, and JAMA Netw. Open 2020 papers

Invited Talk at U. Arizona 02/2020

- Title: [Overcoming model misspecification in structured clustering and reinforcement learning with prediction constrained training](#)
- Event: [Regular meeting of a research working group at U. Arizona](#) funded by NSF TRIPODS award
- Summarizes our recent AISTATS 2020 paper

Invited Short Talk at Duke Clinical Research Institute Think Tank meeting 01/2020

- Talk: [Preferred Quality Metrics for Clinical Prediction Models](#)
- Event: [Leveraging Artificial Intelligence and Machine Learning Methods and Approaches to Transform Clinical Trial Design, Planning, and Execution](#)
- Host Organization: [Duke Clinical Research Institute](#)
- An invitation-only event in Washington D.C. gathering 40 ML experts, clinical experts, and policy makers

Invited Talk at Meeting of Critical Care Directors in Madrid, Spain 01/2020

- Talk Title: Optimizing Machine Learning Models for Interpretable, Actionable Predictions
- Event: Reunión Sobre Nuevas Tecnologías en el Tratamiento de Datos Clínicos Electrónicos
- Translation: Meeting on New Technologies for Processing Electronic Health Records
- Hosts: RGI Informatics (Dr. Richard Goldstein, CEO) and Fuenlabrada University Hospital (Joaquín Álvarez, head of ICU).
- An invitation-only hosted event in Madrid for 30 directors of intensive care units around Madrid, Spain

Invited Mentor at 2019 PLA General Hospital - MIT Critical Data Datathon 11/2019

- [4th annual PLAGH-MIT Datathon](#)
- Event held in Beijing, China with 25 teams of local clinicians and computational scientists
- Team goal: Answer clinical question on historical public dataset ([MIMIC](#)) over 1 weekend
- Event goal: Develop local teams' skills via intense practice with expert oversight
- My role: Advise teams toward principled and clinically-useful analysis

Invited Talk at BNP 2019

06/2019

- Title: Scalable and Reliable Variational Inference for Dirichlet Process Clustering with Sparse Assignments
- Venue: [12th International Conference on Bayesian Nonparametrics](#)
- Summarizes the effective learning methods behind our [BNPy toolbox](#)

Invited Tutorial at MLHC 2018

08/2018

- [Machine Learning for Clinicians: Advances for Multi-Modal Health Data](#) at MLHC '18
- Designed to help clinicians understand enough modern machine learning to collaborate successfully with ML researchers.

Invited Panelist

12/2016

- Software panel at [Advances in Approximate Bayesian Inference workshop](#) at NIPS '16.

Professional Service

Area Chair

- 2021 - ACM CHIL and MLHC

Senior Program Committee / Meta-Reviewer

- 2021 - AAAI
- 2020 - AAAI

Program Committee / Reviewer

- 2020 - NeurIPS, AISTATS, ICLR, MLHC
- 2019 - NeurIPS ([reviewer award](#)), AISTATS, ICLR
- 2018 - NeurIPS ([reviewer award](#)), AAAI, AISTATS, ICLR, AMIA CRI
- 2017 - NeurIPS, ICML, AAAI
- 2016 - NeurIPS
- 2015 - NeurIPS, ICML
- 2014 - NeurIPS, ICML
- 2013 - NeurIPS ([reviewer award](#))

Workshop Organizer: ML4H at NeurIPS 2018

2018

- [Machine Learning for Health workshop](#) at NeurIPS '18 (NeurIPS ML4H 2018).
- Full-day workshop with invited keynotes, accepted papers/posters, and lively panel discussions.
- Provided a forum for interdisciplinary interaction between clinicians, statisticians, and computer scientists.
- Helped with website, PR, and continuity in peer-review process from previous years.

Workshop Organizer: BNP at NeurIPS 2018

2018

- [All of Bayesian Nonparametrics workshop](#) at NeurIPS '18 (NeurIPS BNP 2018).
- Full-day workshop with invited keynotes, accepted papers/posters, and lively panel discussions.
- Helped with peer-review process for accepted posters, <https://sites.google.com/view/nipsbnp2018/schedule>.

Workshop Organizer: ML4H at NeurIPS 2017

2017

- [Machine Learning for Health workshop](#) at NIPS '17 (NIPS ML4H 2017)
- Full-day workshop with invited keynotes and panels involving clinicians, statisticians, and computer scientists.
- Organized peer-review process for 118 submitted papers.

Workshop Organizer: *BNP at NeurIPS 2016*

2016

- o [Practical Bayesian Nonparametrics workshop](#) at NIPS '16.
- o Full-day workshop with invited speakers, contributed talks, two panel discussions, and lively poster session.
- o Led decisions on >25 submitted papers based on peer review.

Teaching and Mentorship

Tufts CS Dept.

Course: [COMP 135 Intro to Machine Learning](#)

Fall 2020

- o Taught core principles of machine learning to 95 students
- o Course format: 3 open-ended projects, 5 homeworks (conceptual and code questions), and 5 quizzes

Tufts CS Dept.

Course: [COMP 136 Statistical Pattern Recognition](#)

Spring 2020

- o Taught advanced statistical learning course to 35 students
- o Course format: 5 math-intensive homeworks, 5 coding-intensive homeworks, 5 short quizzes, 2 exams

Tufts CS Dept.

Course: [COMP 150 Bayesian Deep Learning](#)

Fall 2019

- o Taught advanced topics seminar to 23 students
- o Course format: weekly homeworks for first month, then 2-month open-ended team project

Tufts CS Dept.

Course: [COMP 135 Introduction to Machine Learning](#)

Spring 2019

- o Taught core principles of machine learning to about 50 students
- o Course format: 3 open-ended projects, weekly homeworks, and 2 exams

Tufts CS Dept.

Course: [COMP 150 Bayesian Deep Learning](#)

Fall 2018

- o Taught advanced topics seminar to about 18 students
- o Course format: weekly homeworks for first month, then 2-month open-ended team project
- o One project resulted in publication at IEEE conference (ICDL-EpiRob 2019)

Tufts University

Research Mentor

2018-

- o Mentored masters student projects:
 - o – Yu Liu. 2020-21 CS DS thesis: An Evaluation Pipeline for Heterogeneous Treatment Effect Prediction
 - o – Xi Chen. 2020 MS project: Bayesian Nonparametric Mixture Models for Missing Data
- o Mentored projects for post-bacc students:
 - o – Ally Lee. 2020: Bayesian Analysis of Autoregressive Models for Multi-Site Hospital Admission Forecasting
 - o – Lily H. Zhang 2019-20: Any Parameter Encoders for Topic Models: Variational Encoders that amortize across models as well as data
- o Mentored undergraduate projects:
 - o – Hezekiah Branch. 2020-21 [Tufts LSAMP fellow](#): Supervised Learning for Clinical Multivariate Time-series
 - o – Manh Duc Nguyen. 2019 CS honors thesis: Particle-based algorithms for Bayesian Neural Networks - Hamiltonian Monte Carlo and Stein Variational Gradient Descent

Harvard University SEAS

Research Mentor

2016-2017

- Mentored undergraduate senior thesis projects on Bayesian nonparametric inference.
- Frederick Widjaja. 2017 honors thesis: Streaming Variational Inference for the Indian Buffet Process.
- Madhu Vijay. 2017 honors thesis: Characterizing Posterior Uncertainty for the Indian Buffet Process.

Brown University

Research Mentor

2014-2016

- Mentored students on projects related to Bayesian nonparametric clustering and the BNPy Python package.
- William Stephenson. 2015 undergraduate honors thesis: [Variational Inference for Hierarchical Dirichlet Process based Nonparametric Models](#).
- Sonia Phene. 2015 undergraduate honors thesis: [Multiprocessor Parallelization of Variational Inference for Bayesian Nonparametric Topic Models](#).
- Mengrui Ni. 2015 masters project: [Variational Inference for Beta-Bernoulli Dirichlet Process Mixture Models](#).
- Mert Terzihan. 2015 masters project.

Lead Graduate TA for CS 142: Intro to Machine Learning

Fall 2013

- Led weekly 1 hour recitation session to review key concepts for 50+ students.
- Designed homework assignments and exam questions.

Outreach Experience

TEALS and Boston Latin Academy

Roxbury, MA

Volunteer AP Computer Science Instructor

2014-2016

- Taught 1-2 classes / week for 2 years via TEALS "CS in every high school" initiative sponsored by Microsoft.
- Developed hands-on lessons to excite students from diverse backgrounds about computational thinking.
- Mentored full-time teacher Ingrid Roche as she transitioned from media arts to AP computer science (Java).

Harvard Humanitarian Initiative

Cambridge, MA

Signal Program Fellow

2014

- Developed prototype detector for common housing structures in sub-Saharan Africa from satellite images.
- Intended for humanitarian oversight of conflict areas where burning structures is common attack pattern.
- Featured in TEDx talk: <https://youtu.be/u719rBw0nwU>

Olin College Engineering Discovery

Needham, MA

Co-Founder and Curriculum Director

2007-2010

- Managed 15 undergrads in developing hands-on lessons for 4th-8th graders.
- Hosted workshops for 30 children to design, build, and launch bottle rockets.
- Pioneered green energy workshop which earned over \$750 in outside funding.

Industry Experience

Google

Mountain View, CA

Software Engineering Intern

Summer 2013

- Improved walking/biking/running classifier using smartphone accelerometer data.
- Led collection of dataset from dozens of individuals for classifier evaluation via custom Android app.

All Conference Publications (in reverse chronological order)

1. [“MIMIC-Extract: A Data Extraction, Preprocessing, and Representation Pipeline for MIMIC-III.”](#) Shirly Wang^m, Matthew B. A. McDermott, Geeticka Chauhan, Marzyeh Ghassemi, Michael C. Hughes, and Tristan Naumann. CHIL 2020: The ACM Conference on Health, Inference, and Learning, 2020.
2. [“POPCORN: Partially Observed Prediction-Constrained Reinforcement Learning.”](#) Joseph Futoma, Michael C. Hughes, and Finale Doshi-Velez. AISTATS 2020, 2020.
3. [“Optimal Transport Based Change Point Detection and Time Series Clustering.”](#) Kevin Cheng^d, Shuchin Aeron, Michael C. Hughes, Erika Hussey, and Eric Miller. IEEE ICASSP 2020, 2020.
4. [“Regional Tree Regularization for Interpretability in Deep Neural Networks.”](#) Mike Wu^d, Sonali Parbhoo, Michael C. Hughes, Ryan Kindle, Leo Celi, Maurizio Zazzi, Volker Roth, and Finale Doshi-Velez. AAAI 2020, 2020.
5. [“Feature Robustness in Non-stationary Health Records: Caveats to Deployable Model Performance in Common Clinical Machine Learning Tasks.”](#) Bret Nestor^d, Matthew B. A. McDermott, Willie Boag, Gabriela Berner, Tristan Naumann, Michael C. Hughes, Anna Goldenberg, and Marzyeh Ghassemi. Machine Learning for Healthcare, 2019.
6. [“Supervised Machine Learning Algorithms Using Patient Related Factors to Predict in-Hospital Mortality Following Acute Myeloid Leukemia Therapy.”](#) Nauman Saleem Siddiqui^c, Andreas Klein, Amandeep Godara, Cindy Varga, Rachel J. Buchsbaum, and Michael C. Hughes. Proceedings of 61st Annual Meeting of the American Hematology Society, 2019.
7. [“Sensorimotor Cross-Behavior Knowledge Transfer for Grounded Category Recognition.”](#) Gyan Tatiya^d, Ramtin Hosseini^d, Michael C. Hughes, and Jivko Sinapov. Joint IEEE International Conference on Development and Learning and Epigenetic Robotics (ICDL-EpiRob), 2019.
8. [“Semi-Supervised Prediction-Constrained Topic Models.”](#) Michael C. Hughes, Gabriel Hope^d, Leah Weiner^d, Thomas H. McCoy Jr, Roy H. Perlis, Erik B. Sudderth, and Finale Doshi-Velez. Artificial Intelligence and Statistics (AISTATS), 2018.
9. [“Beyond Sparsity: Tree Regularization of Deep Models for Interpretability.”](#) Mike Wu^u, Michael C. Hughes, Sonali Parbhoo, Maurizio Zazzi, Volker Roth, and Finale Doshi-Velez. Association for Advancement of Artificial Intelligence (AAAI), 2018.
10. [“From Patches to Images: A Nonparametric Generative Model.”](#) Geng Ji^d, Michael C. Hughes, and Erik B. Sudderth. International Conference on Machine Learning (ICML), 2017.
11. [“Right for the Right Reasons: Training Differentiable Models by Constraining their Explanations.”](#) Andrew Slavin Ross^m, Michael C. Hughes, and Finale Doshi-Velez. International Joint Conference on Artificial Intelligence (IJCAI), 2017.
12. [“Predicting Intervention Onset in the ICU with Switching State Space Models.”](#) Marzyeh Ghassemi, Mike Wu^u, Michael C. Hughes, Peter Szolovits, and Finale Doshi-Velez. AMIA Summit on Clinical Research Informatics, 2017.
13. [“Scalable Adaptation of State Complexity for Nonparametric Hidden Markov Models.”](#) Michael C. Hughes, William Stephenson^u, and Erik B. Sudderth. Neural Information Processing Systems (NIPS), 2015.
14. [“Reliable and Scalable Variational Inference for the Hierarchical Dirichlet Process.”](#) Michael C. Hughes, Dae Il Kim, and Erik B. Sudderth. Artificial Intelligence & Statistics (AISTATS), 2015.
15. [“Memoized Online Variational Inference for Dirichlet Process Mixture Models.”](#) Michael C. Hughes

- and Erik B. Sudderth. Neural Information Processing Systems (NIPS), 2013.
16. [“Effective Split-Merge Monte Carlo Methods for Nonparametric Models of Sequential Data.”](#) Michael C. Hughes, Emily Fox, and Erik B. Sudderth. Neural Information Processing Systems (NIPS), 2012.
 17. [“The Nonparametric Metadata Dependent Relational Model.”](#) Dae Il Kim, Michael C. Hughes, and Erik B. Sudderth. International Conference on Machine Learning (ICML), 2012.

All Journal Publications (in reverse chronological order)

1. [“A Framework for Sensorimotor Cross-Perception and Cross-Behavior Knowledge Transfer for Object Categorization.”](#) Gyan Tatiya^d, Ramtin Hosseini^d, Michael C. Hughes, and Jivko Sinapov. Frontiers in Robotics and AI, 2020.
2. [“Assessment of a Prediction Model for Antidepressant Treatment Stability Using Supervised Topic Models.”](#) Michael C. Hughes, Melanie F. Pradier, Andrew Slavin Ross, Thomas H. McCoy Jr, Roy H. Perlis, Finale Doshi-Velez. JAMA Network Open, 2020.
3. [“Predicting change in diagnosis from major depression to bipolar disorder after antidepressant initiation.”](#) Melanie F. Pradier, Michael C. Hughes, Thomas H. McCoy Jr, Sergio A. Barroilhet, Finale Doshi-Velez, and Roy H. Perlis. Neuropsychopharmacology, 2020.
4. [“Predicting Treatment Discontinuation after Antidepressant Initiation.”](#) Melanie F. Pradier, Thomas H. McCoy, Michael C. Hughes, Roy H. Perlis, and Finale Doshi-Velez. Translational Psychiatry, 2020.
5. [“Refinery: An Open Source Topic Modeling Web Platform.”](#) Daeil Kim, Benjamin F. Swanson, Michael C. Hughes, and Erik B. Sudderth. JMLR Machine Learning Open Source Software (MLOSS), 2017.
6. [“Joint Modeling of Multiple Time Series via the Beta Process with Application to Motion Capture Segmentation.”](#) Emily Fox, Michael C. Hughes, Erik B. Sudderth, and Michael I. Jordan. Annals of Applied Statistics, Vol. 8(3), 2014.

All Workshop Papers (in reverse chronological order)

1. [“Using Hierarchy-Informed Multi-Label Classification for Enzyme Promiscuity Prediction.”](#) Gian Marco Visani^u, Michael C. Hughes, and Soha Hassoun. Machine Learning in Computational Biology Workshop (MLCB), 2020.
2. [“Rapid Model Comparison by Amortizing Across Models.”](#) Lily H. Zhang^b, and Michael C. Hughes. Second Symposium on Advances in Approximate Bayesian Inference (AABI 2019), 2019.
3. [“Classification of Enzyme Promiscuity Using Positive, Unlabeled, and Hard Negative Examples.”](#) Gian Marco Visani, Michael C. Hughes and Soha Hassoun. Machine Learning in Computational Biology Workshop (MLCB), 2019.
4. [“Prediction-Constrained POMDPs.”](#) Joseph Futoma, Michael C. Hughes, and Finale Doshi-Velez. Reinforcement Learning under Partial Observability (RLPO) workshop at NeurIPS 2018, 2018.
5. [“Rethinking clinical prediction: Why machine learning must consider year of care and feature aggregation.”](#) Bret Nestor^d, Matthew B. A. McDermott, Geeticka Chauhan, Tristan Naumann, Michael C. Hughes, Anna Goldenberg, Marzyeh Ghassemi. Machine Learning for Healthcare (ML4H) workshop at NeurIPS 2018, 2018.
6. [“Prediction-Constrained Topic Models for Antidepressant Prediction.”](#) Michael C. Hughes, Gabriel

- Hope^d, Leah Weiner^d, Thomas H. McCoy, Roy H. Perlis, Erik B. Sudderth, and Finale Doshi-Velez. NIPS Workshop on Machine Learning for Health (NIPS ML4H), 2017.
7. "[Associations between aboveground forest biomass and waveform LiDAR metrics: implications for modeling footprint-level biomass using Global Ecosystem Dynamics Investigation data.](#)" J. Kellner, J. B. Blair, L. Duncanson, L., S. Hancock, M. A. Hofton, M. C. Hughes, S. Marselis, S., J. Armston, E. B. Sudderth, H. Tang, L. Weiner^d, and R. Dubayah. American Geophysical Union, Fall General Assembly, 2016.
 8. "[Supervised topic models for clinical interpretability.](#)" Michael C. Hughes, Huseyin Melih Elibol, Thomas McCoy, Roy Perlis, and Finale Doshi-Velez. NIPS Workshop on Machine Learning for Health (NIPS ML4H), 2016.
 9. "[BNPy: Reliable and scalable variational inference for Bayesian nonparametric models.](#)" Michael C. Hughes and Erik B. Sudderth. 3rd NIPS Workshop on Probabilistic Programming, 2014.
 10. "[Nonparametric Discovery of Activity Patterns from Video Collections.](#)" Michael C. Hughes and Erik B. Sudderth. CVPR Workshop on Perceptual Organization in Computer Vision (POCV), 2012.