Michael C. Hughes

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Education

Brown University
Ph.D., Computer Science   *May 2016*

Brown University
M.S. Computer Science, GPA: 4.0   *May 2012*

Olin College of Engineering
B.S. Electrical & Computer Engineering, GPA: 3.93   *May 2010*

Research Experience

Postdoctoral fellow: Machine learning for clinical interpretability
Adviser: Prof. Finale Doshi-Velez (Harvard)   *Fall 2016 - present*
- Collaboration with MGH to improve prediction of drugs for mental health patients
- Collaboration with MIT to better suggest interventions in the ICU
- Supported by gift from Oracle

Estimating carbon biomass from LiDAR waveforms
Adviser: Prof. Erik Sudderth & Prof. Jim Kellner (Ecology & Evolutionary Biology)   *Summer 2016*
- Predicted forest biomass from LiDAR waveforms to better understand land use and climate change
- Developed Bayesian nonparametric regression to jointly model waveforms and biomass values
- Intended for use in upcoming NASA mission GEDI

Ph.D. Thesis: Scalable inference for Bayesian nonparametric clustering
Adviser: Prof. Erik Sudderth   *Spring 2016*
- Developed variational inference algorithm that adapts to data by adding or removing clusters during training.
- Optimizes sophisticated objective function based on marginal likelihood for Ockham's razor model selection.
- Applicable to mixture models, topic models, and hidden Markov models.
- Implemented algorithms in open-source Python package BNPy.

Master's Project: Sequential Models for Video and Motion Capture
Adviser: Prof. Erik Sudderth   *Spring 2012*
- Developed methods to discover common actions from many videos of humans performing common activities.
- Improved existing MCMC inference algorithms with data-driven Metropolis-Hastings proposals.

Honors and Awards

NSF Graduate Research Fellowship Award   *Spring 2011*
- Three year funding award. Covers tuition and provides research stipend.

NDSEG Graduate Research Fellowship Award   *Spring 2011*
- Three year funding award. Declined to accept NSF fellowship.

Publications

1. "Predicting intervention onset in the ICU with switching state space models." Marzyeh Ghassemi, Mike Wu, Michael C. Hughes, Peter Szolovits, and Finale Doshi-Velez. AMIA CRI, 2017.
2. "Refinery: An Open Source Topic Modeling Web Platform." Daeil Kim, Benjamin F. Swanson, Michael C. Hughes, and Erik B. Sudderth. JMLR MLOSS, 2017.
3. "Supervised topic models for clinical interpretability." Michael C. Hughes, Huseyin Melih Elibol, Thomas McCoy, Roy Perlis, and Finale Doshi-Velez. ML for Health workshop at NIPS, 2016.
4. "Fast Learning of Clusters and Topics via Sparse Posteriors." Michael C. Hughes & Erik B. Sudderth. arXiv e-print, 2016.
5. "Scalable Adaptation of State Complexity for Nonparametric Hidden Markov Models." Michael C. Hughes, William Stephenson, & Erik B. Sudderth. Neural Information Processing Systems (NIPS), 2015.
6. "Reliable and Scalable Variational Inference for the Hierarchical Dirichlet Process." Michael C. Hughes, Dae Il Kim, & Erik B. Sudderth. Artificial Intelligence & Statistics (AISTATS), 2015.
7. "BNPy: Reliable and scalable variational inference for Bayesian nonparametric models." Michael C. Hughes, & Erik B. Sudderth. 3rd NIPS Workshop on Probabilistic Programming, 2013.
8. "Joint Modeling of Multiple Time Series via the Beta Process with Application to Motion Capture Segmentation." Emily Fox, Michael C. Hughes, Erik B. Sudderth, & Michael I. Jordan. Annals of Applied Statistics, Vol. 8(3), 2014.
9. "Memoized Online Variational Inference for Dirichlet Process Mixture Models." Michael C. Hughes & Erik B. Sudderth. Neural Information Processing Systems (NIPS), 2013.
10. "Effective Split-Merge Monte Carlo Methods for Nonparametric Models of Sequential Data." Michael C. Hughes, Emily Fox, & Erik B. Sudderth. Neural Information Processing Systems (NIPS), 2012.
11. "The Nonparametric Metadata Dependent Relational Model." Dae Il Kim, Michael C. Hughes, & Erik B. Sudderth. International Conference on Machine Learning (ICML), 2012.
12. "Nonparametric Discovery of Activity Patterns from Video Collections." Michael C. Hughes & Erik B. Sudderth. CVPR Workshop on Perceptual Organization in Computer Vision (POCV), 2012.

Industry Experience

Google   **Mountain View**
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.

Non-profit Experience

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: http://youtu.be/u7l9rBwOnwU

Teaching Experience

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 TA for CS 142: Intro to Machine Learning   *Fall 2013*
- Led weekly 1 hour recitation session to review key concepts.
- Designed homework assignments and exam questions.

Professional Service

Workshop Organizer   *2016*
- Practical Bayesian Nonparametrics workshop at NIPS '16
- Full day workshop with invited speakers, contributed talks, two panel discussions, and lively poster session
- Led decisions on >25 submitted papers based on peer review

Invited Panelist   *2016*
- Software panel at Advances in Approximate Bayesian Inference workshop at NIPS '16

Program Committee / Reviewer
- ICML 2017
- AAAI 2017
- NIPS 2016
- ICML 2015
- NIPS 2015
- NIPS 2014
- NIPS 2013 (reviewer award)