

Taylor W. Killian

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RESEARCH INTERESTS

Computational and mathematical strategies applied to problems in science and industry:
particularly in *decision science*, *machine learning*, *operations research*, *optimization*, *data analytics*,
dynamical systems, *compressed sensing*, and *image processing*.

EDUCATION

Computational Science and Engineering, M.Eng **May 2017**

Harvard University, Cambridge, MA

- GPA: 3.92

Relevant Courses:

- Advanced Scientific Computing (Numerical Methods, Stochastic Optimization)
- Advanced Optimization
- Computational Foundations for Computational Science (Parallel Programming)
- Machine Learning , Data Science

Advisor: Finale Doshi-Velez

Thesis: Robust and Efficient Transfer Learning by Accounting for and Modeling Parameter Variation

Mathematics, BS

April 2013

Brigham Young University, Provo, Utah

- GPA: 3.83

Relevant Courses:

- Numerical Analysis, Linear Algebra, Differential Equations
- Optimization, Applied Analysis, Dynamical Systems

EXPERIENCE

Associate Technical Staff

June 2017 - present

Air, Missile and Maritime Defense Technology, MIT Lincoln Laboratory

- Leading effort to identify and develop areas for Laboratory investment in Artificial Intelligence
- Developing ML algorithms for efficient and accurate performance in low-data regimes
- Extending state of the art ML techniques to U.S. Military and Homeland Defense

Assistant Technical Staff

May 2013-May2017

Air, Missile and Maritime Defense Technology, MIT Lincoln Laboratory

- Systems analysis of near- and long-term development of U.S. missile defenses.
- Evaluated the impact of technological and operational improvements to U.S. missile defenses.
- Developed algorithms and computational paradigms to improve U.S. DoD capabilities.
- Produced briefing materials to present to key DoD decision makers.

Undergraduate Research Assistant

June 2010-May 2013

Department of Mechanical Engineering, Brigham Young University

- Published research on fluid activated passive dampening as primary author.
- Furnished analytical and mathematical support to experimental techniques.

- Presented at 2011 APS March Meeting and 2011, 2012 APS-DFD Annual Meetings.

Office of Naval Research NREIP Intern

Summer 2011

Naval Surface Warfare Center, Dahlgren, Virginia

- Designed and carried out experiment to study optimal nose shape for submerging projectiles.

Language Instructor (Swedish)

December 2009-June 2010

Missionary Training Center, Church of Jesus Christ of Latter-day Saints

- Collaborated with other instructors to prepare lessons to satisfy curriculum and individual student needs.
- Counseled with students to overcome individual concerns and problems.
- Instructed and evaluated language fluency and understanding of concepts.

VOLUNTEER

President, Student Advisory Committee

January 2011-December 2011

Department of Mathematics, Brigham Young University

- Led effort to improve curriculum and increase collaboration between students and faculty.
- Participated in department review to introduce an applied and computational concentration.
- Planned and carried out activities to promote mathematics and educate BYU community.

Missionary, Sweden Stockholm Mission

March 2007- March 2009

The Church of Jesus Christ of Latter-day Saints

- Managed and oversaw the work and safety of 12 other missionaries in remote areas of Sweden.
- Trained 6 newly arrived missionaries in language, culture, and proselyting skills.
- Served full-time as a church representative identifying and meeting the needs of the community.

PUBLICATIONS

- Killian, T., Daulton, S., Konidaris, G. & Doshi-Velez, F. , “Robust and Efficient Transfer Learning in Hidden Parameter Markov Decision Processes”, *Advances in Neural Information Processing Systems* (pp. 6245-6250). (2017)
- Killian, T., Konidaris, G. & Doshi-Velez, F., “Robust and Efficient Transfer Learning in Hidden Parameter Markov Decision Processes.” In *AAAI* (pp. 4949-4950). (2017).
- Killian, T., Klaus, R. & Truscott, T.T., “Rebound and jet formation of a fluid-filled sphere”, *Physics of Fluids* **24**, 122106 (2012), DOI:10.1063/1.4771985.

PRE-PRINTS

- Killian. T., Konidaris, G. & Doshi-Velez F., “Transfer Learning Across Patient Variations with Hidden Parameter Markov Decision Processes.” arXiv preprint arXiv:1612.00475. (2016).

PRESENTATIONS

- Killian, T., Daulton, S., Konidaris, G. & Doshi-Velez, F., “Robust and Efficient Transfer Learning using Hidden Parameter Markov Decision Processes.” *NIPS 2017*. Long Beach, CA. December 6, 2017.
- Killian, T., Doshi-Velez, F. & Konidaris, G., “Robust and Efficient Transfer Learning using Hidden Parameter Markov Decision Processes.” *31st AAAI Conference*. San Francisco, CA. February 7, 2017.
- Killian, T., & Doshi-Velez, F., “Accounting for Patient Variation when Predicting Effective Treatment Policies.” *MIT Lincoln Laboratory PED Seminar Series*. Lexington, MA. July 12, 2016.
- Killian, T., Bryson, J., Bird, JC., Huey, J., Truscott, T.T., “Self Healing Soap Films.” *65th Annual Meeting of the American Physical Society Division of Fluid Dynamics*. San Diego, CA. November 21-23, 2012.

- Killian, T., Klaus, R. & Truscott, T.T., “Harnessing sloshing as a passive dampener.” *64th Annual Meeting of the American Physical Society Division of Fluid Dynamics*. Baltimore, MD. November 20-22, 2011.
- Killian, T., Klaus, R. & Truscott, T.T. , “Sphere rebound suppression from sloshing,” *75th Annual Meeting of the American Physical Society*. Dallas, TX. March 2011.

POSTERS/VIDEOS

- [POSTER] Killian, T., Daulton, S., Konidaris, G. & Doshi-Velez, F., “Robust and Efficient Transfer Learning using Hidden Parameter Markov Decision Processes.” *NIPS 2017*. Long Beach, CA. December 6, 2017.
- [POSTER] Killian, T., Konidaris, G. & Doshi-Velez, F., “Robust and Effective Transfer Learning using Hidden Parameter Markov Decision Processes.” *31st AAAI Conference*. San Francisco, CA. February 7, 2017
- [POSTER] Killian, T., Konidaris, G. & Doshi-Velez, F., “Transfer Learning Across Patient Variations with Hidden Parameter Markov Decision Processes.” *NIPS Workshop on Machine Learning for Healthcare*. Barcelona, Spain. December 9, 2016.
- [POSTER] Killian, T., & Doshi-Velez, F., “Accounting for Patient Variation in the Development of Optimal Treatment Policies.” *2nd Annual Harvard IACS Project Showcase*. Cambridge, MA. May 10, 2016.
- [POSTER] Killian, T., Hanus, D., & Doshi-Velez, F., “Inferring missing data & accounting for patient variation to predict effective HIV treatments.” *5th Annual New England Machine Learning Day*. Cambridge, MA. May 6, 2016.
- [VIDEO] Killian, T., Huey, J., Bryson, J., & Truscott, T.T., “Self healing soap films,” *65th Annual Meeting of the American Physical Society Division of Fluid Dynamics*. San Diego, CA. November 18-20, 2012. <http://arxiv.org/abs/1210.3797>
- [POSTER] Jafek, A., Langley, K., Killian, T. & Truscott, T.T., “Bouncing in puddles,” *64th Annual Meeting of the American Physical Society Division of Fluid Dynamics*. Baltimore, MD. November 20-22, 2011.
- [POSTER] Klaus, R., Killian T. & Truscott, T.T., “Sphere rebound suppression from sloshing,” *63rd Annual Meeting of the American Physical Society Division of Fluid Dynamics*. Long Beach, CA. Nov 2010.

PROJECTS

- **Weighted k-Centers, Optimal Facility Location** Using data derived from the 2010 US Census for the state of Massachusetts, we augmented the Metric k-centers and Lloyd’s algorithms to optimally assigne the locations of a constrained number of facilites or distribution centers.
- **Stochastic Inference of Greater Boston Bike-share Data** With data from the Hubway bike-sharing system from the 2012 season, we performed second order analyses to develop intuition about how to augment or improve the system.
- **Two-Stage Supermodular Minimization for Dictionary Selection** Developed a method by which to solve dictionary selection under a supermodular assumption.
- **Automated Anomaly Detection in Surveillance Video** Attempted to provide real-time processing and identification of anomalous behavior in surveillance video, utilizing contemporary methods of parallel computing.
- **Quantitative Evaluation of Player Performance** Evaluated the transfer market of international soccer and the perception of player value. Developed a merit-based scoring metric that was used to measure the impact a player has on the matches a player participates in. This impact score was used to infer what value they would have on the transfer market.

AWARDS

- AAAI, Student Abstract Track, Best Student Presentation, 2017
- MIT LL Lincoln Scholar, 2015-2017
- NDSEG Fellowship Award (Declined), 2013
- SMART Fellowship Finalist, 2011

SKILLS AND LANGUAGES

- Bayesian approaches in Machine Learning, Deep Learning
- Systems Analysis, Algorithm development and analysis, Optimization methods
- High Speed Photography, Image Processing
- Proficient in MATLAB, LaTeX, Python, Tensorflow, Pytorch
- Experience with Apache-Spark, OpenMP, Java, CUDA, C++
- Fluent in Swedish