

# Kyle Heuton

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## *Machine Learning Scientist for a Healthier World*

### Professional Research Experience

- 2020 **Software Engineer**, *Institute for Health Metrics and Evaluation*, Seattle
- Re-designed COVID-19 hospitalization forecasting software. This saved hours of runtime and thousands of dollars of compute cost each week, and resulted in software that was better tested, more stable, and easier to maintain.
  - Developed a software framework to combine climate models and GDP models to create a model of climate change that could capture the feedback loop between changes in temperature, rainfall, and agricultural productivity
- 2018–2020 **Software Engineer**, *OM1*, Boston
- Designed a cloud platform to receive, de-identify, and normalize Electronic Medical Records (EMR) and insurance claims data from diverse sources on hundreds of millions of patients
  - Constructed and refine cohorts of patients based on clinically-relevant disease criteria
  - Transformed EMR and claims data into actionable evidence for use in life-sciences, healthcare practice, and administration
  - Managed data team as interim team lead to develop data transmission procedures with customers, mentored junior engineers, and planned the team's roadmap
- 2015–2018 **Forecasting Researcher and Software Engineer**, *Institute for Health Metrics and Evaluation*, Seattle
- Developed models and software to forecast all deaths and disease with a model of global health and economics using Apache Spark
  - Created a method to forecast the cascading effects of specific policies within this global forecast for use by governments and ministries of health to guide policy decisions
- 2012–2015 **Post-Bachelor Fellow**, *Institute for Health Metrics and Evaluation*, Seattle
- Built a scientific software pipeline in Python used by dozens of modelers to run more than 20,000 disease models, the results of which were used as the basis of the disability estimates of the Global Burden of Disease Project and by the Bill and Melinda Gates Foundation to set priorities
  - Generated and interpreted the results of complex random effect and Bayesian econometric and disease models
  - Wrote a Python script to create a unique report for each of 187 participating countries which was used to inform ministries of health about the greatest sources of disease burden in their country
- Summer, 2011 **fMRI Analysis Intern**, *IBM*, IBM T. J. Watson Research Center, Yorktown Heights
- 2011 Advisor: Irina Rish, PhD
- Analyzed fMRI image data using sparse regression techniques and trained models to predict neurological diagnoses
  - Competed in the ADHD-200 Competition to predict ADHD in patients from fMRI scans
  - Presented the results of this work as two talks at the SPIE Medical Imaging conference in 2012

- Summer, **CT Scan Denoising Intern**, *Vital Images (Now a Canon Medical company)*, Minneapolis  
2010 Advisor: Stefan Atev, PhD
- Implemented an anisotropic denoising algorithm to reduce digital noise in CT scan images, which was eventually incorporated into the company's commercial medical imaging software
- Summer, **Placental Modeling Intern**, *UCLA*, Los Angeles  
2009 Advisors: Dr. Carolyn Salafia, MD, Xiaoqun Zhang, PhD. This work was part of the Research in Industrial Projects for Students at the Institute for Pure and Applied Mathematics
- Developed novel methods in MATLAB to characterize the shape of placentas in an effort to learn more about neonatal health
  - Participated in discussions on the placental measurement protocol for the National Children's Study
- Summer, **Automated Railroad Damage Detection Intern**, *Loram*, Minneapolis  
2007 Advisor: Dr. Gilad Lerman, PhD. This work was part of the Industrial Internship program at the Minnesota Center for Industrial Mathematics
- Created image analysis software to automatically detect damage in digital images of railroad tracks

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## Education

- 2020– **PhD**, *Tufts University*, Medford, Advisor: Michael C. Hughes  
Research Focus: Machine Learning for Healthcare
- 2012–2015 **Master of Public Health**, *University of Washington*, Seattle  
Global Health Metrics and Evaluation Track  
Master Thesis: Forecasting Exposure to Occupational Back Pain
- 2008–2012 **Bachelor of Chemical Engineering, Bachelor of Science in Mathematics**,  
*University of Minnesota*, Twin Cities

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## Awards

### **Data Driven Decision Making Fellowship**, 2022

The Data Driven Decision Making (D3M) Fellowship is a competitive fellowship awarded to students working to combine numbers and narratives to address societally relevant problems

### **Tufts School of Engineering Dean's Fellowship**, 2020

An award given in recognition of my academic record and potential for doctoral study

### **MIT Policy Hackathon**, *April 2019*, Grand prize; health challenge prize

My team worked with a project sponsor from a cancer hospital in the Middle East to design policies to measure and reduce emergency department wait times. Our proposal was selected as the best from the health challenge, and won the grand prize out of 17 teams working on challenges in artificial intelligence, climate, health, urban planning, and the future of work.

### **MIT Policy Hackathon**, *April 2018*, Grand prize; health challenge prize

My team worked with a project sponsor from the National Diaper Bank Network to develop policies to improve diaper access and affordability for families in Connecticut.

## Invited Conference Presentations

- 2023 **Learning where to intervene with a differentiable top-k operator: Towards data-driven strategies to prevent fatal opioid overdoses**, *ICML 3rd Workshop on Interpretable Machine Learning in Healthcare (IMLH)*, Honolulu, Kyle Heuton, Shikhar Shrestha, Thomas Stopka, and Michael C Hughes
- 2022 **Predicting spatiotemporal counts of opioid-related fatal overdoses via zero-inflated gaussian processes**, *The 2022 NeurIPS Workshop on Gaussian Processes, Spatiotemporal Modeling*, New Orleans, Kyle Heuton, Shikhar Shrestha, Thomas J Stopka, Jennifer Pustz, Li-Ping Liu, and Michael C Hughes
- 2013 **Risking our future: a comparative risk assessment of the burden of disease and injury in young people aged 10 – 24 years, 1990 – 2010**, *Global Health Metrics and Evaluation*, Seattle, Kyle Heuton, Rafael Lozano
- 2012 **Sparse regression analysis of task-relevant information distribution in the brain**, *SPIE Medical Imaging 2012*, San Diego, Irina Rish, Guillermo A. Cecchi, Kyle Heuton, Marwan N. Baliki, A. Vania Apkarian
- 2012 **Schizophrenia classification using functional network features**, *SPIE Medical Imaging 2012*, San Diego, Irina Rish, Guillermo A. Cecchi, Kyle Heuton

## Academic Service

- 2023 **Machine Learning for Health**, (*ML4H*), New Orleans, LA
  - Finance Chair

## Open Source Contributions

**xarray**, <https://github.com/pydata/xarray>

## Publication Notes

- For a continuously updated list of my publications with links to articles when available, please see my Google Scholar profile at:  
<https://scholar.google.com/citations?user=RIE2AC0AAAAJ>
- Articles with the author listed as "*As part of the GBD 2013 Collaboration*" were written for the 2013 Global Burden of Disease study. These articles have hundreds of authors from the global network of researchers who took part in this work.

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## Publications

- [1] Kyle Heuton, Shikhar Shrestha, Thomas Stopka, and Michael C Hughes. Learning where to intervene with a differentiable top-k operator: Towards data-driven strategies to prevent fatal opioid overdoses. *ICML 3rd Workshop on Interpretable Machine Learning in Healthcare (IMLH)*, 2023.
- [2] Kyle Heuton, Shikhar Shrestha, Thomas J Stopka, Jennifer Pustz, Li-Ping Liu, and Michael C Hughes. Predicting spatiotemporal counts of opioid-related fatal overdoses via zero-inflated gaussian processes. *The 2022 NeurIPS Workshop on Gaussian Processes, Spatiotemporal Modeling, and Decision-making Systems*, 2022.
- [3] Kyle J Foreman, Neal Marquez, Andrew Dolgert, Kai Fukutaki, Nancy Fullman, Madeline McGaughey, Martin A Pletcher, Amanda E Smith, Kendrick Tang, Chun-Wei Yuan, Jonathan C Brown, Joseph Friedman, Jiawei He, Kyle R Heuton, Mollie Holmberg, Disha J Patel, Patrick Reidy, Austin Carter, Kelly Cercy, Abigail Chapin, Dirk Douwes-Schultz, Tahvi Frank, Falko Goettsch, Patrick Y Liu, Vishnu Nandakumar, Marissa B Reitsma, Vince Reuter, Nafis Sadat, Reed J D Sorensen, Vinay Srinivasan, Rachel L Updike, Hunter York, Alan D Lopez, Rafael Lozano, Stephen S Lim, Ali H Mokdad, Stein Emil Vollset, and Christopher J L Murray. Forecasting life expectancy, years of life lost, and all-cause and cause-specific mortality for 250 causes of death: reference and alternative scenarios for 2016–40 for 195 countries and territories. *The Lancet*, 392(10159):2052 – 2090, 2018.
- [4] As part of the GBD 2013 Collaboration. Global, regional, and national levels and causes of maternal mortality during 1990–2013: a systematic analysis for the global burden of disease study 2013. *The Lancet*, 384(9947):980–1004, 2014.
- [5] As part of the GBD 2013 Collaboration. Global, regional, and national incidence and mortality for hiv, tuberculosis, and malaria during 1990–2013: a systematic analysis for the global burden of disease study 2013. *The Lancet*, 384(9947):1005–1070, 2014.
- [6] As part of the GBD 2013 Collaboration. Global, regional, and national age–sex specific all-cause and cause-specific mortality for 240 causes of death, 1990–2013: a systematic analysis for the global burden of disease study 2013. *The Lancet*, 2014.
- [7] As part of the GBD 2013 Collaboration. Global, regional, and national incidence, prevalence, and years lived with disability for 301 acute and chronic diseases and injuries in 188 countries, 1990–2013: a systematic analysis for the global burden of disease study 2013. *The Lancet*, 386(9995):743–800, 2015.
- [8] As part of the GBD 2013 Collaboration. Global, regional, and national disability-adjusted life years (dalys) for 306 diseases and injuries and healthy life expectancy (hale) for 188 countries, 1990–2013: quantifying the epidemiological transition. *The Lancet*, 386(10009):2145–2191, 2015.
- [9] As part of the GBD 2013 Collaboration. Global, regional, and national comparative risk assessment of 79 behavioural, environmental and occupational, and metabolic risks or

clusters of risks in 188 countries, 1990–2013: a systematic analysis for the global burden of disease study 2013. *The Lancet*, 386(10010):2287–2323, 2015.

- [10] Kyle Heuton and Rafael Lozano. Risking our future: a comparative risk assessment of the burden of disease and injury in young people aged 10–24 years, 1990–2010. *The Lancet*, 381:S61, 2013.
- [11] Irina Rish, Guillermo A Cecchi, and Kyle Heuton. Schizophrenia classification using functional network features. In *SPIE Medical Imaging*, pages 83170W–83170W. International Society for Optics and Photonics, 2012.
- [12] Irina Rish, Guillermo A Cecchi, Kyle Heuton, Marwan N Baliki, and A Vania Apkarian. Sparse regression analysis of task-relevant information distribution in the brain. In *Proceedings of SPIE*, volume 8314, page 831412, 2012.