Charles Delahunt CV

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Global Health Labs, Bellevue, WA (2012 – present)
- Senior Research Engineer, machine learning for medical diagnostics
- Role: Research and develop ML algorithms tailored to use-cases in global health
- Projects: automated malaria detection; grain moisture prediction; pregnancy risk stratification; vitamin A deficiency detection from pupillary response; lung ultrasound; helminth diagnosis.

U. Washington Applied Math Postdoc (2018 – 2021, J. Nathan Kutz P.I.)
- Data-driven discovery of governing equations in high-noise regimes
- Application of biological learning mechanisms to ML contexts

Key skills
- Applied machine learning
- Analyze, interrogate, and understand data sets
- Research and develop end-to-end ML systems
- Honor use-case demands, biophysical priors, and domain knowledge in algorithm design
- Assess algorithm performance and results
- Work with field experts and collaborators
- Image processing
- Data and database management
- Writing and presentations

Education
- Ph.D. Electrical Engineering, University of Washington. Advisors J. Nathan Kutz (Applied Math) and Eve Riskin (Electrical Engineering). 2018
- B.S. Math and Music, MIT

Languages
> Python, Matlab, SQL. Some Java, C, Linux, Powershell, Git, Tensorflow.

ML and biological learning papers **(*)** indicates lead author

- **(*)** *A toolkit for data-driven discovery of governing equations in high-noise regimes.* IEEE Access 2022. link
- **(*)** *Predicting United States Policy Outcomes with Random Forests*. INET 2020. link
- **(*)** *Money on the Table: Statistical information ignored by Softmax can improve classifier accuracy.* arXiv 2019. link
- **(*)** *Putting a bug in ML: The moth olfactory network learns to read MNIST.* Neural Networks 2019. link
- **(*)** *Insect cyborgs: Bio-mimetic feature generators improve machine learning accuracy on limited data*. NeurIPS workshop 2019. link
- **(*)** *A moth brain learns to read MNIST.* ICLR workshop 2019. link
- **(*)** *Biological Mechanisms for Learning: A Computational Model of Olfactory Learning in the*

Manduca sexta Moth, with Applications to Neural Nets. Front Comp Neurosci 2018. link

(*) *Built to Last: Functional and structural mechanisms in the moth olfactory network mitigate effects of neural injury*. Brain Sciences 2021. link

(*) *Engineered for Function: The Power of Biologically-Constrained Neural Networks for Neurosensory Integration*. SIAM News July 2019. link

In the press:

- Quanta Magazine: *New AI strategy mimics how brains learn to smell*. link
- Technology Review: *Why even a moth's brain is smarter than AI*. link
- The Register: *Moth brain AI*. link

ML for global health papers   **(*)** indicates lead author

(*) *Use case-focused metrics to evaluate machine learning for diseases involving parasite loads* arXiv 2022. link

(*) *Algorithms to predict moisture content of grain using relative humidity time-series*. IEEE GHTC 2020. link

(*) *Tutorial: MICCAI for Global Health*. half-day, MICCAI 2022. (lead organizer)

(*) *Tutorial: Applied machine learning for social good*. half-day, IEEE GHTC 2022. (co-organizer)

(*) *Tutorial: Applied machine learning for social good*. half-day, IEEE GHTC 2020. (co-organizer)

(*) *Fully-automated patient-level malaria assessment on field-prepared thin blood film microscopy images*. IEEE GHTC 2019. link

* *Field evaluation of the diagnostic performance of EasyScan GO: a digital malaria microscopy device based on machine learning*. Malaria J 2022. link

* *Performance of a fully-automated system on a WHO malaria microscopy evaluation slide set*. Malaria J 2021. link

* *Automated microscopy for routine malaria diagnosis: a field comparison on Giemsa-stained blood films in Peru*. Malaria J, 2018, link

* *Computer-Automated Malaria Diagnosis and Quantitation Using Convolutional Neural Networks*. ICCV 2017. link

(*) *Automated Microscopy and Machine Learning for Expert-Level Malaria Field Diagnosis*. IEEE GHTC 2015. link

(*) *Limitations of haemozoin-based diagnosis of Plasmodium falciparum using dark-field microscopy*. Malaria J 2014. link

* *A paper microfluidic cartridge for automated staining of malaria parasites with an optically transparent microscopy window*. Lab on Chip 2014. link

In the press:

- Technology Review: *AI offers a better way to diagnose malaria*. link

Patents

- Image analysis systems and related methods. Patent # 10061972
- Devices and methods for staining and microscopy. Patent # 9453996

Service

- Board member, RISE-MICCAI (Reinforcing inclusiveness & diversity and empowering MICCAI in low-to-middle income countries) link
- Peer Reviewer: NeurIPS, ICML, MICCAI, IEEE GHTC, ML4H, TMLR, Malaria J, others
- Roosevelt High School Vocational Advisory Committee (for technical education)
- Devoted runner ☺