Daphne E. Schlesinger

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Education

2018–2024 | **Massachusetts Institute of Technology**
PhD in Medical Engineering and Computer Science

2014–2018 | Johns Hopkins University
BS in Biomedical Engineering and in Physics

Work Experience

2019–present | **Collin Stultz's Computational Cardiovascular Research Group**
Graduate Researcher

- Applied state-of-the-art deep learning methods to non-invasively infer central hemodynamics from the 12-lead electrocardiogram
- Fine-tuned and applied the above model to single lead electrocardiographic signals in order to detect hemodynamic congestion, and evaluated on wearable device data, creating a tool to improve the management and outcomes of patients with chronic heart failure
- Participated in the planning and execution of prospective clinical studies to collect data to evaluate deep learning models
- Developed a novel framework to incorporate mechanistic knowledge into machine learning models, in order to infer latent parameters of the cardiovascular system in patients with advanced heart failure
- Processed and analyzed diverse clinical data, including electrocardiographic and hemodynamic time series, and tabular data, such as vitals, lab results, medications, and demographics

Summer 2023 | Tempus Labs
Machine Learning Summer Associate

- Applied Vision Transformers to the electrocardiogram to predict the future onset of cardiac arrhythmias, including fine-tuning large pretrained Vision Transformers on electrocardiographic data for the above downstream task
- Updated existing model training infrastructure to support custom Vision Transformer architectures
- Utilized Google Cloud Platform to launch model training jobs and evaluate over a range of hyperparameters, and profiled model training runs with TensorBoard to optimize GPU utilization

Work Experience (cont.)

2019 — Thomas Heldt's Integrative Neuromonitoring and Critical Care Informatics Group
Research Rotation

- Evaluated machine learning models for sepsis-related vasopressor administration in the emergency department

2017–2018 — The Institute for Data Intensive Engineering and Science (IDIES)
Undergraduate Researcher

- Applied unsupervised ML pre-processing techniques to pathologic scans
- Designed and implemented a graphical user interface for pathology image analysis

2014–2018 — Jordan Green's Biomaterials and Drug Delivery Laboratory
Undergraduate Researcher

- Designed and fabricated microscale needles for drug delivery
- Fabricated and tested microfluidic devices for monodisperse polymer particle synthesis
- Fabricated and tested laser triggered drug release and shape memory PDLLA microparticles, and synthesized gold nanorods for embedding in microparticles
- Utilized imaging techniques including scanning electron miscroscopy, transmission electron microscopy, and fluorescent microscopy to profile microparticles for size and morphology

2017 — Johns Hopkins University Department of Biomedical Engineering
Teaching Assistant

- Precepted and graded exams for a cell biology course, Molecules & Cells

2017–2018 — Johns Hopkins Center for Bioengineering Innovation and Design (CBID)
Undergraduate Design Team Leader

- Recruited and managed a team of students to develop a design solution to a biomedical problem
- Project subject: Detecting malfunction in cerebroventricular shunts

2015–2017 — Johns Hopkins University Academic Support
Peer-Led-Team (PILOT) Learning Group Leader

- Helped peers to develop problem solving skills in Multivariable Calculus and Electricity & Magnetism

2016 — Johns Hopkins Applied Physics Laboratory (APL)
Summer Research Intern

- Performed electromagnetic simulations on metamaterial models for non-specular reflection of radiation in CST Microwave Studio

2015–2016 — Johns Hopkins University Department of Physics & Astronomy
Physics I Lab Learning Assistant

- Assisted students in Physics I laboratory course by explaining methods and answering technical questions

Honors & Awards

2020	National Science Foundation Graduate Research Fellow
2018	David T. Yue Memorial Award for Undergraduate Teaching
2016	Provost's Undergraduate Research Award

Computer Languages & Skills

Proficient in	Python (TensorFlow and PyTorch), MATLAB, LaTeX, Unix, Bash, Git
Exposure to	Julia, Java, SQL, Google Cloud Platform (GCP), Streamlit

Additional Activities

2024	AI in Healthcare Course at Harvard Medical School course design
2022, 2024	Learning from Time Series for Health (TS4H) NeurIPS workshop reviewer
2022, 2023	Machine Learning for Healthcare (ML4H) conference reviewer
2019-2020	MIT Graduate Hillel Student Board *President*
2018–2019	Harvard-MIT Health Sciences and Technology Joint Council *Representative to the MD Curriculum Committee*
2017-2018	Engineering Educational Outreach, Barclay Middle School, Baltimore, MD *Student Leader*

Publications

2023	Daphne Schlesinger, Ridwan Alam, Roey Ringel, Eugene Pomerantsev, Srikanth Devireddy, Pinak Shah, Joseph Garasic, and Collin M Stultz. Artificial intelligence for outpatient hemodynamic monitoring with a wearable ECG monitor. *Submitted*, 2023
2023	Aniruddh Raghu, Daphne Schlesinger, Eugene Pomerantsev, Srikanth Devireddy, Pinak Shah, Joseph Garasic, John Guttag, and Collin M Stultz. ECG-guided non-invasive estimation of pulmonary congestion in patients with heart failure. *Scientific Reports*, 13(1):3923, 2023
2022	Daphne E Schlesinger, Nathaniel Diamant, Aniruddh Raghu, Erik Reinertsen, Katherine Young, Puneet Batra, Eugene Pomerantsev, and Collin M Stultz. A deep learning model for inferring elevated pulmonary capillary wedge pressures from the 12-lead electrocardiogram. *JACC: Advances*, 1(1):100003, 2022
2020	Daphne E Schlesinger and Collin M Stultz. Deep learning for cardiovascular risk stratification. *Current Treatment Options in Cardiovascular Medicine*, 22(8):1–14, 2020
2018	Qiongyu Guo, Corey J Bishop, Randall A Meyer, David R Wilson, Lauren Olasov, Daphne E Schlesinger, Patrick T Mather, James B Spicer, Jennifer H Elisseeff, and Jordan J Green. Entanglement-based thermoplastic shape memory polymeric particles with photothermal actuation for biomedical applications. *ACS applied materials & interfaces*, 10(16):13333–13341, 2018

Poster Presentations

2022 MIT Jameel Clinic AI Cures Conference
RHCNet: A deep learning model for inferring elevated pulmonary capillary wedge pressures from the 12-lead electrocardiogram
DE Schlesinger, N Diamant, A Raghu, E Reinertsen, K Young, P Batra, E Pomerantsev, CM Stultz

2022 American College of Cardiology Scientific Session
A deep learning model for inferring elevated pulmonary capillary wedge pressures from the 12-lead electrocardiogram
DE Schlesinger, N Diamant, A Raghu, E Reinertsen, K Young, P Batra, E Pomerantsev, CM Stultz

2018 BMES Annual Meeting
Computational Modeling of Valve Behavior in Hydrocephalus Shunts
DE Schlesinger, R Najmi, V Ayyappan, D Navarro, W Zhao, H Wiegand, S Hemmati, A Kleine, C Heier, M Luciano, A Manbachi

2018 BMES Annual Meeting
Experimental Characterization of Valve Behavior in Hydrocephalus Shunts
DE Schlesinger, R Najmi, V Ayyappan, D Navarro, W Zhao, H Wiegand, S Hemmati, A Kleine, C Heier, M Luciano, A Manbachi

2017 Tissue Engineering & Regenerative Medicine Annual Conference
Entanglement-based thermoplastic shape memory polymeric particles with photothermal actuation for biomedical applications
DE Schlesinger, Q Guo, CJ Bishop, RA Meyer, DP Wilson, L Olasov, JB Spicer, JH Elisseeff, JJ Green

2017 IDIES Annual Symposium
Big Data Approaches to Cancer Immunotherapy
DE Schlesinger, T Cotrell, P Nguyen, S Berry, B Green, N Giraldo, JM Taube, A Szalay

2016 International Nanomedicine & Drug Delivery Symposium
Polymer microneedles for advanced transdermal drug delivery
DE Schlesinger, RA Meyer, JJ Green

Patents

2023 Submitted: *Method and Apparatus for Inferring Elevated Pulmonary Capillary Wedge Pressures from Single-Lead Electrocardiogram Telemetry Data*
DE Schlesinger, R Alam, CM Stultz