Nicole Chiou

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Academic history

Ph.D. Student in Computer Science   Sep. 2022 – Present
Stanford University, Stanford, CA
Cumulative GPA: 4.02/4.00

Master of Science in Robotics   May 2020 – May 2021
University of Pennsylvania, Philadelphia, PA
Cumulative GPA: 4.00/4.00
Thesis: Cross-Domain Transfer Learning with Auxiliary Task Selection for Cardiac Arrhythmia Classification
Advisors: Dr. Rahul Mangharam and Dr. Eric Eaton

Bachelor of Science in Bioengineeing, Minor in Computer Science   Aug. 2016 – May 2020
University of Pennsylvania, Philadelphia, PA
Cumulative GPA: 3.51/4.00, *Last two years GPA:* 3.92/4.00

Research interests

Causal inference, distribution shift, measurement error, data-centric approaches, trustworthy machine learning, fairness, applications in medicine and healthcare.

Relevant coursework

Foundations of Causal Machine Learning, Transfer Learning, Algorithmic Fairness, Machine Learning.

Research experience

Machine Learning Research Assistant, STAIR Lab   May 2022 – Present
Advisor: Dr. Sanmi Koyejo, Department of Computer Science
Stanford University

- Developing dataset sub-selection heuristics for multi-source domain accumulation (data addition) settings. Adapting a causal modeling perspective to characterize and quantify distribution shifts between source domains and an observed target domain.
- Establishing self-supervised distillation methods that leverage synthetic data to train LM-as-judge models to assess whether LM-generated medical texts are factually consistent with inputs. Designing automated risk categorization metrics to enable the evaluation of LMs in making deployment safety decisions.
- Defining mechanisms to combine DSPy-based prompt optimization with a counterfactual-based prompting strategy to simulate varying covariates of health equity. Quantifying model bias and potential downstream harms of medical chatbots.
- Operationalizing the evaluation of fairness in multi-stage decision-making pipelines. Decomposing LM-as-judge pipelines into auditable components (e.g., validator, generator). Determining necessary and sufficient conditions to bridge the gap between the global fairness objective and local fairness in intermediate stages of the pipeline.
- Investigating the role of standard risk scoring measures in health outcome inequalities using causal mediation analysis to quantify unexplained inequalities that persist even after equalizing for environmental and procedural variables.

Machine Learning Research Assistant, KoyejoLab   Aug. 2021 – May 2022
Advisor: Dr. Sanmi Koyejo, Department of Computer Science
University of Illinois Urbana-Champaign

- Developed generalizable machine learning algorithms for brain-computer interfaces (BCI) robust to temporal data distribution shifts and non-homogeneity among subjects.
- Proposed subject-specific model training and data subset selection methods to address distribution shifts induced by different sensor configurations.

Machine Learning Research Assistant, mLAB   Jan. 2020 – Aug. 2021
Advisor: Dr. Rahul Mangharam, Departments of Electrical Engineering and Computer Science
University of Pennsylvania

- Performed patient-specific optimization of implantable cardioverter-defibrillator (ICD) algorithms using data-driven methods and gradient-free optimization of parametric methods.

- Designed generative modeling-based approaches for domain adaptation, deriving and incorporating a latent context embedding from each patient's normal rhythm to address the challenge of limited patient-specific data.
- Established a neural network-based discriminator for cardiac arrhythmias using transfer learning and multi-task learning to leverage learned representations from electrocardiogram (ECG) data, improving classification performance on class-imbalanced patient-specific electrogram (EGM) data.
- Developed a multi-task learning objective and a technique for auxiliary task selection for hierarchical and class-imbalanced data.

WORK EXPERIENCE

Google Student Researcher, Ph.D., Google Research, Responsible AI   May 2023 – Nov. 2023
Dr. Mercy Asiedu and Dr. Katherine Heller

- Developed deep learning methods to reduce the subjectivity of predicting fetal hypoxia from visual cardiotocography (CTG) interpretation.
- Analyzed the effect of (a) the choice of objective vs. subjective ground truth labels and (b) temporal distribution shift on predictive performance.
- Proposed end-to-end preprocessing, data augmentation, and statistical evaluation methods to overcome challenges with the limited dataset size.

Google Student Researcher, Ph.D., Google Brain (now Google DeepMind)   May 2022 – Nov. 2022

- Estimated the optimal target predictor in an unsupervised domain adaptation setting, where the source differs from the target due to a shift in the distribution of the latent subgroup.
- Showed that causally-informed latent variable models can estimate the distribution of the latent subgroup variable with the help of concept and proxy variables available in the source domain.
- Evaluated the approach on a medical classification task with demographic subpopulation shift.

Bio1 Systems, San Carlos, California   May 2021 – Oct. 2021
Machine Learning Consultant, Software

- Phase II proposal contributor for the Army Applied SBIR Program; selected for funding in October 2021.
- Developed an ML clinical decision support tool that combines raw sensor and EHR data to provide medical alerts.
- Designed recurrent neural network (RNN) approaches to detect exposure to a chemical or biological agent-based on heart rate data obtained from wearable devices and predict the mortality risk for affected patients based on dynamic vital sign data and cross-sectional EHR data.
- Established an end-to-end training framework, from data integration and cleaning to evaluation and on-device deployment.

TEACHING EXPERIENCE

Applied Machine Learning (CS 441), taught by Dr. Marco Morales	Fall 2021
Artificial Intelligence (CIS 521), taught by Dr. Chris Callison-Burch	Summer 2021
Computing Systems (CIT 593), taught by Dr. Thomas Farmer	Summer 2020
Biological Data Science (ENM 375), taught by Dr. Jennifer Cremins	Spring 2019

MEMBERSHIPS

Women in Machine Learning (WiML), Mentor	2022 – Present
Penn Engineering Master's Advisory Board (EMAB), Robotics representative	2020 – 2021
Women in Computer Science (WiCS), Mentor	2018 – 2021

HONORS & AWARDS

HAI-HPI Research Fellow, Human-Centered AI	Jan. 2024 – Present
Outstanding Teaching Assistant Award, Computing Systems	Aug. 2020
Bioengineering Senior Design Award, relieVR Bioreponsive Virtual Reality	May 2020
2nd Place Johns Hopkins International Healthcare Design Competition (200+ teams), relieVR	Apr. 2020
Penn Berkman Innovation Prize Winner, relieVR	Oct. 2019

Publications

∗ denotes equal contribution. α-β denotes alphabetical order.

Are Domain Generalization Benchmarks with Accuracy on the Line Misspecified?
Olawale Salaudeen, **Nicole Chiou***, Shiny Weng*, Sanmi Koyejo.
*Transactions on Machine Learning Research (**TMLR**), 2025.* Featured in Stanford HAI News. Awarded a TMLR Journal-to-Conference Certification.

On Domain Generalization Datasets as Proxy Benchmarks for Causal Representation Learning
Olawale Salaudeen, **Nicole Chiou**, Sanmi Koyejo.
*NeurIPS Causal Representation Learning Workshop (**oral**), 2024.*

Development and Evaluation of Deep Learning Models for Cardiotocography Interpretation
Nicole Chiou, Nichole Young-Lin, Christopher Kelly, Julie Cattiau, Tiya Tiyasirichokchai, Abdoulaye Diack, Sanmi Koyejo, Katherine Heller, Mercy Asiedu.
npj Women's Health, 2025.

Bridging Gaps in Automated Acute Myocardial Infarction Detection between High-income and Low-income Countries
Nicole Chiou, Sanmi Koyejo, Christine Ngaruiya.
PLOS Global Public Health, 2024.

Proxy Methods for Domain Adaptation
Katherine Tsai, Stephen R Pfohl, Olawale Salaudeen, **Nicole Chiou**, Matt Kusner, Alexander D'Amour, Sanmi Koyejo, Arthur Gretton.
*International Conference on Artificial Intelligence and Statistics (**AISTATS**), 2024.*

Adapting to Latent Subgroup Shifts via Concepts and Proxies
α-β. Ibrahim Alabdulmohsin*, **Nicole Chiou***, Alexander D'Amour*, Arthur Gretton*, Sanmi Koyejo*, Matt Kusner, Stephen Pfohl*, Olawale Salaudeen*, Jessica Schrouff*, Katherine Tsai*.
*The International Conference on Artificial Intelligence and Statistics (**AISTATS**), 2023.*

Single-Trial Detection and Classification of Event-Related Optical Signals for a Brain–Computer Interface Application
Nicole Chiou, Mehmet Günal, Sanmi Koyejo, David Perpetuini, Antonio Maria Chiarelli, Kathy A Low, Monica Fabiani, Gabriele Gratton.
Bioengineering, 2024.

Fast Optical Signals for Real-Time Retinotopy and Brain Computer Interface
David Perpetuini, Mehmet Günal, **Nicole Chiou**, Sanmi Koyejo, Kyle Mathewson, Kathy A Low, Monica Fabiani, Gabriele Gratton, Antonio Maria Chiarelli.
Bioengineering, 2023.

Cross-Domain Transfer Learning with Auxiliary Task Selection for Cardiac Arrhythmia Classification
Nicole Chiou, Eric Eaton, Rahul Mangharam.
University of Pennsylvania, 2021.

Works in progress

MedVAL: Toward Expert-Level Medical Text Validation with Language Models
Asad Aali, Vasiliki Bikia, Maya Varma, **Nicole Chiou**, Sophie Ostmeier, Arnav Singhvi, Magdalini Paschali, Ashwin Kumar, Andrew Johnston, Karimar Amador-Martinez, Eduardo Juan Perez Guerrero, Paola Naovi Cruz Rivera, Sergios Gatidis, Christian Bluethgen, Eduardo Pontes Reis, Eddy D Zandee van Rilland, Poonam Laxmappa Hosamani, Kevin R Keet, Minjoung Go, Evelyn Ling, David B Larson, Curtis Langlotz, Roxana Daneshjou, Jason Hom, Sanmi Koyejo, Emily Alsentzer, Akshay S Chaudhari.
In submission, 2025. arXiv PDF.

Technical Skills

Languages: Python, Java, MATLAB, C/C++, C#

Libraries: JAX, PyTorch, NumPy/SciPy, Pandas, Matplotlib, Keras, Ax, OpenAI, OpenCV

Developer Tools: Git, VS Code, Visual Studio

Other: machine learning, LLM, representation learning, causal inference, time-series analysis, LaTeX, Linux

Referees

Dr. Sanmi Koyejo, Assistant Professor of CS
Stanford University
(217) 300-4907, sanmi@cs.stanford.edu

Dr. Eric Eaton, Research Associate Professor of CS
University of Pennsylvania
(215) 746-1734, eeaton@seas.upenn.edu

Dr. Rahul Mangharam, Associate Professor of EECS
University of Pennsylvnia
(215) 573-3636, rahulm@seas.upenn.edu

Dr. David Meaney, Senior Associate Dean
University of Pennsylvnia
(215) 573-3155, dmeaney@seas.upenn.edu

Other interests

Hair stylist/colorist for the bold, unadventurous, and everyone in between. Obstacle course race athlete, dancer when nobody is watching, and towel animal extraordinaire. Baroque Ensemble harpsichordist and cellist. Piano soloist at Carnegie Hall who knows all the lyrics to *The Phantom of the Opera* by heart.