Natalie Dullerud

natalie.dullerud@stanford.edu | natalie-dullerud | ndullerud | ndullerud.github.io

Education

Ph.D. in Computer Science 2022-present
Stanford University, Stanford, CA, USA

M.Sc. in Computer Science 2020-2022
University of Toronto, Toronto, ON, Canada
Supervisors: Dr. Marzyeh Ghassemi, Dr. Nicolas Papernot
Overall GPA: 3.93/4.00

B.S. in Mathematics, Minors in Computer Science, Chemistry 2016-2020
University of Southern California, Los Angeles, CA, USA
Overall GPA: 3.76/4.00

Experience

Graduate Differential Privacy Summer Intern 2022
Societal Resilience Group, Microsoft Research, Redmond, WA, USA
Supervisors: Dr. Darren Edge, Dr. Ha Trinh

- Methodological development and theoretical privacy analysis for private federated data analysis
- Facilitated data sharing and downstream learning on private federated data between Societal Resilience group partners

Graduate Machine Learning Summer Intern 2021
Algorithms Group, Microsoft Research, Redmond, WA, USA
Supervisor: Dr. Sergey Yekhanin

- Experimental development for differentially private methods in deep learning
- Leveraged dimensionality reduction in gradient space to reduce privacy-utility trade-offs introduced by DPSGD in deep learning

Graduate Student Researcher (Machine Learning) 2020-present
Vector Institute for Artificial Intelligence, Toronto, ON, Canada

- Machine learning research pertaining to differential privacy, algorithmic fairness & inequity, and applications to healthcare settings

Computational Immunology (Machine Learning) Research Intern 2019-2020
City of Hope Cancer Research Center, Duarte, CA, USA & Caltech, Pasadena, CA, USA
Supervisor: Dr. Vanessa Jonsson

- Developed computational pipeline for constraining and optimizing over viral antibody design space
- Designed dynamical systems model for modeling cellular immunotherapy treatment and presented solution for optimal immunotherapy scheduling to address solid tumor heterogeneity
- Analyzed single-cell RNA sequencing time series data using machine learning methods to assess immunological response in patients undergoing clinical trials for immunotherapy

Computational Biology (Machine Learning) Research Intern 2018-2020
University of Southern California Department of Computational Biology, Los Angeles, CA, USA
Supervisor: Dr. Liang Chen

- Combined graph theory and probabilistic techniques in order to develop method for identification of sub-populations of human and murine cells from single-cell RNA sequencing data

Bioinformatics Research Intern 2017-2018
University of Southern California Keck School of Medicine, Los Angeles, CA, USA
Supervisor: Dr. Paul Thomas

- Integration of multiple protein databases; large-scale sorting, classification and phylogenetic analysis of transcription factor data

Honors

Junior Fellow 2020-2021
Massey College, University of Toronto, Toronto, ON, Canada

Presidential Scholar 2016-2020
University of Southern California, Los Angeles, CA, USA

National Merit Scholar 2016-2020
University of Southern California, Los Angeles, CA, USA

Team Honorable Mention 2015
National Toshiba Exploravision Technology Competition, USA

Publications

Dullerud, N.*, Shamsabadi, A. S.*, Yaghini, M.*, Wyllie, S., Aïvodji, U., Alaagib, A., Gambs, S., Papernot, N. (2022) Washing The Unwashable: On the (Im)possibility of Fairwashing Detection. *Proceedings of the 36th Conference on Neural Information Processing Systems*.

Dullerud, N., Roth, K., Hamidieh, K., Papernot, N., Ghassemi, M. (2022). Is Fairness Only Metric Deep? Evaluating and Addressing Subgroup Gaps in Deep Metric Learning. *Proceedings of the 10th International Conference on Learning Representations.*

** Banerjee, I., Bhimireddy, A. R., Burns, J. L., Celi, L. A., Chen, L., Correa, R., **Dullerud, N.**, Ghassemi, M., Gichoya, J.W., Huang, S., Kuo, P., Lungren, M. P., Price, B. J., Purkayastha, S., Pyrros, A. A., Oakden-Rayner, L., Okechukwu, C., Seyyed-Kalantari, L., Trivedi, H., Wang, R., Zaiman, Z., Zhang, H. Reading Race: AI Recognizes Patient's Racial Identity In Medical Images. [In Review *New England Journal of Medicine 2021*]

Zhang, H., **Dullerud, N.**, Seyyed-Kalantari, L., Morris, Q., Joshi, S., Ghassemi, M. (2021). An Empirical Framework for Domain Generalization in Clinical Settings. *Proceedings of the 2nd ACM Conference on Health, Inference, and Learning*.

Jia, H.*, Yaghini, M.*, Choquette-Choo, C.A.†, **Dullerud, N.**†, Thudi, A.†, Chandrasekaran, V., Papernot, N. (2021). Proof-of-Learning: Definitions and Practice. *Proceedings of the 42nd IEEE Symposium on Security and Privacy*.

Cheng, V., Suriyakumar, V., **Dullerud, N.**, Joshi, S., Ghassemi, M. (2021). Can You Fake It Until You Make It?: Impacts of Differentially Private Synthetic Data on Downstream Classification Fairness. *Proceedings of the 4th ACM Fairness, Accountability, and Transparency Conference*.

Choquette-Choo, C.A.*, **Dullerud, N.***, Dziedzic, A.*, Zhang, Y.*, Jha, S., Wang, X., Papernot, N. (2021). CaPC Learning: Confidential and Private Collaborative Learning. *Proceedings of the 9th International Conference on Learning Representations*.

Dullerud, N., Freedman-Susskind, T., Gnanapragasam, P., Snow, C., West, A.P., and Jonsson, V.D. (2020). Feature selection and combinatorial optimization on fitness landscapes to constrain anti-SARS-CoV2 antibody design and address viral escape. *LMRL Workshop at the 34th Neural Information Processing Systems Conference.*

Dullerud, N., Jonsson, V.D. (2020). Cellular Immunotherapy Treatment Scheduling to Address Antigen Escape. *Proceedings of the 59th IEEE Conference on Decision and Control.*

Jonsson, V.D., Ng, R., **Dullerud, N.**, Wong, R.A., Hibbard, J., Wang, D., Aguilar, B., Starr, R., Weng, L., Alizadeh, D., Forman, S., Badie, B., Brown, C.E. (2021). CAR T cell therapy drives endogenous locoregional T cell dynamics in a responding patient in glioblastoma. [In Review *Nature Medicine* 2021]

*,† Equal contribution, authors listed alphabetically
** All authors listed alphabetically

Invited Presentations

CaPC—Confidential and Private Collaborative Learning, *Intelligence Cooperation Group*, *Foresight Institute*, Virtual, 2023

Fairness in representation learning: A study in evaluation and mitigation of bias via subgroup disparities in deep metric learning, *Seminar*, *Stanford MedAI Club*, Virtual, 2022

CaPC—Confidential and Private Collaborative Learning, *AI Superstream Series: Securing AI, O'Reilly Media Sponsored by Intel*, Virtual, 2021

Proof of Learning: Definitions and Practice, *Endless Summer School Seminar: AI Model Governance, Vector Institute*, Toronto, CA, 2021

Reading Race: AI Recognises Patient's Racial Identity In Medical Images, *Workshop Seminar, Ethical Principles of AI Club, Engineering Society*, *University of Toronto*, Toronto, CA, 2021

Computer Languages / Skills

Programming Languages	Python, Java, C/C++, R, MATLAB, Swift
Web Development/Database Languages	HTML/CSS, SQL, Firebase, RealmSwift
ML Packages	Pytorch, Tensorflow, Keras, sklearn

Mentoring Experience

Undergraduate Research Mentor 2021
University of Toronto, Toronto, ON
Mentee: Aditi Misra; Co-mentor: Dr. Nicolas Papernot

Undergraduate Research Mentor 2021
University of Toronto, Toronto, ON
Mentee: Sierra Wyllie; Co-mentor: Dr. Nicolas Papernot

Summer Undergraduate Research Fund (SURF) Mentor 2020
California Institute of Technology, Pasadena, CA
Mentee: Tea Freedman-Susskind; Co-mentor: Dr. Vanessa Jonsson

Teaching Experience

Enriched Theory of Computation (CSC240) Teaching Assistant 2021
University of Toronto, Toronto, ON, Canada
Supervisor: Dr. Faith Ellen

Theory of Computation (CSC236) Teaching Assistant 2020
University of Toronto, Toronto, ON, Canada
Supervisors: Dr. Francois Pitt, Dr. Bahar Aameri

Mathematics Center Tutor Assistant 2018-2020
University of Southern California, Los Angeles, CA, USA
Supervisors: Chaunte Williams, Dr. Cymra Haskell

Reviewer Experience

Reviewer for *Conference on Health, Inference and Learning 2022* 2022

External Reviewer for *International Conference on Machine Learning 2021* 2021
External Reviewer (First Round) for *IEEE Symposium on Security and Privacy 2021* 2021
External Reviewer (Second Round) for *IEEE Symposium on Security and Privacy 2021* 2021

Thesis Projects

Is Fairness Only Metric Deep? (Thesis for Master's of Science) 2022
University of Toronto, Toronto, ON, Canada
Supervisors: Dr. Marzyeh Ghassemi, Dr. Nicolas Papernot

SURF Global Health and Infectious Diseases – Maternal Mortality in Sierra Leone 2018
University of Oxford, Oxford, Oxon, UK & University of Southern California, Los Angeles, CA, USA
Supervisor: Dr. Erin Quinn