Scott L. Fleming

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EDUCATION

Stanford University, Stanford CA
M.S. Computer Science, Specialization in Artificial Intelligence (Expected 12/2023).
Ph.D. Biomedical Data Science (Expected 12/2023).
Advisors: Nigam Shah, Emma Brunskill

Stanford University, Stanford CA
B.S. Mathematical and Computational Science
with Departmental Honors (Highest) and University Distinction (Highest), 2017.

INTERESTS

Machine Learning, Healthcare, Distributional Shifts, Causal Inference, AI Safety

EXPERIENCE

Graduate Student Researcher, Stanford University **2019 - Present**
Developing machine learning methods for healthcare applications as part of the Stanford Statistical Machine Learning group and the Shah Lab. Projects include natural language processing for understanding effective strategies in talk therapy, weak supervision for annotating medical text, reinforcement learning for optimizing treatment plans in the ICU, and developing clinical prediction models that are robust to temporal data drift. Supervised by Dr. Emma Brunskill and Dr. Nigam Shah.

Machine Learning Resarch Intern, Apple Inc. **Summer 2021**
Developed novel methods for analyzing large datasets as part of Apple's Health AI team. Supervised by Dr. Nicholas Foti, Dr. Joseph Futoma, and Dr. Sean Jewell.

Teaching Assistant, Stanford University **2019 - 2020**
Assisted in curriculum development, course administration, and teaching for "CS 270: Modeling Biomedical Systems: Ontology, Terminology, Problem Solving".

Graduate Student Researcher, Stanford Medicine **Summer 2018**
Designed a rater-adaptive machine learning method for crowdsourced annotations that enables rapid and accurate diagnosis of autism spectrum disorder online. Supervised by Dr. Dennis Wall.

Graduate Student Researcher, Stanford Medicine **2017 - 2018**
Developed machine learning pipelines in Python and R to analyze functional magnetic resonance imaging (fMRI) data and discover patterns of brain activity that contribute to anxiety and depression. Supervised by Dr. Leanne Williams.

JOURNAL ARTICLES

Steven Yadlowsky*, **Scott Fleming***, Nigam Shah, Emma Brunskill, Stefan Wager. Evaluating Treatment Prioritization Rules via Rank-Weighted Average Treatment Effects. *Under review.*

HyunJi Nam*, **Scott Fleming***, Emma Brunskill. Reinforcement Learning with State Observation Costs in Action-Contingent Noiselessly Observable Markov Decision Processes. *Advances in Neural Information Processing Systems (NeurIPS)*, 2021.

Scott Fleming*, Kelly McFarlane*, Isha Thapa*, Andrea Johnson, Jenna Kruger, Andrew Shin, David Scheinker, Lane Donnelly. Performance of a Commonly Used Pressure Injury Risk Model under Changing Incidence. *The Joint Commission Journal on Quality and Patient Safety*, 2021.

Lin Lawrence Guo, Stephen Pfohl, Jason Fries, Jose Posada, **Scott Fleming**, Catherine Aftandilian, Nigam Shah, Lillian Sung. Systematic Review of Approaches to Preserve Machine Learning Performance in the Presence of Temporal Dataset Shift in Clinical Medicine. *Applied Clinical Informatics*, 2021.

Jason Fries, Ethan Steinberg, Saelig Khattar, **Scott Fleming**, Jose Posada, Alison Callahan, Nigam Shah. Ontology-driven weak supervision for clinical entity classification in electronic health records. *Nature Communications*, 2021.

Kevin Thomas, Lukasz Kidzinski, Eni Halilaj, **Scott Fleming**, Guhan Venkataraman, Edwin Oei, Garry Gold, Scott Delp. Automated Classification of Knee X-rays Using Deep Neural Networks Outperforms Radiologist. *Radiology: Artificial Intelligence*, 2020.

Adina Fischer*, Bailey Holt-Gosselin*, **Scott Fleming***, Laura Hack, Tali Ball, Alan Schatzberg, Leanne Williams. Intrinsic reward circuit connectivity profiles underlying symptom and quality of life outcomes following antidepressant medication: a report from the iSPOT-D trial. *Neuropsychopharmacology*, 2021.

Leonardo Tozzi, **Scott Fleming**, Zachary Taylor, Cooper Raterink, Leanne Williams. Short-term test-retest reliability of the human intrinsic functional connectome. *Network Neuroscience*, 2020.

Andrea Goldstein-Piekarski*, Tali Ball*, Zoe Samara†, Brooke Staveland†, Arielle Keller†, **Scott Fleming**†, Katherine Grisanzio†, Bailey Holt-Gosselin†, Patrick Stetz†, Jun Ma†, Leanne Williams. Mapping Neural Circuit Biotypes to Symptoms and Behavioral Dimensions of Depression and Anxiety. *Biological Psychiatry*, 2020.

Adam Miner*, Albert Haque*, Jason Fries, **Scott Fleming**, Denise Wilfley, Terence Wilson, Arnold Milstein, Dan Jurafsky, Bruce Arnow, Stewart Agras, Li Fei-Fei, Nigam Shah. Assessing the Accuracy of Automatic Speech Recognition for Psychotherapy. *npj Digital Medicine*, 2020.

Qandeel Tariq*, **Scott Fleming***, Jessey Schwartz, Kaitlyn Dunlap, Conor Corbin, Peter Washington, Haik Kalantarian, Naila Khan, Gary Darmstadt, Dennis Wall. Detecting Developmental Delay and Autism Through Machine Learning Models Using Home Videos of Bangladeshi Children: Development and Validation Study. *Journal of Medical Internet Research*, 2019.

PRESENTATIONS / POSTERS

Scott Fleming, Kuhan Jeyapragasan, Tony Duan, Daisy Ding, Saurabh Gombar, Nigam Shah, Emma Brunskill. Missingness as Stability: Understanding the Structure of Missingness in Longitudinal EHR data and its Impact on Reinforcement Learning in Healthcare. *NeurIPS ML for Health (ML4H) Workshop*, 2019.

Daisy Ding*, Tony Duan*, **Scott Fleming***, Saurabh Gombar, Kenneth Jung, Nigam Shah (September, 2019). Anti-Xa or aPTT? Using Off-Policy Reinforcement Learning to understand the implications of optimizing for one assay over another while titrating heparin dosages in the ICU. **Spotlight Oral Presentation** (**top 2 submissions** in topic, "AI to Improve step-by-step clinical pathways used to apply

treatments"). *Frontiers of AI-Assisted Care Scientific Symposium.*

Scott Fleming*, Shaimaa Bakr*, Nandita Bhaskhar*, Daniel Rubin, Leanne Williams (2019, June). Characterizing a New Taxonomy of Mental Disorders from Natural Language on Reddit, a Social Media Platform. *Stanford Psychiatry Grand Grounds.*

Nandita Bhaskhar, **Scott Fleming**, Imon Bannerjee, Leanne Williams, Rebecca Bernert, Daniel Rubin (2019, May). Advancing Suicide Risk Detection: Establishing Digital Phenotypes using Artificial Intelligence. Poster, *Big Data in Precision Health Conference.*

Leonardo Tozzi, **Scott Fleming**, Cooper Raterink, Zachary Taylor, Leanne Williams (2019, June). Counts of Small Subgraphs Within the Resting Functional Connectome are Parsimonious, Stable and Individualized Features in Healthy as Well as Disordered Mood. Poster, *Society of Biological Psychiatry.* Poster, *Organization of Human Brain Mapping.* Abstract Published in *Biological Psychiatry*, June 2019.

Yosef Berlow, Katherine Grizansio, **Scott Fleming**, Abdullah Ahmed, Emily Aiken, Linda Carpenter, Noah Philip (2018, December). Symptom Profile Subtypes Predict Treatment Response to 5 Hz rTMS in MDD and Co-Morbid PTSD. Poster, *American College of Neuropsychopharmacology (ACNP)* 57^{th} *Annual Meeting.*

Scott Fleming*, Qandeel Tariq*, Michael Du, Kaiti Dunlap, Jessey Schwartz, Naila Khan, Gary Darmstadt, Dennis Wall (2018, November). An Ensemble Learning Method for Early Detection of Autism and Other Developmental Delays using Crowd-sourced Video Annotations. **Spotlight Oral (top 20% of submissions)** at the *Maternal and Child Health Research Institute Symposium.* Poster, **3rd place for most exciting application**, at the *Biomedical Informatics Retreat.*

Scott Fleming, John Leikauf, Matthew Sacchet, Russell Poldrack (2018, May). A Data-Driven Characterization of Neuropsychiatric Disorders using Measures of Attention, Working Memory, and Response Inhibition. Poster, *Big Data in Precision Health Conference.*

SELECTED HONORS

National Defense Science and Engineering Graduate Fellowship (2019)
Awarded to top 200 science and engineering doctoral students across the country.

Stanford Graduate Fellowship, Stanford University, Stanford CA (2018)
Awarded to top 100 incoming Stanford doctoral students in science and engineering.

University Distinction, Stanford University, Stanford CA (2017)
Awarded to top 15% of graduating class based on cumulative grade point averages.

Phi Beta Kappa, Stanford University, Stanford CA (2017)
For excellence and breadth of undergraduate scholarly accomplishments. Awarded to top 10% of the graduating class, with additional breadth of study requirements.

Departmental Honors, Stanford University, Stanford CA (2017)
For intensive research and coursework beyond the major requirements.

Bio-X Undergraduate Summer Research Program, Stanford CA (2016)
Competitive research grant awarded to top research proposals. Included three months of intensive study and research with select Stanford University faculty.

Dean's List, College of Life Sciences, BYU, Provo UT (2015)
Awarded to top 5% of the college.

Garth L. Lee Undergraduate Teaching Award, BYU, Provo UT (2015)
Awarded for excellent instructional work as an undergraduate teaching assistant.

RELEVANT COURSEWORK

CS 230: Deep Learning
CS 224N: Natural Language Processing with Deep Learning
CS 234: Reinforcement Learning
CS 221: Artificial Intelligence: Principles and Techniques
CS 229: Machine Learning
CS 238: Decision Making under Uncertainty
CS 228: Probabilistic Graphical Models: Principles and Techniques
CS 224W: Machine Learning with Graphs
CS 231N: Convolutional Neural Networks for Visual Recognition
CS 236: Deep Generative Models
CS 329D: Machine Learning under Distribution Shifts
STATS 315B: Modern Applied Statistics: Data Mining
STATS 202: Data Mining and Analysis
STATS 200: Introduction to Statistical Inference
STATS 214: Machine Learning Theory
ECON 293: Machine Learning and Causal Inference
EE 364A: Convex Optimization I
BIOMEDIN 215: Data Driven Medicine

SKILLS

Software
Python (PyTorch, TensorFlow, Pandas, NumPy, Matplotlib), R, C, SQL

Languages
English (native), Portuguese (intermediate)

SERVICE

Reviewer **2018-Present**

International Conference on Machine Learning (ICML)	2020
Advances in Neural Information Processing Systems (NeurIPS)	2021
International Conference on Learning Representations (ICLR)	2022
Journal of Medical Internet Research	2020-2022

Workshop Organizer, NeurIPS ML4H **2018-2021**
Organizer and Program Committee Member. Designed virtual experience and peer reviewed submissions for NeurIPS Machine Learning for Health workshop.

Student Representative, Biomedical Informatics Training Program **2020-2021**
Elected student leader of Stanford's Biomedical Informatics Training Program for MS and PhD students within the Department of Biomedical Data Science. Worked closely with department faculty and staff to coordinate recruitment, admissions, curriculum, department seminars, and strategic planning. Reported to the department's Executive Committee.

Student Representative, Diversity, Equity, and Inclusion Committee **2020-2021**
Led student efforts within the Department of Biomedical Data Science (DBDS) to improve diversity, equity, and inclusion (DEI). Coordinated with the DBDS Faculty DEI Committee as a student liaison. Spearheaded DEI town halls, student onboarding and mentoring, changes to admissions, and other DEI-related programming.