

# Samuel G. Finlayson

## Curriculum Vitae

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### Education

- 2014–present **Harvard Medical School and Massachusetts Institute of Technology, Cambridge, MA,**  
MD, PhD (expected).  
Harvard-MIT Division of Health Sciences and Technology (MD)  
Harvard Department of Systems, Synthetic, and Quantitative Biology (PhD)  
PhD Advisors: Isaac Kohane (HMS DBMI) and Peter Szolovits (MIT CSAIL)
- 2012–2014 **Stanford University, Stanford, CA,**  
Master of Science.  
Biomedical Informatics
- 2007–2013 **Stanford University, Stanford, CA,**  
Bachelor of Arts.  
Human Biology (Specialization: Biomedical Computation)

### Research Positions

- 2016–Present **Isaac Kohane Lab, Harvard Department of Biomedical Informatics, Boston, MA.**  
**Clinical Decision Making Group, MIT Computer Science & Artificial Intelligence Laboratory,**  
Cambridge, MA.  
PhD Student. Designing, implementing, and analyzing machine learning algorithms for use in biomedicine. Applications areas include medical imaging, medical text, EHR and claims data, genomics, and drug development.
- 2013–2014 **Nigam Shah Lab of Clinical Informatics, Stanford University, Stanford, CA.**  
Research Assistant. Analyzed millions of electronic medical records, including clinical text, for temporal associations between drugs, diseases, devices, and procedures. Applications included off-label drug use profiling, adverse drug event detection, and comparative effectiveness research. Supervisor: Dr. Paea LePendur
- 2013–2014 **Daniel Rubin Lab of Imaging Informatics, Stanford University, Stanford, CA.**  
Research Assistant. Designed and implemented the Melanoma Rapid Learning Utility (MRLU), a tool for interactive analysis of clinical and genetic data from the Stanford and Vanderbilt Cancer Centers.

### Journal Articles

- SG Finlayson**, J. D. Bowers, J. Ito, J. L. Zittrain, A. L. Beam, I. S. Kohane. Adversarial attacks on medical machine learning. *Science* **2019**, 363, 1287–1289.
- S. L. Lipnick, D. M. Agniel, R. Aggarwal, N. R. Makhortova, **SG Finlayson**, A. Brocato, N. Palmer, B. T. Darras, I. Kohane, L. L. Rubin. Systemic nature of spinal muscular atrophy revealed by studying insurance claims. *PloS one* **2019**, 14, e0213680.

T. Gurry, **HST Microbiome Consortium**, S. M. Gibbons, S. M. Kearney, A. Ananthakrishnan, X. Jiang, C. Duvallet, Z. Kassam, E. J. Alm, et al.. Predictability and persistence of prebiotic dietary supplementation in a healthy human cohort. *Scientific Reports* **2018**, 8, 12699.

X. Tu, M. Xie, J. Gao, Z. Ma, D. Chen, Q. Wang, **SG Finlayson**, Y. Ou, J.-Z. Cheng. Automatic Categorization and Scoring of Solid, Part-Solid and Non-Solid Pulmonary Nodules in CT Images with Convolutional Neural Network. *Scientific Reports* **2017**, 7.

**SG Finlayson**, M. Levy, S. Reddy, Rubin. Toward rapid learning in cancer treatment selection: an analytical engine for practice-based clinical data. *Journal of Biomedical Informatics* **2016**.

S. Tamang, M. Patel, D. Blayney, J. Kuznetsov, **SG Finlayson**, N. H. Shah. Detecting Unplanned Care from Unstructured Text in Electronic Health Records. *Journal of Oncology Practice* **2015**.

**SG Finlayson**, P. LePendur, N. H. Shah. Building the graph of medicine from millions of clinical narratives. *Scientific Data* **2014**, 1.

R. Harpaz, A. Callahan, S. Tamang, Y. Low, D. Odgers, **SG Finlayson**, K. Jung, P. LePendur, N. H. Shah. Text Mining for Adverse Drug Events: the Promise, Challenges, and State of the Art. *Drug Safety* **2014**, 37, 777–790.

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## Peer-Reviewed Workshop Papers

**SG Finlayson**, HK Lee, IS Kohane, L Oakden-Rayner Towards generative adversarial networks as a new paradigm for radiology education *Machine Learning for Health (NeurIPS Workshop)* 2018.

BK Beaulieu-Jones, W Yuan, **SG Finlayson**, Z Wu Privacy-Preserving Distributed Deep Learning for Clinical Data *Machine Learning for Health (NeurIPS Workshop)* 2018.

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## Preprints and Completed Manuscripts Under Review

**SG Finlayson**, MD McDermott, A Pickering, S Lipnick, W Yuan, IS Kohane Approaching Small Molecule Prioritization as a Cross-Modal Information Retrieval Task through Coordinated Representation Learning *In Submission* 2019.

**SG Finlayson**, IS Kohane, AL Beam Adversarial Attacks Against Medical Deep Learning *arXiv preprint arXiv:1804.05296* 2018.

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## Peer-Reviewed Conference Abstracts

Tamang S, **Finlayson S**, Chen X, Kuznetsov JL, Blayney D, Patel M, Shah NG. Assessing the true nature of unplanned cancer care. *Journal of Clinical Oncology (Meeting Abstracts)*, Boston, MA. 2014.

**Finlayson S**, Sochat V, Szabo L, Yancy L. A Rapid Learning System for Personalized Glioblastoma Treatment Planning. *AMIA Annual Symposium (Abstract, Focus Session Presentation)*, Washington, D.C.. 2013.

## Book Chapters

Pollard T, Dernoncourt F, **Finlayson S**, Velasquez A. "Data Preparation". *Secondary Analysis of Electronic Health Records*. Springer International Publishing, 2016. 101–114.

## Invited Presentations (Selected)

- 2019 "Robust machine learning for highly vulnerable patients", HMS Media Fellows Program, Harvard Medical School. September 10, 2019.
- 2019 "AI algorithm design: key considerations for real-world performance", Tutorial and Panel Discussion. AI Workshop, ARVO 2019. April 27, 2019.
- 2018 "Learning from large-scale Real World Evidence: Challenges and Opportunities", UCB Pharmaceuticals, Chief Executive and Chief Scientific Officer Briefing. October 1, 2018.
- 2018 "Adversarial Attacks and the Potential for Deep Harm to the Healthcare System", Presentation and Panel, NLM Informatics Training Conference 2018.

## Committee Membership

2013–Present Member, Research Advisory Committee, Hydrocephalus Association

## Journal Referee Activities

2018–Present Referee for: *New England Journal of Medicine*, *Journal of Biomedical Informatics*, *Pacific Symposium on Biocomputing*, *NeurIPS Machine Learning for Health Workshop*

## Teaching

- 2015 **Teaching Assistant**, *Harvard-MIT Health Sciences, and Technology*, Boston, MA.  
HST 190: Introduction to Biostatistics (Prof. Rebecca Betensky) and HST 015: Matlab for Medicine (Prof. Matthew Frosch).
- 2012–2013 **Teaching Assistant**, *Department of Computer Science*, Stanford University, Stanford, CA.  
CS 181: Ethics in computer science (Prof. Stephen Cooper) and CS 103: Mathematical Foundations of Computing (Profs. Ma and Colgrove).
- 2013 **Teaching Assistant**, *Department of Biology*, Stanford University, Stanford, CA.  
BIO 112/212 Human Physiology (Prof. Daniel Garza).
- 2012–2013 **Private Tutor**, *Mathematics, English, and Physics*.  
Tutored middle and high school students on a weekly basis.

## Honors

- 2014 Medical Scientist Training Program, NIH Predoctoral Fellowship
- 2011 Academic All-American Honors, NCAA Division I Men's Water Polo
- 2011 Mountain Pacific Sports Federation All-Academic Honors
- 2007–2008, 2010–2012 Thomas Ford Family Endowed Scholarship, Stanford University Athletic Department
- 2007–2012 National Scholar, Coca-Cola Scholars Foundation
- 2007 Finalist, National Merit Scholar

- 2007 California State Scholar-Athlete of the Year, California Interscholastic Sports Federation
- 2007 National Winner, Wendy's High School Heisman Award
- 2004 2<sup>nd</sup>, American Physiological Society, Intel International Science and Engineering Fair
- 2004 Eagle Scout with Gold Palm, Boy Scouts of America

## Industry Experience

### 2018–Present **Clinical Data Scientist and Deep Learning Engineer.**

Consulting scientist for pharmaceutical and information technology companies. Engagements ranging from short term (single sessions) to longer term (year+). Help formulate new strategies for using machine learning for clinical and biological data, implement statistical analyses, prototype deep learning systems, and present results to senior leadership and research teams.

## Volunteer Work

### 2008–Present **Co-Founder and Chief Scientific Officer, Team Hydro.**

Co-Founded non-profit organization to raise funds and awareness for Hydrocephalus research through open water swims throughout nation, including from Alcatraz Island to SF. Have raised more than \$700,000+ to date. Research, author, and produce informational materials and website articles for lay public. Develop and maintain relationships with sponsors, donors, researchers, and swimmers. [www.teamhydro.org](http://www.teamhydro.org)

### 2012–2014 **Program Director and Counselor, Camp Kesem, Stanford, CA.**

As program director (2014), developed, planned, and oversaw all camp activities for week-long, sleep-away program for 140+ children of cancer patients. Worked with team of student and community volunteers to select and train a team of 50+ counselors and staff, raise funding through private and corporate donations, and execute camp program. As counselor (2012-2014), oversaw group of 14 campers throughout week.

### 2011–2013 **Medical Interpreter, Pacific Free Clinic, Stanford, CA.**

Selected via application and interview process to interpret for Spanish-speaking patients at free community clinic. Assisted and followed patients from triage. Completed 40-hour certification program.

## Miscellaneous Experience

2007, **Member, Varsity Water Polo Team**, Stanford University, Stanford, CA.

2010–2011 Trained 20+ hours per week, approx. 46 weeks per year. Competed in matches at venues throughout nation. Team consistently ranked in top four nationally.

2007, **Member and Soloist, The Mendicants A Capella**, Stanford University.

2010–2011 Represented Stanford at concerts on campus and throughout nation. Featured as soloist on professionally produced album.

## Programming Languages

Advanced R, PYTHON,SQL

Intermediate Unix Scripting (awk, etc.), MATLAB, JAVA, C, C++, JULIA, Web Development (HTML, CSS, Javascript)

## Languages

English Native

Spanish Full working proficiency