

Research Interests

Machine Learning and Deep Learning

A main focus of my research has been on scientifically understanding properties of representations learned by deep neural networks. I've also worked on broader modelling questions in big data settings, and have recently been working on applying some of our representation analysis methods to healthcare data.

Education

Cornell University and Google Brain

PhD. in Computer Science

New York and Mountain View, USA

Aug. 2014 — present

University of Cambridge (Trinity College)

BA and Masters in Mathematics. First Class Honours

Cambridge, UK

Oct. 2010 — June 2014

Research and Industry Experiences

UC Berkeley, Simons Institute

Foundations of Machine Learning Workshop

Invited participant for workshop on better understanding fundamentals of machine learning.

Visiting Student

January 2017 – June 2017

Stanford University

with Surya Ganguli

Understanding fundamentals of deep neural networks and connections to neuroscience

Visiting Researcher

June 2016 – June 2017

Google Inc., Brain Team

with Quoc Le, Samy Bengio and Jascha Sohl-Dickstein

Working on experiments and theory to provide greater understanding and interpretability in deep neural networks.

Research Resident

January 2016 – present

Google Inc., Strategic Technologies

with Andrew Tomkins, Ravi Kumar and Tamas Sarlos

Predicting user trails (website visits, song listens, location checkins) with Markov models and LSTMs

Research Intern

May 2015 – August 2015

Brown University

with Eli Upfal

Developed and analysed a random sampling procedure that could greatly reduce the amount of metadata storage required during garbage collection in flash memory.

Visiting Researcher

July 2013 – September 2013

Tata Institute of Fundamental Research

with C.S. Rajan

Scholarship student at summer school aimed at exposing students to advanced mathematics. Studied Galois Theory and Elliptic Curves.

Visiting Scholar

June 2012 – August 2012

Selected Awards

HHMI Janelia Visiting Scholarship

Awarded on merit of research in deep neural networks, to facilitate participation in workshop in Machine Learning.

2016

Cornell PhD McMullen Fellowship

Awarded to excellent incoming graduate students.

2014 — 2015

Rouse Ball Essay Prize

Awarded for excellent dissertation essay on properties of Random Walks on Graphs.

2013

Trinity College Cambridge Senior Scholarship	2013
Awarded for outstanding results in University of Cambridge Part II Examinations.	
China Girls Maths Olympiad: Bronze Medal	2010
One of a team of four representing United Kingdom at an international Olympiad.	
British Mathematical Olympiad: Gold Medal	2009 — 2010
Top (nationally) twenty and top ten, 2009, 2010	

Publications

Adversarial Spheres	
J Gilmer, L Metz, F Faghri, S Schoenholz, Maithra Raghu, M Wattenberg, I Goodfellow	2018
In Submission to NIPS 2018, also in ICLR Workshop 2018	
Can Deep Reinforcement Learning Solve Erdos-Selfridge-Spencer Games?	
Maithra Raghu, Alexander Irpan, Jacob Andreas, Robert Kleinberg, Quoc V. Le, Jon Kleinberg	2018
ICML 2018, also in ICLR Workshop 2018	
SVCCA for Deep Learning Dynamics and Interpretability	
Maithra Raghu, Justin Gilmer, Jason Yosinski, Jascha Sohl-Dickstein	2017
Neural Information Processing Systems 2017	
On the expressive power of deep neural networks	
Maithra Raghu, Ben Poole, Jon Kleinberg, Surya Ganguli, Jascha Sohl-Dickstein	2017
In International Conference on Machine Learning 2017. Also appeared in Janelia Workshop in Machine Learning and Computer Vision, BayLearn 2016, Research@Google, NIPS Interpretable Machine Learning Workshop 2016, Women in Machine Learning (WiML) 2016.	
Explaining the Learning Dynamics of Direct Feedback Alignment	
Justin Gilmer, Colin Raffel, Sam Schoenholz, Maithra Raghu, Jascha Sohl-Dickstein	2017
In International Conference on Learning Representations (ICLR) Workshop 2017	
Exponential expressivity in deep neural networks through transient chaos	
B Poole, S Lahiri, M Raghu, J Sohl-Dickstein, S Ganguli	2016
In Neural Information Processing Systems (NIPS) 2016	
Linear Additive Markov Processes	
with Tamas Sarlos, Ravi Kumar and Andrew Tomkins (alphabetical order)	2016
WWW 2017	
Team Performance with Test Scores	
Jon Kleinberg, Maithra Raghu (alphabetical order)	2015
In Economics and Computation (EC) 2015. Invited for submission to the journal ACM Transactions on Economics and Computation (TEAC).	
Random Walks on Graphs	Dissertation (Trinity College)
Maithra Raghu	2013
Entered and won Cambridge Rouse Ball Essay prize.	

Invited Talks

UMass Amherst	2018
Insights from Deep Representations	
Institute of Advanced Study, Princeton	2017
Understanding Generalization in Reinforcement Learning	
Columbia University	2017
Understanding Generalization in Reinforcement Learning	
OpenAI	2017
Interpreting Deep Representations	

International Conference on Machine Learning Expressivity of Deep Networks	2017
REWORK: Deep Learning Summit Neural Network Learning Dynamics	2017
World Wide Web Conference Modelling Sequential Data with Linear Additive Markov Processes	2017
DeepMind Better interpretability for deep networks.	2016
NIPS Workshop: Women in Machine Learning (WiML) New York University	2016
Northstar Science Film Panel for Arrival Success of modern methods of machine translation, and women in STEM	2016
Janelia Workshop on Machine Learning and Computer Vision Interpreting results from Deep Neural Architectures	2016
Economics and Computation Evaluating Team Performance with Tests	2015

Professional Activities

Workshop Organization

NIPS Workshop: Deep Learning: Bridging Theory and Practice Co-organized NIPS workshop looking at a systematic exploration of phenomena observed with deep neural networks.	2017
Women in Machine Learning (WiML) Organizer Co-located with NIPS, this workshop brings together hundreds of leading women and men machine learning researchers, and displays top peer-reviewed results in Machine Learning by female researchers. Organizers are vetted by leading women ML researchers.	2015

Peer Review

Neural Information Processing Systems (NIPS)	2018
International Conference on Machine Learning (ICML)	2018
International Conference on Learning Representations Workshop (ICLR)	2018
International Conference on Learning Representations (ICLR)	2018
NIPS Workshop Deep Learning: Bridging Theory and Practice	2017
Women in Machine Learning (WiML)	2017
Neural Information Processing Systems (NIPS)	2017
International Conference on Machine Learning (ICML)	2017
International Conference on Learning Representations (ICLR)	2017
Neural Information Processing Systems (NIPS)	2016
Women in Machine Learning	2015

Press Coverage

WIRED Coverage of Interpretability Work

Quartz Post on SVCCA

Washington Post article on our work on team selection

Misc.

Ask Me Anything Reddit (r/machinelearning) 2016
with the Google Brain Team, answering questions on Machine Learning and Deep Learning, and academia and industry

Cambridge University Mathematics Society 2013 – 2014

United Kingdom Mathematics Trust, Senior Mentor 2010 – 2012
Mentored talented students for the national mathematical olympiads