

Research Interests

Machine Learning, Deep Learning and Applications to Healthcare

My primary research interests are developing principled tools to gain insights into deep neural networks and using these insights to develop better methods in healthcare applications.

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

Google Brain Team

with Quoc Le, Samy Bengio

Scientific experiments on deep neural network representations and applications to healthcare.

Research Scientist

August 2018 –

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 – June 2018

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

Forbes 30 Under 30 (Science)

Global list of most impactful leaders and scientists

2019

EECS Rising Stars 2018

Invited participant in workshop for top female graduate students in EECS

2018

HHMI Janelia Visiting Scholarship	2016
Awarded on merit of research in deep neural networks, to facilitate participation in workshop in Machine Learning.	
Cornell PhD McMullen Fellowship	2014 — 2015
Awarded to excellent incoming graduate students.	
Rouse Ball Essay Prize	2013
Awarded for excellent dissertation essay on properties of Random Walks on Graphs.	
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

The Algorithmic Automation Problem: Prediction, Triage and Human Effort	
Maithra Raghu, Katy Blumer, Greg Corrado, Jon Kleinberg, Ziad Obermeyer, Sendhil Mullainathan	2019
Preprint	
Transfusion: Understanding Transfer Learning in Medical Imaging	
Maithra Raghu*, Chiyuan Zhang*, Jon Kleinberg, Samy Bengio	2019
Preprint	
Direct Uncertainty Prediction for Medical Second Opinions	
Maithra Raghu*, Katy Blumer*, Rory Sayres, Ziad Obermeyer, Sendhil Mullainathan, Jon Kleinberg	2018
In Submission	
Insights on Representational Similarity in Neural Networks with CCA	
Ari Morcos*, Maithra Raghu*, Jascha Sohl-Dickstein, Samy Bengio	2018
Neural Information Processing Systems (NIPS) 2018	
Adversarial Spheres	
J Gilmer, L Metz, F Faghri, S Schoenholz, Maithra Raghu, M Wattenberg, I Goodfellow	2018
In submission, also 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)
WWW 2017

2016

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

Artificial Intelligence, O'Reilly Media

2019

Artificial And Human Intelligence in Healthcare

HealthAI, Stanford

2019

Artificial And Human Intelligence in Healthcare

Deep Learning Summit, San Francisco

2019

Direct Uncertainty Prediction for Medical Second Opinions

Deep Learning Summit, San Francisco

2019

Direct Uncertainty Prediction for Medical Second Opinions

TTIC: Young Researchers Seminar

2018

Insights on Deep Representations and Applications to Healthcare

REWORK: Deep Learning in Healthcare Summit

2018

Direct Uncertainty Prediction for Medical Second Opinions

Simons Institute

2018

Insights from Deep Representations

Facebook AI Research

2018

Insights from Deep Representations with Applications to Healthcare

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

2017

Expressivity of Deep Networks

Massachusetts Institute of Technology

2017

Neural Network Learning Dynamics

REWORK: Deep Learning Summit

2017

Neural Network Learning Dynamics

World Wide Web Conference

2017

Modelling Sequential Data with Linear Additive Markov Processes

DeepMind

2016

Better interpretability for deep networks.

NIPS Workshop: Women in Machine Learning (WiML)	2016
New York University	2016
Northstar Science Film Panel for Arrival	2016
Success of modern methods of machine translation, and women in STEM	
Janelia Workshop on Machine Learning and Computer Vision	2016
Interpreting results from Deep Neural Architectures	
Economics and Computation	2015
Evaluating Team Performance with Tests	

Professional Activities

Program (Co)-Chair

National Academy of Sciences Sackler Colloquium: Science of Deep Learning	2019
Invited to be one of five organizers for colloquium at National Academy of Sciences on The Science of Deep Learning. Invited leading researchers, policy makers and representatives from different government bodies to convene and discuss the advances and important challenges for AI and Deep Learning.	
NIPS Workshop: Deep Learning: Bridging Theory and Practice	2017
Co-organized NIPS workshop looking at a systematic exploration of phenomena observed with deep neural networks.	
Women in Machine Learning (WiML) Organizer	2015
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.	

Peer Review

Neural Information Processing Systems (NIPS)	2018
Conference on Learning Theory (COLT)	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

Quanta: The Foundations of Neural Networks
 Forbes 30 Under 30 (Science)
 Podcast on Talking Machines

WIRED: Interpreting Deep Neural Networks

Quartz: Principled tools to study deep learning

Northstar Science Film Festival

Washington Post: Algorithmic Team Selection and Diversity

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