Vivek Ramanujan

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Research Interests

Machine Learning, Computer Vision, Dynamics, Optimization, Reinforcement Learning

Education

University of Washington, Seattle, WA — 2020 to Present
PhD Student in Computer Science
Advisor. Prof. Ali Farhadi

Brown University, Providence, RI — 2015 to 2018
B.S. Mathematics and Computer Science *with Honors*, May 2018
Major GPA: 3.96, Cumulative: 3.92
Thesis title: *Latent Space Augmentations for Generative Adversarial Networks*

Relevant coursework on last page

Research + Work Experience

University of Washington - Seattle — Sep 2020 to Present
Graduate Research Assistant
Advisor. Ali Farhadi
Working on machine learning and computer vision with insights from theory. Currently working on extending neural tangent kernels (NTKs) to close the gap in generalization performance to standard finite architectures.

Allen Institute for Artificial Intelligence — Dec 2018 to Sep 2020
Research Resident
Advisors. Prof Ali Farhadi, Mohammad Rastegari, Aniruddha Kembhavi
Worked on a wide array of topics including but not limited to: self-supervised learning, sparse network optimization, continual and transfer learning. Resulted in publications [0, 1, 2, 3], in **NeurIPS 2020**, **CVPR 2020** and **ICML 2020**, listed on the next page.

Brown University RL Lab — May 2018 to Sep 2018
Undergraduate Researcher
Advisors. Dave Abel, Prof Michael Littman
Worked on the problem of state abstraction for MDPs. Developed proofs in the single MDP case for optimality bounds related to a certain class of abstractions.

Brown University Visual Computing Group — Dec 2016 to May 2018
Undergraduate Researcher
Advisor. Prof James Tompkin

Created generative models to produce images from other images or text. Utilized neural networks and graphical models. Worked on formalism and extension of Generative Adversarial Networks for high variance productions and segmentation (funded by UTRA). Collaborated on CycleGAN extension (Publication 4.) published in **ECCV 2018**.

Laboratory for Communications and Applications June 2017 to Sep 2017
Ecole Polytechnique Federale de Lausanne (EPFL)
Undergraduate Research Assistant
Advisor. Elisa Celis (Sr. Research Scientist)
Did algorithmic analysis, theoretical and empirical, on fixed points of recommendation systems and their relationship to polarization. Set up systems to handle large amounts of data.

Google June 2016 to Aug 2016
Software Engineering Intern
Supervisor: Luis Carlos Cobo (Sr. Research Engineer)
Used neural networks (among other techniques) with Torch and Tensorflow, ran experiments. Wrote backend code to handle large amounts of data. Also included front end work and data visualization.

Publications

Refereed * means equal contribution

1. Supermasks in Superposition for Continual Learning
   M. Worstman*, **V. Ramanujan***, R. Liu, A. Kembhavi, M. Rastegari, J. Yosinski, A. Farhadi.
   (to appear) *Neural Information Processing Systems 2020*
   (spotlight) *International Conference for Machine Learning Continual Learning Workshop 2020*.

2. Soft Threshold Weight Reparameterization for Learnable Sparsity
   A. Kusupati, **V. Ramanujan***, R. Somani*, M. Worstman*, P. Jain, A. Farhadi, S. Kakade, A. Farhadi.
   (virtual talk) *International Conference for Machine Learning 2020*.

3. What's Hidden in a Randomly Weighted Neural Network?
   V. Ramanujan*, M. Worstman*, A. Kembhavi, A. Farhadi, M. Rastegari.
   At *Computer Vision and Pattern Recognition 2020*.

4. Improving Shape Deformation in Unsupervised Image-to-Image Translation
   A. Gokaslan, **V. Ramanujan**, D. Ritchie, K. Kim, J. Tompkin
   At *European Conference for Computer Vision 2018*.

Preprint

0. Parameter Norm Growth During the Training of Transformers
   W. Merrill, **V. Ramanujan**, Y. Artzi, R. Schwartz, N. Smith
   In submission, 2020

Programming Skills

Languages and Libraries

Experienced Python • Golang • (Py)Torch • Jax (autograd framework) **Intermediate** C • C++ • Tensorflow • Julia • Haskell

Awards

Student Awards — Brown University Computer Science
- Andy Van Dam Named TA
- Undergraduate Teaching and Research Assistantship Award — Sept 2017, June 2017
- Publication (1) received second at Brown Undergraduate Research Symposium — Spring 2018

EPFL Summer Research Assistantship — Summer 2017
Sigma Xi (Nominated, Declined) — Spring 2018

Teaching Experience

Brown University - Computer Science Department — 2016 to 2018
- **Teaching Assistant**, CS 2951K (grad) - Deep Learning, Prof Eugene Charniak — Fall 2016
- **Teaching Assistant**, CS 1410 - Applied Artificial Intelligence, Prof George Konidaris — Spring 2017
- **Teaching Assistant**, CS 1430 - Computer Vision, Prof James Tompkin — Fall 2017
- **Teaching Assistant**, CS 1420 - Machine Learning, Prof Michael Littman — Spring 2018

General Responsibilities: Worked with other TAs to design new assignments. Held office hours to help students with homework and course concepts. Graded homeworks.

Projects

Select Paper Replications (some code available on my GitHub) — Various
- *Conditional Random Fields as Recurrent Neural Networks*, Zheng et al.
- *Autoencoding Variational Bayes*, Kingma et al.
- *Wasserstein GAN*, Arjovsky et al.
- *A Laplacian Framework for Option Discovery in Reinforcement Learning*, Machado et al.

Fault Tolerant File and Job system — Spring 2017
- Developed a fault tolerant distributed file system using Go.
- Scalable to a large number of nodes, implemented file-locking and time-series backups.
- Used Raft for membership changes and Tapestry for the distributed object location and retrieval service(DOLR).
- Built on this later to manage compute jobs on small clusters, included experimental mapreduce implementation.

Service

Volunteer Education — Sept 2017 - May 2018
Supervised and taught a Computer Science club, with other Brown students, at a middle school near Providence. Helped arrange curriculum.

Relevant Coursework

Undergraduate
Multivariable Calculus
Linear Algebra
Computational Linguistics
Theory of Computation
Machine Learning
Information Theory
Pattern and Information Theory (II)
Computer Vision
Real Analysis
Cryptography
Abstract Algebra (I/II)
Probabilistic Graphical Models (IS)
Design and Analysis of Algorithms
Distributed Systems[1]
Computation and Probability Theory

Graduate
Learning and Sequential Decision Making
Graphical Models for Computer Graphics
Special Topics in Computational Linguistics
Randomized Algorithms
Computer Vision for Computer Graphics
Grounded Language for Robotics
Probability Theory (Measure Theoretic)
Smooth Manifolds[1]

Work Details

US Citizen, Seattle Area based, willing to relocate

[1] Self-study, can show proof of work