Atish Agarwala

Contact Information

Address: 397 Vine Avenue,
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Research interests

Machine learning: Deep learning theory, dynamical systems perspective on learning, high-dimensional optimization, loss landscape geometry, scaling laws, feature learning.

Theoretical biology: Ecology and evolution, fitness landscapes, machine learning for theoretical biology.

Employment

Google DeepMind, Mountain View, CA
Research Scientist — **March 2021 – Present**

Google Research, Mountain View, CA
AI Resident — **October 2019 – March 2021**

Education

Stanford University, Stanford, CA
PhD in Physics — **September 2013 – September 2019**

Swarthmore College, Swarthmore, PA
Bachelors degree in Physics and Math (Highest honors) — **August 2009 – May 2013**

Programming

Python, JAX, Tensorflow, Matlab, C++. Use UNIX/Linux and Google cloud compute.

Selected Publications

Agarwala, **Atish** and Jeffrey Pennington (2024). "High dimensional analysis reveals conservative sharpening and a stochastic edge of stability". *arXiv preprint arXiv:2404.19261*.

Beaglehole, Daniel, Ioannis Mitliagkas, and **Atish Agarwala** (2024). "Feature learning as alignment: a structural property of gradient descent in non-linear neural networks". *Transactions on Machine Learning Research*. ISSN: 2835-8856.

Dauphin, Yann N, **Atish Agarwala**, and Hossein Mobahi (2024). "Neglected Hessian component explains mysteries in Sharpness regularization". *The Thirty-eighth Annual Conference on Neural Information Processing Systems*.

Roulet, Vincent, **Atish Agarwala**, Jean-Bastien Grill, Grzegorz Michal Swirszcz, et al. (2024). "Stepping on the Edge: Curvature Aware Learning Rate Tuners". *The Thirty-eighth Annual Conference on Neural Information Processing Systems*.

Agarwala, **Atish** and Yann Dauphin (2023). "SAM operates far from home: eigenvalue regularization as a dynamical phenomenon". *International Conference on Machine Learning*. PMLR, pp. 152–168.

Agarwala, **Atish**, Fabian Pedregosa, and Jeffrey Pennington (2023). "Second-order regression models exhibit progressive sharpening to the edge of stability". *International Conference on Machine Learning*. PMLR, pp. 169–195.

Agarwala, **Atish** and Samuel S Schoenholz (2022). "Deep equilibrium networks are sensitive to initialization statistics". *International Conference on Machine Learning*. PMLR, pp. 136–160.

Pearce, Michael T, **Atish Agarwala**, and Daniel S Fisher (2020). "Stabilization of extensive fine-scale diversity by ecologically driven spatiotemporal chaos". *Proceedings of the National Academy of Sciences* 117.25, pp. 14572–14583.

Agarwala, **Atish** and Daniel S Fisher (2019). "Adaptive walks on high-dimensional fitness landscapes and seascapes with distance-dependent statistics". *Theoretical population biology* 130, pp. 13–49.

Venkataram, Sandeep, Barbara Dunn, Yuping Li, **Atish Agarwala**, et al. (2016). "Development of a comprehensive genotype-to-fitness map of adaptation-driving mutations in yeast". *Cell* 166.6, pp. 1585–1596.

Academic Service

Program Chair for High Dimensional Learning Dynamics Workshop (ICML 2024)

Honours and Awards

CEHG Fellow, 2018-2019
Stanford Bowes BioX Fellow, 2015-2018
William C. Elmore Prize, Swarthmore Physics Department, 2013