# Behnam Neyshabur

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## Current Interest

I am currently co-leading Blueshift team at Google DeepMind where as part of Gemini team, we are focused on improving Gemini's abilities in solving hard reasoning/planning problems in areas such as STEM.

## Professional Career

2019–present **Senior Staff Research Scientist and Team Lead**, Google DeepMind.

2018–2019 **Postdoctoral Associate**, Computer Science Department, New York University.

2017–2018 **Research Scholar**, School of Mathematics, Institute for Advanced Study (IAS), Princeton.

2011–2017 **Ph.D. in Computer Science**, Toyota Technological Institute at Chicago (TTIC).
Thesis: Implicit Regularization in Deep Learning.

2009–2011 **M.S. in Computer Engineering**, Sharif University of Technology.

2005–2009 **B.S. in Computer Engineering**, Sharif University of Technology.

## Internships

2016 **Research Intern, Microsoft Research**, New York, NY.

2013 **Research Intern, Microsoft Research**, Mountain View, CA.

## Academic Service

**Editorial Board/Area Chair:** NeurIPS (2019-), ICLR (2020-), JMLR (2020-).

**Reviewer:** NeurIPS (2014-), ICLR (2016-), JMLR (2018-), ICML(2015-), COLT (2014-).

**Organizer**: NeurIPS 2020 competition on Predicting Generalization in Deep Learning, ICML 2019 workshop: Identifying & Understanding Deep Learning Phenomena, ICML 2019 workshop: Understanding & Improving Generalization in Deep Learning

## Publications (citations: 11K+, h-index: 40+)

1 **Gemini 1.5: Unlocking multimodal understanding across millions of tokens of context**
By Gemini Team, et al.. In: *Technical Report* (2024).

2 **Gemini: a family of highly capable multimodal models**
By Gemini Team, et al.. In: *arXiv preprint arXiv:2312.11805* (2023).

3 **REPAIR: REnormalizing Permuted Activations for Interpolation Repair**
By K. Jordan, Sedghi, O. Hanie Saukh, R. Entezari, and B. Neyshabur. In: *ICLR*, 2023.

4 **Long Range Language Modeling via Gated State Spaces**
By H. Mehta, A. Gupta, A. Cutkosky, and B. Neyshabur. In: *ICLR*, 2023.

5 **Beyond Human Data: Scaling Self-Training for Problem-Solving with Language Models**
By A. Singh, J. D. Co-Reyes, R. Agarwal, A. Anand, P. Patil, P. J. Liu, J. Harrison, J. Lee, K. Xu, A. Parisi, et al.. In: *arXiv preprint arXiv:2312.06585* (2023).

6 **Beyond the Imitation Game: Quantifying and extrapolating the capabilities of language models**
By A. Srivastava, A. Rastogi, A. Rao, A. A. M. Shoeb, A. Abid, A. Fisch, A. R. Brown, A. Santoro, A. Gupta, A. Garriga-Alonso, et al.. In: *TMLR* (2023).

7 **Exploring the Limits of Large Scale Pre-training**
By S. Abnar, M. Dehghani, B. Neyshabur, and H. Sedghi. In: *ICLR*, Nov. 2022 **(spotlight)**.

8 **Revisiting Neural Scaling Laws in Language and Vision**
By I. Alabdulmohsin, B. Neyshabur, and X. Zhai. In: *NeurIPS*, Nov. 2022.

9 **The evolution of out-of-distribution robustness throughout fine-tuning**
By A. Andreassen, Y. Bahri, B. Neyshabur, and R. Roelofs. In: *TMLR* (May 2022).

10 **Exploring Length Generalization in Large Language Models**
By C. Anil, Y. Wu, A. Andreassen, A. Lewkowycz, V. Misra, V. Ramasesh, A. Slone, G. Gur-Ari, E. Dyer, and B. Neyshabur. In: *NeurIPS*, 2022 **(oral)**.

11 **Data Scaling Laws in NMT: The Effect of Noise and Architecture**
By Y. Bansal, B. Ghorbani, A. Garg, B. Zhang, M. Krikun, C. Cherry, B. Neyshabur, and O. Firat. In: *ICML*, 2022.

12 **The Role of Permutation Invariance in Linear Mode Connectivity of Neural Networks**
By R. Entezari, H. Sedghi, O. Saukh, and B. Neyshabur. In: *ICLR*, 2022.

13 **Convexifying Transformers: Improving optimization and understanding of transformer networks**
By T. Ergen, B. Neyshabur, and H. Mehta. In: *arXiv preprint arXiv:2211.11052* (2022).

14 **Leveraging Unlabeled Data to Predict Out-of-Distribution Performance**
By S. Garg, S. Balakrishnan, Z. C. Lipton, B. Neyshabur, and H. Sedghi. In: *ICLR*, 2022.

15 **A Loss Curvature Perspective on Training Instability in Deep Learning**
By J. Gilmer, B. Ghorbani, A. Garg, S. Kudugunta, B. Neyshabur, D. Cardoze, G. Dahl, Z. Nado, and O. Firat. In: *ICLR*, 2022.

16 **Block-Recurrent Transformers**
By D. Hutchins, I. Schlag, Y. Wu, E. Dyer, and B. Neyshabur. In: *NeurIPS*, 2022.

17 **Layer-Stack Temperature Scaling**
By A. Khalifa, M. C. Mozer, H. Sedghi, B. Neyshabur, and I. Alabdulmohsin. In: *arXiv preprint arXiv:2211.10193* (2022).

18 **Solving Quantitative Reasoning Problems with Language Models**
By A. Lewkowycz, A. Andreassen, D. Dohan, E. Dyer, H. Michalewski, V. Ramasesh, A. Slone, C. Anil, I. Schlag, T. Gutman-Solo, et al.. In: *NeurIPS*, 2022.

19 **Teaching Algorithmic Reasoning via In-context Learning**
By H. Zhou, A. Nova, H. Larochelle, A. Courville, N. Behnam, and H. Sedghi. In: *arXiv preprint arXiv:2211.09066* (2022).

20 **Deep Learning Through the Lens of Example Difficulty**
By R. J. Baldock, H. Maennel, and B. Neyshabur. In: *NeurIPS*, 2021.

21 **Sharpness-Aware Minimization for Efficiently Improving Generalization**
By P. Foret, A. Kleiner, H. Mobahi, and B. Neyshabur. In: *ICLR*, 2021 **(spotlight)**.

22 **Are wider nets better given the same number of parameters?**
By A. Golubeva, B. Neyshabur, and G. Gur-Ari. In: *ICLR*, 2021.

**23 Methods and Analysis of The First Competition in Predicting Generalization of Deep Learning**
By Y. Jiang, P. Natekar, M. Sharma, S. K. Aithal, D. Kashyap, N. Subramanyam, C. Lassance, D. M. Roy, G. K. Dziugaite, S. Gunasekar, et al.. In: *NeurIPS 2020 Competition and Demonstration Track*, PMLR, 2021.

**24 Extreme Memorization via Scale of Initialization**
By H. Mehta, A. Cutkosky, and B. Neyshabur. In: *ICLR*, 2021.

**25 Understanding the failure modes of out-of-distribution generalization**
By V. Nagarajan, A. Andreassen, and B. Neyshabur. In: *ICLR*, 2021.

**26 The Deep Bootstrap: Good Online Learners are Good Offline Generalizers**
By P. Nakkiran, B. Neyshabur, and H. Sedghi. In: *ICLR*, 2021.

**27 When Do Curricula Work?**
By X. Wu, E. Dyer, and B. Neyshabur. In: *ICLR*, 2021 **(oral)**.

**28 The intriguing role of module criticality in the generalization of deep networks**
By N. S. Chatterji, B. Neyshabur, and H. Sedghi. In: *ICLR*, 2020 **(spotlight)**.

**29 Neurips 2020 competition: Predicting generalization in deep learning**
By Y. Jiang, P. Foret, S. Yak, D. M. Roy, H. Mobahi, G. K. Dziugaite, S. Bengio, S. Gunasekar, I. Guyon, and B. Neyshabur. In: *arXiv preprint arXiv:2012.07976* (2020).

**30 Fantastic Generalization Measures and Where to Find Them**
By Y. Jiang, B. Neyshabur, H. Mobahi, D. Krishnan, and S. Bengio. In: *ICLR*, 2020.

**31 Towards learning convolutions from scratch**
By B. Neyshabur. In: *NeurIPS*, 2020.

**32 What is being transferred in transfer learning?**
By B. Neyshabur, H. Sedghi, and C. Zhang. In: *NeurIPS*, 2020.

**33 Observational Overfitting in Reinforcement Learning**
By X. Song, Y. Jiang, Y. Du, and B. Neyshabur. In: *ICLR*, 2020.

**34 Towards Understanding the Role of Over-Parametrization in Generalization of Neural Networks**
By B. Neyshabur, Z. Li, S. Bhojanapalli, Y. LeCun, and N. Srebro. In: *ICLR*, 2019.

**35 Stronger Generalization Bounds for Deep Nets via a Compression Approach**
By S. Arora, R. Ge, B. Neyshabur, and Y. Zhang. In: *ICML*, 2018.

**36 Predicting Protein–Protein Interactions through Sequence-Based Deep Learning**
By S. Hashemifar, B. Neyshabur, A. A. Khan, and J. Xu. In: *Bioinformatics* 34.17 (2018).

**37 A PAC-Bayesian Approach to Spectrally-Normalized Margin Bounds for Neural Networks**
By B. Neyshabur, S. Bhojanapalli, and N. Srebro. In: *ICLR*, 2018.

**38 Corralling a Band of Bandit Algorithms**
By A. Agarwal, H. Luo, B. Neyshabur, and R. E. Schapire. In: *COLT*, 2017.

**39 Implicit Regularization in Matrix Factorization**
By S. Gunasekar, B. E. Woodworth, S. Bhojanapalli, B. Neyshabur, and N. Srebro. In: *NeurIPS*, 2017 **(spotlight)**.

**40 Implicit Regularization in Deep Learning**
By B. Neyshabur, PhD thesis, TTIC, 2017.

**41 Stabilizing GAN Training with Multiple Random Projections**
By B. Neyshabur, S. Bhojanapalli, and A. Chakrabarti. In: *arXiv preprint* (2017).

**42 Exploring Generalization in Deep Learning**
By B. Neyshabur, S. Bhojanapalli, D. McAllester, and N. Srebro. In: *NeurIPS*, 2017.

**43 Geometry of Optimization and Implicit Regularization in Deep Learning**
By B. Neyshabur, R. Tomioka, R. Salakhutdinov, and N. Srebro. In: *arXiv preprint* (2017).

**44 Global Optimality of Local Search for Low Rank Matrix Recovery**
By S. Bhojanapalli, B. Neyshabur, and N. Srebro. In: *NeurIPS*, 2016.

**45 Data-Dependent Path Normalization in Neural Networks**
By B. Neyshabur, R. Tomioka, R. Salakhutdinov, and N. Srebro. In: *ICLR*, 2016.

**46 Path-normalized Optimization of Recurrent Neural Networks with ReLU Activations**
By B. Neyshabur, Y. Wu, R. Salakhutdinov, and N. Srebro. In: *NeurIPS*, 2016.

**47 Joint Inference of Tissue-Specific Networks with a Scale Free Topology**
By S. Hashemifar, B. Neyshabur, and J. Xu. In: *BIBM*, 2015.

**48 Path-SGD: Path-Normalized Optimization in Deep Neural Networks**
By B. Neyshabur, R. R. Salakhutdinov, and N. Srebro. In: *NeurIPS*, 2015.

**49 On Symmetric and Asymmetric LSHs for Inner Product Search**
By B. Neyshabur and N. Srebro. In: *ICML*, 2015.

**50 In Search of the Real Inductive Bias: On the Role of Implicit Regularization in Deep Learning**
By B. Neyshabur, R. Tomioka, and N. Srebro. In: *ICLR workshop*, 2015.

**51 Norm-Based Capacity Control in Neural Networks**
By B. Neyshabur, R. Tomioka, and N. Srebro. In: *COLT*, 2015.

**52 Clustering, Hamming Embedding, Generalized LSH and the Max Norm**
By B. Neyshabur, Y. Makarychev, and N. Srebro. In: *ALT*, 2014.

**53 Sparse Matrix Factorization**
By B. Neyshabur and R. Panigrahy. In: *arXiv preprint* (2014).

**54 NETAL: A New Graph-Based Method for Global Alignment of Protein–Protein Interaction Networks**
By B. Neyshabur, A. Khadem, S. Hashemifar, and S. S. Arab. In: *Bioinformatics* 29.13 (2013).

**55 The Power of Asymmetry in Binary Hashing**
By B. Neyshabur, P. Yadollahpour, N. Srebro, R. Salakhutdinov, and Y. Makarychev. In: *NeurIPS*, 2013.