Jacobs Hall, Room 6406
9500 Gilman Drive, MC 0407
La Jolla, CA 92093
+1 858 822 2507
rahul@ucsd.edu
sparsity.ucsd.edu/rahul

Rahul Parhi

publications

Journal Publications

11. Ronald DeVore, Robert D. Nowak, **Rahul Parhi**, and Jonathan W. Siegel. "Weighted Variation Spaces and Approximation by Shallow ReLU Networks". In: *Applied and Computational Harmonic Analysis* 74.101713 (2025), pp. 1–22. DOI: 10.1016/j.acha.2024.101713.

10. **Rahul Parhi**, Pakshal Bohra, Ayoub El Biari, Mehrsa Pourya, and Michael Unser. "Random ReLU Neural Networks as Non-Gaussian Processes". In: *Journal of Machine Learning Research* 26.19 (2025), pp. 1–31. URL: https://jmlr.org/papers/v26/24-0737.html.

9. **Rahul Parhi** and Michael Unser. "Function-Space Optimality of Neural Architectures with Multivariate Nonlinearities". In: *SIAM Journal on Mathematics of Data Science* 7.1 (2025), pp. 110–135. DOI: 10.1137/23M1620971.

8. **Rahul Parhi** and Michael Unser. "Distributional Extension and Invertibility of the k-Plane Transform and Its Dual". In: *SIAM Journal on Mathematical Analysis* 56.4 (2024), pp. 4662–4686. DOI: 10.1137/23M1556721.

7. Joseph Shenouda, **Rahul Parhi**, Kangwook Lee, and Robert D. Nowak. "Variation Spaces for Multi-Output Neural Networks: Insights on Multi-Task Learning and Network Compression". In: *Journal of Machine Learning Research* 25.231 (2024), pp. 1–40. URL: https://www.jmlr.org/papers/v25/23-0677.html.

6. **Rahul Parhi** and Robert D. Nowak. "Near-Minimax Optimal Estimation With Shallow ReLU Neural Networks". In: *IEEE Transactions on Information Theory* 69.2 (2023), pp. 1125–1140. DOI: 10.1109/TIT.2022.3208653.

5. **Rahul Parhi** and Robert D. Nowak. "Deep Learning Meets Sparse Regularization: A signal processing perspective". In: *IEEE Signal Processing Magazine* 40.6 (2023), pp. 63–74. DOI: 10.1109/MSP.2023.3286988.

4. **Rahul Parhi** and Michael Unser. "The Sparsity of Cycle Spinning for Wavelet-Based Solutions of Linear Inverse Problems". In: *IEEE Signal Processing Letters* 30 (2023), pp. 568–572. DOI: 10.1109/LSP.2023.3275916.

3. **Rahul Parhi** and Robert D. Nowak. "What Kinds of Functions Do Deep Neural Networks Learn? Insights from Variational Spline Theory". In: *SIAM Journal on Mathematics of Data Science* 4.2 (2022), pp. 464–489. DOI: 10.1137/21M1418642.

2. **Rahul Parhi** and Robert D. Nowak. "Banach Space Representer Theorems for Neural Networks and Ridge Splines". In: *Journal of Machine Learning Research* 22.43 (2021), pp. 1–40. URL: https://jmlr.org/papers/v22/20-583.html.

1. **Rahul Parhi** and Robert D. Nowak. "The Role of Neural Network Activation Functions". In: *IEEE Signal Processing Letters* 27 (2020), pp. 1779–1783. DOI: 10.1109/LSP.2020.3027517.

Journal-Equivalent ML/AI Conference Publications

1. Akash Kumar, **Rahul Parhi**, and Mikhail Belkin. "A Gap Between the Gaussian RKHS and Neural Networks: An Infinite-Center Asymptotic Analysis". In: *Conference on Learning Theory (COLT)*. Vol. 291. 2025, pp. 3463–3485. URL: https://proceedings.mlr.press/v291/kumar25b.html.

Other Conference Publications

6. **Rahul Parhi** and Ben Adcock. "Upper Bounds on Averaged Sampling Numbers for General Model Classes". In: *International Conference on Sampling Theory and Applications (SampTA)*. 2025, pp. 1–5.

5. **Rahul Parhi** and Michael Unser. "Modulation Spaces and the Curse of Dimensionality". In: *International Conference on Sampling Theory and Applications (SampTA)*. 2023, pp. 1–5. DOI: 10.1109/SampTA59647.2023.10301395.

4. Joseph Shenouda, **Rahul Parhi**, and Robert D. Nowak. "A Continuous Transform for Localized Ridgelets". In: *International Conference on Sampling Theory and Applications (SampTA)*. 2023, pp. 1–5. DOI: 10.1109/SampTA59647.2023.10301398.

3. **Rahul Parhi** and Robert D. Nowak. "On Continuous-Domain Inverse Problems with Sparse Superpositions of Decaying Sinusoids as Solutions". In: *IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP)*. 2022, pp. 5603–5607. DOI: 10.1109/ICASSP43922.2022.9746165.

2. **Rahul Parhi**, Michael Schliep, and Nicholas Hopper. "MP3: A More Efficient Private Presence Protocol". In: *International Conference on Financial Cryptography and Data Security*. 2018, pp. 38–57. DOI: 10.1007/978-3-662-58387-6_3.

1. **Rahul Parhi**, Chris H. Kim, and Keshab K. Parhi. "Fault-Tolerant Ripple-Carry Binary Adder Using Partial Triple Modular Redundancy (PTMR)". In: *IEEE International Symposium on Circuits and Systems (ISCAS)*. 2015, pp. 41–44. DOI: 10.1109/ISCAS.2015.7168565.

Lightly-Refereed Workshop Papers

2. Luke McDermott and **Rahul Parhi**. "Finding Stable Subnetworks at Initialization with Dataset Distillation". In: *ICLR Workshop on Neural Network Weights as a New Data Modality*. 2025. URL: https://weight-space-learning.github.io/papers.

1. **Rahul Parhi**, Jack Wolf, and Robert D. Nowak. "On the Sparsity of Deep Neural Networks in the Overparameterized Regime: An Empirical Study". In: *ICML Workshop on Overparameterization: Pitfalls & Opportunities (OPPO)*. 2021. URL: https://sites.google.com/view/icml2021oppo/accepted-papers.

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