Curriculum Vitae/Resume

Ekdeep Singh Lubana
Email: eslubana@umich.edu

Education

Ph.D. Candidate, University of Michigan, Ann Arbor *August, 2019–ongoing*
(Co-affiliated with Center for Brain Science, Harvard University)
Advisors: Robert P. Dick and Hidenori Tanaka
B.Tech., Indian Institute of Technology, Roorkee *July, 2015–May, 2019*
Major: Electronics and Communication Engineering
Thesis: Resource Efficient Techniques for Embedded Machine Vision (Nominated for Best Bachelor's Thesis)

Areas of Interest

· Interpretability, Alignment, Science of Deep Learning

Experience

· **Research Intern**, Qualcomm AI Research, Amsterdam *June., 2023–Nov., 2023*
Mentors: Taco Cohen, Johann Brehmer, and Pim de Haan
· **Research Affiliate**, Center for Brain Science, Harvard University *May, 2022–Present*
Host: Venkatesh Murthy and Hidenori Tanaka
· **Research Intern**, Bell Labs Cambridge, UK *Sept., 2021–Dec., 2021*
Mentor: Akhil Mathur
· **Research Intern**, Physics and Informatics Lab, NTT Research Inc. *May, 2021–Aug., 2021*
Mentor: Hidenori Tanaka

Publications

1. Samyak Jain*, Robert Kirk*, **Ekdeep Singh Lubana***, Robert P. Dick, Hidenori Tanaka, Edward Grefenstette, Tim Rocktaschel, and David Krueger. Mechanistically analyzing the effects of fine-tuning on procedurally defined tasks. *arXiv preprint arXiv:2311.12786*, 2023. (In submission.)

2. Rahul Ramesh, Mikail Khona, , Robert P. Dick, Hidenori Tanaka, and **Ekdeep Singh Lubana**. How capable can a transformer become? a study on synthetic, interpretable tasks. *arXiv preprint arXiv:2311.12997*, 2023. (In submission.)

3. Eric Bigelow, **Ekdeep Singh Lubana**, Robert P. Dick, Hidenori Tanaka, and Tomer Ullman. In-context learning dynamics with random binary sequences. *arXiv preprint arXiv:2310.17639*, 2023. (In submission.)

4. Maya Okawa*, **Ekdeep Singh Lubana***, Robert P. Dick, and Hidenori Tanaka*. Compositional Abilities Emerge Multiplicatively: Exploring Diffusion Models on a Synthetic Task. In *Proc. Adv. in Neural Information Processing Systems (NeurIPS)*, 2023.

5. **Ekdeep Singh Lubana**, Eric J Bigelow, Robert P. Dick, David Krueger, and Hidenori Tanaka. Mechanistic Mode Connectivity. In *Proc. Int. Conf. on Machine Learning (ICML)*, 2023.

6. Liu Ziyin, **Ekdeep Singh Lubana**, Masahito Ueda, and Hidenori Tanaka. What Shapes the Loss Landscape of Self-Supervised Learning? In *Proc. Int. Conf. on Learning Representations (ICLR)*, 2023.

7. Puja Trivedi and **Ekdeep Singh Lubana**, Mark Heimann, Danai Koutra, and Jay Jayaraman Thiagarajan. Analyzing Data-Centric Properties for Contrastive Learning on Graphs . In *Proc. Adv. in Neural Information Processing Systems (NeurIPS)*, 2022.

8. **Ekdeep Singh Lubana**, Ian Tang, Fahim Kawsar, Robert P. Dick, and Akhil Mathur. Orchestra: Unsupervised Federated Learning via Globally Consistent Clustering. In *Proc. Int. Conf. on Machine Learning (ICML)*, 2022. (Accepted for **Spotlight** presentation.)

9. **Ekdeep Singh Lubana**, Robert P. Dick, and Hidenori Tanaka. Beyond BatchNorm: Towards a Unified Understanding of Normalization in Deep Learning. In *Proc. Adv. in Neural Information Processing Systems (NeurIPS)*, 2021.

10. **Ekdeep Singh Lubana** and Robert P. Dick. A Gradient Flow Framework for Analyzing Network Pruning. In *Proc. Int. Conf. on Learning Representations (ICLR)*, 2021. (Accepted for **Spotlight** presentation.)

11. **Ekdeep Singh Lubana**, Puja Trivedi, Danai Koutra, and Robert P. Dick. How do Quadratic Regularizers Prevent Catastrophic Forgetting: The Role of Interpolation. In *Proc. Conf. on Lifelong Learning Agents (CoLLAs)*, 2022.

12. **Ekdeep Singh Lubana**, Robert P. Dick, Vinayak Aggarwal, and Pyari Mohan Pradhan. Minimalistic Image Signal Processing for Deep Learning Accelerators. In *Proc. Int. Conf. on Image Processing (ICIP)*, 2019.

13. **Ekdeep Singh Lubana**, Vinayak Aggarwal, and Robert P. Dick. Machine Foveation: An Application-Aware Compressive Sensing Framework. In *Proc. Data compression Conference (DCC)*, 2019.

14. **Ekdeep Singh Lubana** and Robert P. Dick. Digital Foveation: An Energy-Aware Machine Vision Framework. *IEEE Trans. Computer-Aided Design of Integrated Circuits and Systems*, pages 2371–2380, 2018.

Technical Service

· Reviewer for NeurIPS, ICML, ICLR, AISTATS, IEEE TPAMI, IEEE TNNLS *2021–present*
· **Top Reviewer**, NeurIPS. *2023*
· **Top Reviewer**, ICLR. *2022*
· **Top Reviewer**, NeurIPS. *2022*

Technical Awards

· Awarded the **BIRAC-GYTI award** by the **President of India.** *2018*
· Winner of the **Ericsson Innovation Challenge** held at the Nobel Museum, Stockholm, Sweden. *2017*
· Winner of the **Jury's choice award** at the **Accenture Innovation Challenge.** *2017*
· **Gold medal** and **winner of Engineers' Conclave** at **Inter-IIT Tech meet.** *2018*

Academic achievements & Scholarships

· Awarded the **KVPY (Kishore Vaigyanik Protsahan Yojna)** Fellowship by Govt. of India. *2015*
· Awarded the **NTSE (National Talent Search)** Scholarship by N.C.E.R.T., New Delhi. *2014*
· Ranked amongst **Top 300** students in **National Standard Examination in Astronomy.** *2015*
· Ranked amongst **Top 300** Students in the **Indian National Mathematics Olympiad.** *2015*