Prakhar Kaushik

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EDUCATION

Johns Hopkins University	**Ph.D.** Computer Science (in-progress) (**Advisor**: **Dr. Alan Yuille**, Bloomberg Distinguished Professor in Cognitive Science and Computer Science); **M.S.**, Computer Science (2020)
Indian Naval Academy, etc.	B.Tech. Electronics and Communications
Rashtriya Indian Military College	High School

RESEARCH STATEMENT

My research focuses on developing machine learning systems that embody key aspects of human cognition—particularly our ability to understand, generalize across, and act within complex 3D environments. While often associated with **AGI** or **post-AGI** research, my work is rooted in building cognitively inspired models that learn efficiently, without dense supervision, and continually over time.

Central to my methodology is the belief that constraints can drive innovation. Motivated by both scientific inquiry and practical limitations, I aim to design algorithms that are computationally **efficient**, **robust** under distribution shift, and capable of **lifelong learning**. These goals naturally align with the way humans acquire knowledge: incrementally, with limited supervision, and under non-stationary conditions.

My current projects span **efficient finetuning** and modular **adaptation** of Large Language Models (**LLMs**), Vision-Language Models (**VLMs**), and image **generative** models; **model merging** for scalable transfer across VLMs; **knowledge unlearning** in foundation models; sparse- and single-view **image-to-3D** reconstruction; and continual learning for multimodal models. These efforts are unified by a central aim—to develop models that scale adaptively, not just computationally.

My previous work includes unsupervised learning for 3D perception, **domain adaptation**, **3D generative modeling**, model **sparsity**, and **robustness**. Drawing from an interdisciplinary background, I've also explored causal inference, conformal prediction, cryptography, medical imaging, and optimal transport.

Ultimately, my long-term vision is to explore neural subspaces and cognitive theories to design efficient, general-purpose learners that mirror the adaptive, data-efficient nature of human intelligence—especially in domains grounded in physical and visual reasoning.

Personal Statement My journey in research has been shaped as much by constraint as by curiosity. As a doctoral student, I worked in environments where access to computational resources, collaborative networks, and institutional support was often limited or structurally inaccessible. These barriers—common among underrepresented researchers—shaped not only the conditions under which I conducted my work, but also the kind of science I chose to pursue.

In navigating these constraints, I became increasingly aware of how access to opportunity in academia is often shaped by structural and social factors beyond the quality of one's ideas or the rigor of one's work. In such ecosystems, visibility and recognition can accrue unevenly, sometimes independent of scientific contribution. My path has been different—driven by independent inquiry and sustained through persistence in the face of limited institutional support. While these conditions have not always aligned with traditional academic markers of success, they have instilled in me a deep respect for originality, integrity, and the often-unseen labor behind meaningful research.

These experiences have not only informed my research focus—on building efficient, adaptive learning systems that can thrive under uncertainty—but also my broader commitment to equity in science. I believe that lowering the computational and institutional barriers to entry in machine learning research is essential for both scientific progress and inclusion. I am equally committed to helping foster academic environments that recognize and support diverse forms of excellence, and that create space for researchers whose work is driven by necessity, creativity, and independence.

RESEARCH EXPERIENCE

Johns Hopkins University Computer Science Department (Baltimore, MD, USA)	9/2020 – now	**Graduate Research Assistant** Advisor: Dr. Alan Yuille
Laboratory for Computational Sensing + Robotics (Baltimore, MD, USA)	6/2020 – 9/2020	**Graduate Research Assistant** Supervisor: Dr. Marin Kobilarov Project: Unsupervised Robot Visual Path Detection
School of Public Health (Baltimore, MD, USA)	10/2018 – 4/2019	**Graduate Research Assistant** Supervisor: Dr. Qingfeng Li Project: World Scale Traffic Dataset Creation
Information Security Institute (Baltimore, MD, USA)	6/2018 – 10/2018	**Graduate Research Assistant** Supervisor: Dr. Lanier Watkins Project: Fuzzy Control Systems
Amazon Sponsored Products	06/2021 – 09/2021	**Applied Scientist Intern** Supervisors: Dr. Avishek Saha Project: Causal Analysis in Ads
Visual Search (Palo Alto, CA, USA)	06/2022 – 12/2022	**Applied Scientist Intern** Supervisors: Dr. Brian Li Project: Structured Image Inpainting
CR Rao Institute of Maths, Stats & CS (Hyderabad, India)	4/2017 – 7/2017	**Research Intern** Host: Dr. Vishal Saraswat
Indian Statistical Institute Microsoft Research Asia (Kolkata, India)	5/2016 – 8/2016	**Research Intern** Host: Dr. Vishal Saraswat

INDUSTRY EXPERIENCE

Amplio Sports Analytics	04/2019 – 04/2020	**AI Development Lead**
Ernst&Young	07/2017 – 12/2017	**Risk Analyst**

PUBLICATIONS AND PAPERS

Papers with future venues are accepted to appear in them.
** equal contribution.*

- **Gaussian Scenes: Pose-Free Sparse-View Scene Reconstruction using Depth-Enhanced Diffusion Priors.** Soumava Paul, Prakhar Kaushik, Alan Yuille. Transactions on Machine Learning Research (**TMLR**) 2025
- **EigenLoRAx: Recycling Adapters to Find Principal Subspaces for Resource-Efficient Adaptation and Inference**. Prakhar Kaushik, Ankit Vaidya, Shravan Chaudhari, Alan Yuille. (**CVPR**-W) **Oral** 2025
- Progressive Prompt Detailing for Improved Alignment in Text-to Image Generative Models. Ketan Suhaas Saichandran*, X Thomas*, Prakhar Kaushik, Deepti Ghadiyaram, (**CVPR**-W) **Oral**, 2025.
- **EigenFlux: Parameter Efficient Continual Finetuning via Low-Rank Shared Subspace Adaptation**. Prakhar Kaushik, Ankit Vaidya, Alan Yuille, preprint, 2024.
- Scaling Neural Mesh Models for Robust Classification and Pose Estimation. Xiaoding Yuan*, Prakhar Kaushik*, Guofeng Zhang*, Artur Jesslen, Adam Kortylewski, and Alan Yuille. preprint, 2024.
- CIDA-3D: Conformal Inference aided Unsupervised Domain Adaptation for 3D-Aware Classification. Prakhar Kaushik, Aayush Mishra, Anqi Liu, Adam Kortylewski, and Alan Yuille. preprint, 2024.
- EigenLoRA: Recycle trained Adapters for Resource Efficient Adaptation and Inference. Prakhar Kaushik, Aayush Mishra*, Ankit Vaidya*, ..., Alan Yuille. preprint, 2024
- DSPart: A Large-scale Diffusion-generated Synthetic Dataset with Annotations from 3D Parts. Jiawei Peng, Yining Sun, Ju He, Jieneng Chen, Prakhar Kaushik, Wufei Ma, Yi Zhang, Jiahao Wang, Angtian Wang, Xiaoding Yuan, Qihao Liu, Adam Kortylewski, Yaoyao Liu, and Alan Yuille. preprint, 2024.
- **A Source-Free and Image-Only Unsupervised Domain Adaptation for Category Level Object Pose Estimation**. Prakhar Kaushik, Aayush Mishra, Adam Kortylewski, and Alan Yuille. In *The Twelfth International Conference on Learning Representations*, (**ICLR**) 2024.
- **A Bayesian Approach to OOD Robustness in Image Classification**. Prakhar Kaushik, Adam Kortylewski, and Alan Yuille. In *The IEEE/CVF Conference on Computer Vision and Pattern Recognition*, (**CVPR**) 2024.
- iNeMo: Incremental Neural Mesh Models for Robust Class-Incremental Learning. Tom Fischer, Yaoyao Liu, Artur Jesslen, Noor Ahmed, Prakhar Kaushik, Angtian Wang, Alan Yuille, Adam Kortylewski, and Eddy Ilg. preprint, The 18th European Conference on Computer Vision **(ECCV)** 2024.
- Learning Part Segmentation from Synthetic Animals. Jiawei Peng, Ju He, Prakhar Kaushik, Zihao Xiao, Jiteng Mu, and Alan Yuille. In *Proceedings of the IEEE/CVF Winter Conference on Applications of Computer Vision*, (**WACV**) 2024.
- Animal3d: A comprehensive dataset of 3d animal pose and shape. Xu et al. In *Proceedings of the IEEE/CVF International Conference on Computer Vision* (**ICCV**), 2023.

- **Understanding catastrophic forgetting and remembering in continual learning with optimal relevance mapping.** Prakhar Kaushik, Alex Gain, Adam Kortylewski, Alan Yuille. In *Conference on Neural Information Processing Systems Fifth Workshop on Meta Learning*, (**NeurIPS**) workshop 2021.
- Adaptive neural connections for sparsity learning. Prakhar Kaushik*, Alex Gain*, Hava Siegelmann. In *Proceedings of the IEEE/CVF Winter Conference on Applications of Computer Vision*, (**WACV**) 2020.
- Radar as a Security Measure - Real Time Neural Model based Human Detection and Behaviour Classification. Prakhar Kaushik. In *IEEE Global Conference on Signal and Information Processing*, 2019.
- Timing attack analysis on AES on modern processors. Prakhar Kaushik, Rana Majumdar. In *International Conference on Reliability, Infocom Technologies and Optimization*, 2017.
- An Offline Outdoor Navigation System with Full Privacy. Prakhar Kaushik, Vishal Saraswat, and Francesco Buccafurri. In *Proceedings of the 14th International Joint Conference on e-Business and Telecommunications* , 2017.

Selected Research Themes Scalable adaptation for generative models (LLMs/VLMs), efficient deep learning, low-rank/shared and part-based representations, continual and transfer learning, biologically inspired 3D modeling, 3D vision, few-shot learning, model compression, and robust multimodal AI.

TALKS

- Artificial Intelligence for Engineering and Medicine Lab (Dr. Rama Chellappa, Bloomberg Distinguished Professor) - April'24
- JHU Cognitive Neuroscience and Deep Learning Group - Feb'25

AWARDS AND FELLOWSHIPS

- Lieutenant General MM Lakhera Silver Medal, 2012 – Best In Mathematics.
- Colonel Haughten Silver Medal, 2012.
- Lieutenant Commander Rajat K Sen Silver Medal, 2010.
- UN Jha Memorial Gold Medal, 2010.
- All India Rank 1 - Rashtriya Indian Military College Examination
- All India Rank 2 - UPSC National Defence Academy and Naval Academy Examination

SERVICE

- Founder and President of Indian Graduate Student Association (IGSA), Johns Hopkins, 2022–now.
- Reviewer for NeurIPS, ICLR, CVPR, ICCV, BMVC, WACV, AAAI, ICML (2019-now).