Bhishma Dedhia

Curriculum Vitae

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Google Scholar

Research Interests

My interests are in scalable training objectives and adaptive inference methods for large-scale generative models. My work bridges foundational machine learning with strong empirical performance to scale inference, enhance capabilities, and improve the efficiency of multimodal models across language, vision, and time-series data.

Education

2020-2025 **Princeton University, New Jersey**,
MA+PhD in Machine Learning, .
Thesis: Concepts, Compositions, and Counterfactuals: Machine Abstractions for Human-like AI
Advisor: Prof. Niraj K Jha
Expected Graduation: Fall 2025

2016–2020 **Indian Institute of Technology (IIT), Bombay**,
Electrical Engineering, Bachelor of Technology with Honors, *GPA* 9.85/10, Rank 4/950, 1/120.
Thesis: On Minimizing Channel-Aware Age of Information in Multi-Sensor Networks
Advisor: Prof. Sharayu Moharir

Published papers

[11] 2025 Generating, Fast and Slow: Scalable Parallel Video Generation with Video Interface Networks
Bhishma Dedhia, David Bourgin, Krishna Kumar Singh, Yuheng Li, Yan Kang, Niraj K Jha, Yuchen Liu ICCV

[10] 2025 Neural Slot Interpreters: Grounding Object Semantics in Emergent Slot Representations
Bhishma Dedhia, Niraj K Jha TMLR

[9] 2024 Zero-TPrune: Zero-Shot Token Pruning through Leveraging of the Attention Graph in Pre-Trained Transformers
Hongjie Wang, **Bhishma Dedhia**, Niraj K Jha CVPR

[8] 2023 Im-Promptu: In-Context Composition from Image Prompts
Bhishma Dedhia, Michael Chang, Jake C Snell, Thomas L Griffiths, Niraj K Jha NeurIPS

[7] 2023 SCouT: Synthetic Counterfactuals via Spatiotemporal Transformers for Actionable Healthcare
Bhishma Dedhia* , Roshini Balasubramanian* , Niraj K Jha ACM HEALTH

[6] 2023 FlexiBERT: Are Current Transformer Architectures too Homogeneous and Rigid?
Shikhar Tuli, **Bhishma Dedhia**, Shreshth Tuli, Niraj K Jha JAIR

[5] 2023 Whittle Index based Age-of-Information Aware Scheduling for Markovian Channels
B Sombabu, **Bhishma Dedhia**, Sharayu Moharir Computer Networks and Communications

[4] 2021 Saliency-driven rate-distortion optimization for 360-degree image coding
Jui-Chiu Chiang, Cheng-Yu Yang, **Bhishma Dedhia**, Yi-Fan Char Multimedia Tools and Applications

[3] 2020 Lower Bounds for Policy Iteration on Multi-action MDPs
Kumar Ashutosh* , Sarthak Consul* , **Bhishma Dedhia*** , Parthasarathi Khirwadkar* , Sahil Shah* , Shivaram Kalyanakrishnan CDC

[2] 2020 You Snooze, You Lose: Minimizing Channel-Aware Age of Information
Bhishma Dedhia, Sharayu Moharir WiOpt

[1] 2019 Saliency Prediction for Omnidirectional Images Considering Optimization on Sphere Domain
Bhishma Dedhia, Jui-Chiu Chiang, Yi-Fan Char ICASSP

Pre-prints

(arXiv) Bottom-up Domain-Specific Superintelligence: A Knowledge Graph is What We Need
Bhishma Dedhia, Yuval Kansal, Niraj K. Jha

Research and Industry Experience

2020- **Graduate Researcher, Jha-Lab, Princeton University**,
Advisor: Prof. Niraj K Jha.

My PhD research spans the following topics:
- Bottom-Up Domain-Specific Superintelligence: Reasoning curriculum generation for LLM post-training with knowledge graphs
- Video Interface Networks: Scaling test-time compute for video generation models (ICCV 2025)
- Neural Slot Interpreters: Visual grounding with object-centric representations (TMLR 2025)
- Zero-T-Prune: Training free token pruning for vision transformers (CVPR 2024)
- Im-Promptu: In-Context learning from images (NeurIPS 2023)
- SCouT: Causal inference with transformers (ACM Health 2023)
- FlexiBERT: Neural architecture search method for language models (JAIR 2023)

May-Nov 2024 **Research Scientist Intern, Adobe Research**,
Mentors: Yuchen Liu and Krishna Singh.

Scaling test-time compute for long video generation
- Developed a novel diffusion-based paradigm for long video generation that can generate temporal segments of photorealistic videos in parallel.
- Proposed a scalable transformer-based backbone for video understanding.
- Designed an input-aware video tokenizer that achieves 50% improved compression FVD compared to the traditional context-agnostic tokenizer.
- Scaled architectures from $1B - 5B+$ parameters.
- Demonstrated state-of-the-art optical flow and long-range semantic coherence. Generated long photorealistic videos up to half a minute long.

2022-2023 **Graduate Researcher, Princeton Computational Cognitive Science Lab**,
Advisor: Prof. Tom Griffiths.

Worked on understanding inductive-biases and designing architectures for in-context learning from visual data.

2019-2020 **Undergraduate Researcher, Stochastic Systems Lab, IIT Bombay**,
Advisor: Prof. Sharayu Moharir.

Formulated and proved efficient resource allocation algorithms for wireless networks, drawing inspiration from restless multi-armed bandits and randomized algorithms.

2019-2020 **Undergraduate Researcher, Reinforcement Learning Group, IIT Bombay**,
Advisor: Prof. Shivaram Kalyanakrishnan.

Proved novel theoretical lower bounds for a generalized abstraction of the simple policy iteration method

2019 **Undergraduate Research Intern, Jha Lab, Princeton University**,
Advisor: Prof. Niraj K Jha.

Designed generative models for extracting Markov blankets and causal discovery.

2018 **Undergraduate Research Intern, Video Communications Lab, CCU Taiwan**, *Advisor: Prof. Rachel Chiang*.

Developed saliency prediction models for omnidirectional videos

Selected Awards and Honors

2023 **Princeton School of Engineering and Applied Sciences Travel Grant**.

2020 **Princeton Natural Sciences and Engineering First Year Fellowship**.

2020 **IIT Bombay Institute Silver Medal**.

2020 **Prof. KC Mukherjee Award for best senior thesis in EE, IIT Bombay**.

2019 **Narotam Sekhsaria Foundation Undergraduate Award, 2019**.

2019 **S.N. Bose Fellowship, Indo-U.S. Science and Technology Forum**.

2019 **Urvish Medh Memorial Award for academic excellence at IIT Bombay**.

2018, 2019 **Institute Academic Award for academic excellence at IIT Bombay**.

2016 **All India Rank 150 in JEE-Mains for entrance to IITs**.

2016 **State Rank 2/100,000 in HSC Examinations, Maharashtra**.

Graduate Coursework

Computational Models of Cognition (A+), Convex and Conic Optimization, Natural Language Processing (A+), Theoretical Reinforcement Learning, Computer Vision, Probabilistic Models of Cognition, Safety-critical Robotic Systems

Teaching

Fall 2021 ECE 364: Predictive Data Analytics, Princeton University
Teaching Assistant with Prof. Niraj K Jha

Spring 2018 MA 108: Differential Equations , IIT Bombay
Teaching Assistant with Prof. Ronny Sebastian and Prof. Manoj Kumar Keshari

Technical Skills

Python, MATLAB, C++, Torch, Tensorflow, JAX, Verilog, Assembly, FPGAs

Distractions

Running, Reading, Analog Photography, Guitar, Development Economics

References

Available on request