Bhavya Vasudeva

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Education

Ph.D., University of Southern California 2021-Present
Major: Computer Science
Advisor: Prof. Vatsal Sharan

B. Tech., Indian Institute of Technology Roorkee 2016-2020
Major: Electronics and Communication Engineering GPA: 9.362/10, Rank: 3/84
Thesis: Compressive Sensing MRI Reconstruction using GANs
Advisors: Prof. Saumik Bhattacharya & Prof. P. M. Pradhan

Interests

Theoretical Foundations of Deep Learning, Robustness to Distributional Shifts

Selected Publications

1. Mitigating Simplicity Bias in Deep Learning for Improved OOD Generalization and Robustness
   B. Vasudeva, K. Shahabi, V. Sharan *SCIS Workshop@ICML 2023*
2. Fast Test Error Rates for Gradient Methods on Separable Data
   P. Deora*, **B. Vasudeva***, V. Sharan, C. Thrampoulidis *HiLD Workshop@ICML 2023; ICASSP 2024*
3. Compressed Sensing MRI Reconstruction with Co-VeGAN: Complex-Valued Generative Adversarial Network
   B. Vasudeva*, P. Deora*, S. Bhattacharya, P. M. Pradhan *WACV 2022*
4. LoOp: Looking for Optimal Hard Negative Embeddings for Deep Metric Learning
   B. Vasudeva*, P. Deora*, S. Bhattacharya, U. Pal, S. Chanda *ICCV 2021*
5. Structure Preserving Compressive Sensing MRI Reconstruction using Generative Adversarial Networks
   P. Deora*, **B. Vasudeva***, S. Bhattacharya, P. M. Pradhan *CVPR Workshops 2020*

(*equal contribution)

Research Experience

Graduate Research Assistant USC
Advisor: Prof. Vatsal Sharan Aug'21 - May'26 (Exp.)

- Developed an approach to mitigate simplicity bias in deep learning, leading to improved OOD generalization and robustness on a variety of benchmarks. Code | Paper | Poster
- Analyzing the inductive bias of transformers to learn low sensitivity functions.

Visiting Researcher ISI Kolkata
Advisors: Prof. Saumik Bhattacharya & Prof. Umapada Pal June'20 - June'21

- Analyzed the gradients of various deep metric learning losses and proposed a novel loss. Paper
- Proposed to find optimal hard negatives for deep metric learning loss functions. Obtains upto 7.2% increase in retrieval, 5.8% increase in clustering performance. Code | Paper | Slides
- Designed an ISP-inspired model for RAW to RGB conversion. Ranked 4^{th} in mean opinion score in an AIM workshop challenge, ECCV 2020. Code | Paper

Undergraduate Researcher (Bachelor Thesis) IIT Roorkee
Advisors: Prof. Saumik Bhattacharya & Prof. P. M. Pradhan June'19 - July'20

- Developed a novel complex-valued GAN framework for reliable reconstruction of both magnitude and phase content of compressed sensing MR images. Uses significantly fewer ($\sim 77\times$) parameters, obtains upto 15.7% increase in PSNR as compared to real-valued approaches. Code | Paper | Slides
- Worked on a GAN-based model aiming to preserve the structural content in the reconstructed CS-MR images. Obtains upto 8.2% increase in PSNR. Code | Paper

Undergraduate Intern Northwestern University
Advisor: Prof. Yuan Yang May'19 - July'19

- Developed a metric to quantify various types of phase coupling. Paper | Slides

Undergraduate Researcher — IIT Roorkee
Advisors: Prof. P. M. Pradhan & Prof. S. Dasgupta — May'18 - Nov'18
- Worked on the FPGA Implementation of a fetal heart rate monitoring system. [Paper]

Other Projects

- Simplicity Bias of SGD for 1-hidden-layer Neural Networks [Report] — EE546, USC | Fall'22
- Survey of OoD Generalization Methods [Report] — CSCI699, USC | Fall'21
- Low-light Image Enhancement [Code | Report] — IIT Roorkee | Spring'19

Awards and Achievements

2023 Selected as a **top reviewer** for NeurIPS 2023
2023 USC **WiSE travel grant** for attending ICML 2023
2021 Selected for **EEML** and **CMMRS** Summer Schools
2020 **Singhal's Tech. for Society Award** for best bachelor thesis at institute level
2020 **Viney K. and Sunita Jain Award** for academic excellence by IIT Roorkee
2020 **3AI Pinnacle Student of the Year Award** for bachelor thesis
2019 **S. N. Bose Scholars Program**, among the 50 students selected across the country
2017 Third position, **International Robotics Challenge** at Techfest'17, IIT Bombay
2016 IIT JEE Advanced **All India Rank 978**, 99.5 percentile
2016 IIT JEE Mains **All India Rank 336** among 1.2 million candidates
2015 **Kishore Vaigyanik Protsahan Yojana**, awarded fellowship in Science stream by IISc Bangalore
2014 **National Talent Search Examination**, awarded scholarship by the Government of India

Skills

Prog. Languages Python, Matlab
Libraries & Tools PyTorch, Keras, TensorFlow, Git, LaTeX

Service

Volunteer ICLR 2021, ICML 2021
Reviewer SCIS Workshop@ICML 2023, NeurIPS 2023, ICLR 2024

Teaching Experience

TA, Fall'22 Teaching Assistant for CSCI567: Machine Learning, offered by Prof. Vatsal Sharan.
TA, Fall'23 Teaching Assistant for CSCI699: Theory of Machine Learning, offered by Prof. Vatsal Sharan.

Students Supervised

- Luke Pratt, SHINE'22 summer research program (K-12 STEM outreach) — Summer'22
- Devin Martin, SURE'22 summer research program (USC UG) — Summer'22
- Kameron Shahabi (USC MS) — Sept'22 - May'23
- Youqi Huang, SURE'23 and CURVE'23 research programs (USC UG) — June'23-Present
- Elliott Kau (USC MS) — Sept'23 - Present

Coursework

Graduate Theory of ML, Advanced Analysis of Algorithms, Convex & Combinatorial Optimization, Mathematics of High-Dimensional Data, Computational Perspectives at the Frontiers of ML
Undergraduate Deep Learning, Digital Image Processing, Digital Signal Processing, Signals & Systems, Probability & Statistics, Maths.-I (Matrix Algebra, Vector Calculus), Mathematical Methods (Solving ODEs & PDEs), Fundamentals of Object Oriented Programming, Data Structures