Anuradha Uggi

Ph.D. Candidate
Indian Institute of Technology, Hyderabad

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Research Interests

Machine Learning, Deep Learning, Computer Vision, and Signal Processing.

Education

- **Ph.D. in EE, Indian Institute of Technology, Hyderabad** *Jan 2021 - Present*

  Courses
  - Image and Video Processing, Pattern Recognition and Machine Learning, Convex Optimization, Random Variables and Stochastic Processes, Information Theory, Advanced Digital Signal Processing, Principles of Digital Communications, etc.

- **B.Tech. in ECE, Rajiv Gandhi University of Knowledge Technologies, IIIT-Basara.** *Aug 2015 - Jul 2019*

  Courses
  - Signals and Systems, Digital Signal Processing, Biomedical Signal Processing, Probability Theory and Stochastic Processes, Computer Networks, Wireless Communications, OOPs through JAVA, C Programming, etc.

Research Summary

Current autonomous navigation systems are heavily reliant on GPS-signals, which are not always and everywhere accessible and reliable. Visual Place Recognition (VPR) offers an alternative navigation system. VPR recognizes the coordinates of an input image, thus localizing the target. However, practical challenges such as occlusions caused by weather changes, differences in perspective, scale, and rotation, day-night shifts, visual aliasing, limited computational resources in real-time, etc., make VPR non-trivial and far from ready to deploy. Modern VPR is predominantly built on deep learning models, which achieved a remarkable performance improvement over classical approaches. Concurrently, they increased the complexity of the models. This call for a development of efficient and robust representation learning techniques which is the primary focus of this research.

Publications

- **A. Uggi and S. S. Channappayya**, "MS-NetVLAD: Multi-Scale NetVLAD for Visual Place Recognition", **IEEE Signal Processing Letters (2024) vol. 31, pp. 1855-1859.**
- **A. Uggi and S. S. Channappayya**, "Training-free Adapter for Multi-Modal Image Matching for All-Day Visual Place Recognition", **ICASSP (2025), pp. 1-5.**
- **A. Uggi and S. S. Channappayya**, "Representation Learning for Adaptive Test-Time Efficiency in Visual Place Recognition", **Elsevier, Signal Processing: Image Communication, 2025 (Under Review).**
- **A. Uggi and S. S. Channappayya**, "A New Perspective on Triplet-Based Contrastive Loss Functions for Better Representations", **In Preparation.**

Experience

- **Research Internship at TCS R&I, Banglore** *May 2023 - Aug 2023*

  Multimodal Biomedical Image Registration
  - Analysed the NeurIPS 2019 work CoMIR for biomedical multimodal (BF and SHG) image registration for better image fusion.
  - Developed a novel contrastive loss function that includes gradient maps of multimodal images for model optimization.
  - Achieved better matching between representation maps of complex BF and SHG in terms of SSIM score.

Projects

- **Cross-Domain Aerial Image Matching for Autonomous UAV Navigation in No GPS Environments** *Jan 2021 - Aug 2024*

  Project with DRDL, Hyderabad
  - Studied a broad range of models such as LPIPS, NetVLAD, MS-NetVLAD, NCNet, PatchNetVLAD, LightGlue, and MixVPR on datsets with many practical challenges.
  - Ported NetVLAD and MixVPR to the resource-constrained hardware board Orin-Nano and achieved 25 FPS and 30 FPS frame rates.
  - Integrated NetVLAD and MixVPR with a realistic end-to-end system with camera sensor.
  - Developed an interactive framework that can run any model from the pool of the above ones.
  - Ported the custom code to the DeepStream App. for real-time streaming.

- **Systematic Analysis of Traditional Methods for Image Matching** *Aug 2021 - Dec 2021*

  IVP Course Project under Prof. Sumohana S. Channappayya at IITH
  - Analysed different classical methods such as SIFT, SURF, BRISK, ORB, and DeepMatch for image matching.
  - Demonstrated the degradation in the number of keypoints extracted for low-texture thermal image pairs compared to RGB pairs through qualitative and quantitative study.

- **Handwritten Character Recognition using Neural Networks** *May 2021 - June 2021*

  PRML Course Project under Prof. K. Sri Rama Murty at IITH
  - Studied the performance of Multi-Layer Perceptrons (MLPs) and Convolutional Neural Networks (CNNs) on handwritten digit and character recognition datasets MNIST.
  - Experimented converting handwritten English text to digital form.

- **Designing a PLC-VLC Communication System for 5G Communications** *Sep 2018 - May 2019*

  Final Year Thesis under Dr. G Srinivas Sagar at RGBUKT, Basar.
  - Implemented a hybrid Power-Line Communication (PLC) and Visible-Light Communication (VLC) system for smart buildings in MATLAB.

Technical Skills

Languages: Python, C, Verilog, MATLAB
Frameworks: PyTorch, Tensorflow, OpenCV
Developer Tools: GitHub, VS-Code
Operating Systems: Linux, Windows

Honors & Awards

- **Sakura Science Program** Selected to visit and contribute to Ehime University, Japan *Dec 2025*
- **All India Rank 1678 (Percentile - 98)** Graduate Aptitude Test in Engineering 2020 - EC20S41402479 *Feb 2020*
- **All India Rank 6956 (Percentile - 93)** Graduate Aptitude Test in Engineering 2019 - EC19S51402353 *Feb 2019*

Responsibilities

- Reviewer for the journal **Elsevier, Signal Processing: Image Communication** *Since 2025*
- Reviewer for the conference **IEEE ICASSP** *Since 2025*
- Subject Matter Expert in Signal & Systems at Chegg Inc. *Sept - Nov 2019*

Teaching Assistantship

- **AI5100: Deep Learning**, IIT Hyderabad *May - Nov 2023*
- **EE6310: Image and Video Processing**, IIT Hyderabad *Jan - May 2023*
- **EE5847: Information Theory**, IIT Hyderabad *Jan - Feb 2022*

References

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