Sandeep Mishra

Ph.D Student, University of Texas at Austin

Advisor: ***Prof. Alan C. Bovik***

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Webpage

Research Interests: Image/Video Quality Assessment and Enhancement, Self-Supervised Learning, Efficient Learning

Education

University of Texas at Austin
Graduate Student Researcher - Electrical and Computer Engineering *2021 - Present*
Anticipated graduation - 12/2025

Indian Institute of Technology Kharagpur, India
B.Tech(E & ECE) + M.Tech Dual Degree in Visual Information & Embedded Systems *2014 - 2019*
Minor in Computer Science & Technology

Publication

Re-IQA : Unsupervised Learning for Image Quality Assessment in the Wild
Sandeep Mishra, *Avinab Saha, Alan C. Bovik*
Conference on Computer Vision and Pattern Recognition - 2023

RecSal : Deep Recursive Supervision for Visual Saliency Prediction
Sandeep Mishra *and Oindrila Saha*
British Machine Vision Conference (BMVC), 2020

Research Projects

- **Rethinking Image Quality Assessment** UT Austin
  PI: Alan C. Bovik *2021 - Present*
  - ▷ Designed a Mixture of Experts approach to learn complementary distortion-aware features and content-aware features for Image Quality Assessment.
  - ▷ Re-used MoCo-v2 training paradigm for learning unsupervised content-aware features using ImageNet dataset.
  - ▷ Modified the MoCo paradigm with a novel image augmentation scheme to facilitate learning of quality-aware features.
  - ▷ Proposed a novel Intra-Pair Image Swapping and an overlapping-area based cropping scheme to generate better samples of 'similar-quality' and 'different-quality' pairs.
  - ▷ Demonstrated the significant impact of content on the subjective quality of 'Images in the Wild' scenario and the impact of distortion-aware features on the subjective quality of synthetically distorted images.
- **LIVE-ShareChat UGC database and Video Quality Evaluation** UT Austin, ShareChat
  PI: Alan C. Bovik *2021 - Present*
  - ▷ Designed and conducted a study to capture human opinion scores for video quality assessment of ShareChat reels.
  - ▷ Mean opinion scores were calculated after post-processing of the raw data collected from 48 subjects over 600 videos.
  - ▷ Trained the novel Re-IQA framework with image-frames from over 20K ShareChat videos to learn quality aware features.
  - ▷ Paired the Re-IQA quality-aware encoder with a LSTM head for temporal processing of video frames.
  - ▷ Single-handedly beats all state of the art methods for video quality prediction on LIVE-ShareChat UGC database.
- **Biologically Inspired Saliency Prediction** IIT Kharagpur
  Independent Project, ***BMVC'20*** *2019 - 2020*
  - ▷ Proposed optimising a different loss per output map & a multi-decoder model to exploit all levels of features.
  - ▷ Extracted temporal and sequential metadata from existing datasets to provide extra supervision for saliency detection.
  - ▷ Designed recursive blocks to provide bio-inspired supervision with temporally/spatially sequenced metadata.
  - ▷ Outperformed previous SOTA methods with 50-80% fewer parameters, while also performing consistently well across all evaluation metrics unlike prior art methods.
  - ▷ First position among all published work in the LSUN-Saliency Prediction Challenge (CVPR'17)
- **Joint embedding space for Image and Text analysis** IIT Kharagpur
  Master Thesis, Guide: Prof. Debashis Sen *2018 - 2019*
  - ▷ Designed a encoder network to extract a feature vector representation of an image.
  - ▷ Generated feature vector representation for a caption of the same image using LSTMs.
  - ▷ Proposed various ranking methods to compute a similarity score between the vectors generated and trained the networks using these scores as loss function.

- **Fuzzy Bayesian surprise model for Human Attention** — IIT Kharagpur
  Bachelor Thesis, Guide: Prof. Debashis Sen — *2017 - 2018*
  - ▷ Compute saliency maps for each frame of a video input based on features like color, intensity and motion.
  - ▷ Formulated the surprise for each frame w.r.t. its previous frames using a fuzzy Bayesian probabilistic model.
  - ▷ Developed a winner-take-all criteria on surprise map to select the point of maximum attention.
  - ▷ Performed an extensive comparison of the above method with SOTA w.r.t. the ground truth/eye tracking data.

Industrial Experience

- **SRIB - Samsung R&D Institute Bangalore** — Bangalore, India
  Lead Research Engineer, Visual Intelligence Group (VIG) — *2019 - 2021*

  AI Gallery Zoom
  - ▷ Designed a low complexity ($\approx 2K$ parameters) CNN based Image Super-Resolution software pipeline.
  - ▷ Trained three different networks configurations and developed classification and detection modules to handle different sources of images in Gallery to produce artifact free super-resolved images under all scenarios.
  - ▷ Commercialized in more than 10 latest Samsung Mid-Tier mobile phones and flagship mobile devices in 2021.
  - ▷ Awarded **Samsung Citizen Award** and **Spot Award** for remarkable contribution and successful commercialization.

  AI Video Super Resolution
  - ▷ Developed a Video SR solution (on top of optical zoom of 4x) for Samsung smartphones.
  - ▷ Implemented unsupervised Cycle-GAN for transferring wide-lens images to Tele-lens domain (self captured).
  - ▷ SR networks when trained on this synthetic data produced outputs with highly enhanced details, sharpness and reduced noise levels as compared to the existing solutions (using conventional datasets) without introducing any artifacts.
  - ▷ Awarded **Spot Award** for remarkable contribution in validating PoC and achieving high quality Super-Resolution on videos captured through Tele-Lens.

- **SRIB - Samsung R&D Institute Bangalore** — Bangalore, India
  Research Intern, Visual Intelligence Group (VIG) — *Summer 2018*
  - ▷ Developed a deep CNN based 3D Human Pose estimation model using a single RGB camera without a depth sensor.
  - ▷ Implemented VNect decoder along with MobileNetV2 encoder and ResNet50 encoder and evaluated their performance.
  - ▷ Achieved real time applications with a significantly small sized model that could be implemented on a mobile device.

Skills

- Programming: Python, C/C++
- Scientific: Pytorch, TensorFlow, MATLAB

Awards and Honors

- Honored with **Samsung Citizen Award** and **Spot Award** for excellent technical contribution in Samsung for the year 2020
- Secured All India Rank **487** in **JEE ADVANCED**-2014 (**secured 99.7 percentile**)
- Secured All India Rank **158** in **JEE MAINS**-2014 conducted by CBSE (**secured 99.99 percentile**)
- Secured All India Rank **102** in **Kishore Vaigyanik Protsahana Yojana**-2013 conducted by IISc, Bangalore and received scholarship for the same from Department of Science and Technology, Government of India
- Received **National Talent Search Examination** Scholarship from Ministry of Human Resource Development, India

Responsibilities

- **Teaching Assistantship**: Department of Electronics and Electrical Communication Engg., IIT Kharagpur
  - ▷ Introduction to Electronics Lab: *Prof. Chetna Singhal & Prof. Shailendra Kumar Varshney* — *2018*
  - ▷ Image Processing Lab: *Prof. Sudipta Mukhopadhyay* — *2019*
- Mentored a 4 week web development course organized by EduSpectrum for freshmen of IIT Kharagpur — *2016*
- Awarded the Best NSS Volunteer (National Service Scheme, under Ministry of Youth Affairs & Sports, India) for excellent service towards education and development in villages near IIT Kharagpur — *2014-16*