

ABHISHEK KUMAR SINHA

abhisheksinha920@gmail.com

EDUCATION

Bachelor of Technology in Electronics and Communication Engineering

Indian Institute of Space Science and Technology, Thiruvananthapuram

CGPA- 9.47/10.00

2016 - 2020

PREVIOUS WORK EXPERIENCE

Scientist/Engineer at Indian Space Research Organization, Ahmedabad

January 2021-Present

- Technology Development Project on lossless and near-lossless neural image compression methods for satellite imagery archival at ground stations.
- Developed multiple deep learning based modules for satellite image processing chain. The modules include deep gradient optimizer for deblurring, data compression, denoising etc.
- Undertaken a research project to explore the application of Fourier features for deep image super-resolution.

Undergraduate Researcher at IIST

January 2020- July, 2020

- Developed a deep learning architecture to compress the video frames without using the motion vectors. The proposed method outperformed the existing codecs and deep learning models.
- The architecture achieved a MS-SSIM and PSNR of 0.911 and 24.469 dB, respectively in CVPR CLIC P-Frame 2020 Validation challenge.

Research Intern at Space Application Centre, Ahmedabad

June 2019-July 2019

- Worked on an algorithm to calculate Doppler shift in the frequency by using the satellite orbital parameters.
- Developed a modified Costas loop PLL to lock on the frequency affected by very high Doppler rate.
- Performed satellite link budget analysis to analyze the feasibility of the real-time implementation using available resources.

ACHIEVEMENTS & SCHOLARSHIPS

- Secured **Rank 2** in the ECE 2016-20 undergraduate batch.
- **Department of Space Assistance Scholarship** for Undergraduate studies at IIST for four years.
- Selected for **Satish Dhawan Endowed CalTech Masters Fellowship 2020** (declined due to program delay during Covid-19).

TALKS & ACADEMIC SERVICES

- Reviewer at IEEE Transactions on Signal Processing, CVPR Workshops 2022, and IAPR-CVIP 2021.
- Full day talk on Image Processing to Bhutan scientists for India-Bhutan Nanosat training program in July 2022.

PUBLICATIONS

- **Abhishek Kumar Sinha**, S. Manthira Moorthi, Debajyoti Dhar, NL-FFC: Non-Local Fast Fourier Convolution for Image Super Resolution, IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR) Workshops, 2022.
- **Abhishek Kumar Sinha**, S. Manthira Moorthi, Debajyoti Dhar, Self-Supervised Variable Rate Image Compression Using Visual Attention, IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR) Workshops, 2022.

- **Abhishek Kumar Sinha**, Deepak Mishra, Deep Video Compression using Compressed P-Frame Resampling, National Conference on Communications, 2021.
- **Abhishek Kumar Sinha**, Deepak Mishra, T3D-Y Codec: A Video Compression Framework using Temporal 3-D CNN Encoder and Y-Style CNN Decoder, IEEE 11th International Conference on Computing, Communication and Networking Technologies, 2020.

RESEARCH PROJECTS

Self-supervised image variable rate image compression

March 2021-June 2022

- Worked on a variable rate compression using feature-pyramid network. The key contributions involve the demonstration of self-supervised features for performing image compression, and theoretical bound to avoid the collapse of variable rate to single rate compression.
- The similar architecture was also used for satellite imagery compression at the local storage server.

T3D-Y Codec for Video Compression | Supervisor- Dr. Deepak Mishra

January 2020- July 2020

- Proposed two video compression architectures to compress the video frames using keyframes.
- Designed and analysed two CNNs, **Temporal 3D CNN** and **Y-Style CNN**, to encode and decode the video frames.

Deep learning model for H.264 baseline profile decoder | Supervisor - Dr. Deepak Mishra

Aug 2019- Dec 2019

- Proposed a Convolutional Neural Network architecture to perform H.264 P-frame decoding.
- The model can decode the P-frame by implicitly learning the features of the I-frame and P-frame and adding them to generate a feature vector for the decoded frame.
- In the initial phase, the model achieve a maximum MS-SSIM of 0.78 and a maximum PSNR of 25 dB. The results subsequently improved to MS-SSIM above 0.9 and PSNR over 35 dB after tuning the training process.