

Joshua Peter Ebenezer

Email-id [firstname][lastname]@utexas.edu

Website: joshuaebenezer.github.io



EDUCATION

- 2019- **MS+PhD, Electrical and Computer Engineering**
University of Texas at Austin
Supervisors: Prof. Alan Bovik and Prof. Sriram Vishwanath
- 2015-19 **B. Tech. (Hons.), Electronics & Electrical Communication Engineering, (Minor in Computer Science and Engineering)**
Indian Institute of Technology Kharagpur, India
CGPA 9.77/10, Institute Rank 3 among the 643 B. Tech. undergraduates
Nilanjan Ganguly memorial award for best undergraduate thesis in ECE

EXPERIENCE

- **Assistant Director**, Laboratory for Image and Video Engineering (August 2020 - present)
- Responsibilities include procuring equipment, managing logistics, maintaining the website, and taking classes/talks in Dr. Bovik's absence.
- **Applied Science Intern**, Amazon Prime Video (May 2021 - August 2021)
- Designed and conducted a video quality study of 750 videos with 95 participants for low-bitrates and multiple frame rates. Conducted extensive evaluation of video quality metrics and made recommendations on bitrate ladder design. Supervised by Dr. Yongjun Wu, Dr. Hai Wei, and Dr. Sriram Sethuraman.
- **Applied Science Intern**, Amazon Prime Video (May 2020 - August 2020)
- Developed a deep-learning based method to detect synchronization errors between audio and video tracks in tennis broadcasts. Supervised by Dr. Yongjun Wu, Dr. Hai Wei, and Dr. Sriram Sethuraman.
- **Research Intern**, Nanyang Technological University (May 2018 - July 2018)
- Proposed a novel pre-processing pipeline and deep learning framework for skin lesion segmentation. Supervised by Dr. Jagath Rajapakse.

PUBLICATIONS AND PREPRINTS

- **HDR-ChipQA: No-Reference Quality Assessment for High Dynamic Range Videos**
J.P. Ebenezer, Z. Shang, Y. Chen, Y. Wu, H. Wei, S. Sethuraman, A.C. Bovik (submitted to IEEE TIP 2022)
- **Subjective and Objective Quality Assessment of High-Motion Sports Videos at Low-Bitrates**
J.P. Ebenezer, Y. Chen, Y. Wu, H. Wei, S. Sethuraman (IEEE ICIP 2022)
- **Subjective assessment of high dynamic range videos under different ambient conditions**
Z. Shang, J.P. Ebenezer, A.C. Bovik, Y. Wu, H. Wei, S. Sethuraman (IEEE ICIP 2022)
- **Detecting audio-video desynchronization**
Y Wu, J.P. Ebenezer, S Sethuraman, H Wei, Z Liu US Patent 11,336,935
- **Study of the Subjective and Objective Quality of High Motion Live Streaming Videos**
Z Shang, J.P. Ebenezer, Y Wu, H Wei, S Sethuraman, AC Bovik (IEEE Transactions on Image Processing 31, 1027-1041)
- **ChipQA: No-Reference Video Quality Prediction via Space-Time Chips**
J.P. Ebenezer, Z. Shang, Yongjun Wu, Hai Wei, Sriram Sethuraman, Alan C. Bovik (IEEE Transactions on Image Processing 30, 8059-8074)
- **Assessment of Subjective and Objective Quality of Live Streaming Sports Videos**
Z. Shang, J. P. Ebenezer, Yongjun Wu, Hai Wei, Sriram Sethuraman, Alan C. Bovik (PCS 2021)

- **Detection of Audio-Video Synchronization Errors Via Event Detection**
J. P. Ebenezer, Yongjun Wu, Hai Wei, Sriram Sethuraman, Zongyi Liu (IEEE ICASSP 2021)
- **No-Reference Video Quality Assessment Using Space-Time Chips**
J. P. Ebenezer, Z. Shang, Y. Wu, H. Wei, A. C. Bovik (IEEE MMSP 2020)
- **Single Image Haze Removal Using Conditional Wasserstein Generative Adversarial Networks**
J. P. Ebenezer, B. Das, S. Mukhopadhyay (EUSIPCO 2019)
- **Screening CAD tool for the detection of microcalcification clusters in mammograms**
V. A. Karale, S. Mukhopadhyay, J. P. Ebenezer, J. Chakraborty, T. Singh, A. Sadhu, and N. Khandelwal (Journal of Digital Imaging, Aug 2019)
- **A Fast and Accurate Class of Carrier Recovery Schemes**
J. P. Ebenezer and M. Krishna (TENCON 2019)
- **Automatic segmentation of skin lesions using deep learning**
J. P. Ebenezer and J. C. Rajapakse (arxiv, 2018)

HIGHLIGHTED PROJECTS

- **HDR Video Quality Assessment**
(UT Austin/APV) *Supervisor: Dr. Alan Bovik, Jan 2021-present*
 - Developing full-reference and no-reference video quality assessment models for High Dynamic Range (HDR) videos. Conducted a subjective study for HDR videos.
- **Low-bitrate Subjective Video Quality Assessment**
(Amazon Prime Video) *Supervisors: Dr. Y. Wu, Dr. H. Wei, Dr. S. Sethuraman, May 2021-Aug 2021*
 - Designed and conducted a large-scale in-lab study with 750 videos and 95 participants to study the quality of low-bitrate, high-motion videos at multiple frame rates and resolutions.
- **Online-learning based deep video reconstruction for adaptive bitrate video streaming**
(UT Austin) *Joint work with S. Kim, D.Y. Lee, Jan 2021 - May 2021*
 - We proposed methods based on online deep learning to reconstruct severely degraded livestreamed videos when the channel is bad using the temporal self-similarity of videos when the channel is good.
- **Peer-to-Peer Live Streaming with Recommender Systems**
(UT Austin) *Joint work with A. Venkataramanan, A. Venkatakrishnan, Dr. G. de Veciana, Jan 2021 - May 2021*
 - We derived the optimal loads and asymptotic behaviors for a P2P system when a recommender system is used to recommend channel switching to peers who are viewing content.
- **Detection of A/V synchronization errors**
(Amazon Prime Video) *Supervisors: Dr. Y. Wu, Dr. H. Wei, Dr. S. Sethuraman, May 2020-Aug 2020*
 - Developed a large scale database of 500,000+ frames of tennis events. Frames in which ball-hits occur were labeled. Used this database to develop a novel deep-learning based audio and video ball-hit detector to find out if the audio and video streams were synchronized.
- **Video quality assessment tool for high-motion videos**
(UT Austin/APV) *PhD Supervisor: Prof. Alan Bovik, Aug 2019-December 2021*
 - Developed statistical models and machine learning tools to quantify the quality of high-motion videos under different distortions. Conducted a large-scale study for the same. Project sponsored by Amazon Prime Video.
- **Conditional Wasserstein Generative Adversarial Nets for image dehazing**
(IIT Kharagpur, India) (*Guide: Prof. Sudipta Mukhopadhyay, August 2018-April 2019*)
 - Achieved state-of-the-art results by training a conditional Wasserstein GAN using the pix2pix model for single image dehazing, with perceptual loss, MSE loss, L1 loss, and texture loss, on the D-Hazy and O-Haze fog datasets, using Pytorch as the programming library.

- **FPGA design and implementation of real-time video dehazing using anisotropic diffusion** (IIT Kharagpur, India) (*Guide: Prof. Sudipta Mukhopadhyay, August 2018- April 2019*)
 - Achieved 200 fps processing speed in simulations of synthesizable code for Xilinx Zedboard FPGA for high-speed video processing to remove fog from images using anisotropic diffusion. Simulated and verified implementation from scratch on Vivado HLS, synthesized to RTL, and integrated blocks at the system level using Vivado IP integrator.
- **Deep learning for skin lesion segmentation** (Nanyang Technological University, Singapore) (*Guide: Prof. Jagath C. Rajapakse, May-July 2018*)
 - Proposed a novel algorithm for the segmentation of skin lesions. Developed an image pre-processing pipeline, a modified deep learning architecture, and a post-processing method that gave state of the art results and showed an improvement of 7% compared to training the network without pre-processing, using the Keras library with a Tensorflow backend.

COMMUNITY INVOLVEMENT

- Reviewer for IEEE Transactions on Image Processing (2020, 2021)
- Reviewer for IEEE Access (2022)
- Reviewer for IEEE MMSP (2021)
- Reviewer for IEEE TENCON (2019)
- Graduate Student Peer Mentor at ECE, UT Austin
- President of Bridges International, UT Austin

ACADEMIC DISTINCTIONS AND TEST PERFORMANCES

- Awarded **Cockrell Engineering Graduate Fellowship** 2019-23 for exceptional academic record.
- Ranked **3rd** among 117 undergraduates in the department as well as among the 643 third-year undergraduates of the institute in terms of GPA. Secured a **semester GPA of 10.0** in the 3rd, 6th and 7th semesters.
- Awarded **Nilanjan Ganguly memorial award** 2018-19 for the best undergraduate thesis in the ECE department at IIT Kharagpur.
- Awarded **Goralal Syngal memorial scholarship** for being in the top 20 of the institute in terms of CGPA among all second, third, and fourth year undergraduates.
- Awarded **NTU-India Connect scholarship** for a fully funded internship at NTU, Singapore.
- Awarded **DAAD WISE scholarship** for a fully funded internship at TU Berlin, Germany (*Did not accept as the NTU scholarship was for the same period*).
- **KVPY fellowship winner** (2015). **All India Rank: 26** (out of 0.1 million aspirants). Highest recognition of scientific research potential with nationwide selectivity of 0.01% per year.
- **Regional Mathematical Olympiad**, 2014. Among 31 who qualified from the state of Kerala for the **Indian National Mathematical Olympiad**.
- **National Standard Examination in Chemistry**, 2015. Among the 720 from India who were selected (11 from the state of Kerala), as the **top 1%** of all students in India, for the **Indian National Chemistry Olympiad**.
- Qualified for the award of the **National Talent Search Exam** scholarship, 2011, that recognizes students of high intellectual and academic ability. (775 selected from more than 500,000 candidates.)

TEST PERFORMANCES

- GRE - 337/340 (170 Q, 167 V), TOEFL - 119/120 (S 30, R 30, L 30, W 29).

- Scored in the **99.87th** percentile in Mathematics and **99.94th** percentile in Physics among more than 18,000 UG students across India in a survey conducted by Stanford Univ. and AICTE in Oct. 2017.
- Joint Entrance Exam Mains 2015. **All India Rank: 410** (out of 1.5 million candidates)
- IIT Joint Entrance Examination Advanced 2015. **All India Rank: 819** (out of 1.5 million candidates)
- Kerala Engineering Entrance Exam (KEAM 2015). **All Kerala Rank 14** (out of more than 100,000 students) in the state of Kerala, India.

MEDIA COVERAGE

- **Real-time fog removal from videos**
 - My successful real-time GPU implementation of fog-removal from videos, using an algorithm developed by our research group, was covered by the Metro Rail magazine (page 14), the Economic Times newspaper, and Better India.

TECHNICAL SKILLS

Languages: Python, C, C++, MATLAB®, CUDA C, Verilog, Arduino, 8051 ALP

Libraries: OpenCV (including GPU and Xilinx libraries), Keras, Pytorch, Tensorflow, Apache MXNet

Tools: PSpice, Solidworks, Simulink®, L^AT_EX.

RELEVANT COURSEWORK

EE: Digital Video Processing, Digital Image Processing, Digital Signal Processing, Statistical Machine Learning, Adaptive Signal Processing, Information Theory, Signals and Systems, Network Theory, Control Systems .

Math: Statistical Methods, Probability and Stochastic processes, Convex optimization, Matrix Algebra, Operations Research, Real analysis, Complex analysis.

CS: Artificial Intelligence, Algorithms, Computer Architecture and Operating Systems, Speech and Natural Language Processing, Pattern Recognition, Deep Learning.