

# Joshua Peter Ebenezer

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## EDUCATION

- 2019- **MS+PhD, Electrical and Computer Engineering**  
*University of Texas at Austin GPA 4.0*  
*Assistant Director of Laboratory for Image and Video Engineering*  
*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*
- 2013-15 **Higher Secondary Education, Central Board of Secondary Education (CBSE)**  
*Saraswathi Vidyanikethan, Kochi, India. Aggregate 96.2%*
- 2012 **Secondary School Education, Central Board of Secondary Education (CBSE)**  
*Bhavans Varuna Vidyalaya, Kochi, India. GPA 10.0*

## PUBLICATIONS AND PREPRINTS

- **Single Image Haze Removal Using Conditional Wasserstein Generative Adversarial Networks**  
*Joshua P. Ebenezer, Bijaylaxmi Das, Sudipta Mukhopadhyay (EUSIPCO 2019)*
- **Screening CAD tool for the detection of microcalcification clusters in mammograms**  
*Vikrant A. Karale, Sudipta Mukhopadhyay, Joshua P. Ebenezer, Jayasree Chakraborty, Tulika Singh, Anup Sadhu, and Niranjana Khandelwal (Journal of Digital Imaging, Aug 2019)*
- **A Fast and Accurate Class of Carrier Recovery Schemes**  
*Joshua Peter Ebenezer and Murali Krishna (TENCON 2019)*
- **A Comparative Study on Fog Removal from Single Images**  
*Bijaylaxmi Das, Joshua Peter Ebenezer, Sudipta Mukhopadhyay (Under review at IETE Technical Review)*
- **Automatic segmentation of skin lesions using deep learning**  
*Joshua Peter Ebenezer, Jagath C. Rajapakse (<https://arxiv.org/abs/1807.04893v1>)*

## PROJECTS

- **Video quality assessment tool for high-motion videos**  
(UT Austin/APV) *PhD Supervisor: Prof. Alan Bovik, Aug 2019-*
  - Working on developing statistical models and machine learning tools to quantify the quality of high-motion videos under different distortions. 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.
- **Study of FM-RDS communications protocol** (Naval Physical and Oceanographic Laboratory, DRDO) (Guide: Dr. P. Murali Krishna, December 2017)
  - Developed a novel carrier recovery scheme for the FM-RDS communications protocol. A scheme to send digitised words that carry information with checkwords and offsets on conventional stereo FM broadcasts was fully implemented on MATLAB® and Simulink®.
- **Computer-aided diagnosis of breast cancer** (IIT Kharagpur, India) (Guide: Prof. Sudipta Mukhopadhyay, August 2017-November 2017 )
  - Compared state-of-the-art machine learning techniques with a method developed by our research group for the detection of microcalcifications. Features based on Hessian matrix operations, foveal multiscale segmentation, tophat transform, and wavelet transform, were extracted and tested with various classifiers on MATLAB®.
- **Parallel implementation of fog removal from video using anisotropic diffusion** (IIT Kharagpur, India) (Guide: Prof. Sudipta Mukhopadhyay, May 2017 )
  - Successfully achieved a frame rate of more than 300 fps on a Quadra K600 GPU for a patented fog removal algorithm. Used CUDA C to parallelize most operations. The results of the project appeared in leading newspapers and will be commercialized.

## 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<sup>A</sup>T<sub>E</sub>X.

## RELEVANT COURSEWORK

**EE:** Digital Image Processing, Digital Signal Processing, Machine Learning, Adaptive Signal Processing, Information Theory and coding techniques, Signals and Systems, Network Theory, Control Systems .

**Math:** Probability and Stochastic processes (**Graduate level**), Convex optimization (**Graduate level**), Matrix Algebra, Operations Research, Mathematics-I and II (Calculus, Real analysis, Complex analysis).

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

## ACADEMIC DISTINCTIONS AND TEST PERFORMANCES

- 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.