Uday Bondi

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Education

2015-2020   **Indian Institute of Technology Madras** INTEGRATED MASTERS
Biomedical Design
CGPA - 8.4/10.0

Fall 2018   **Nanyang Technological University** SEMESTER EXCHANGE

Research Interests

Deep Learning, Computer Vision, Medical image analysis, Machine Learning, Computer Graphics

Research Experience

Aug'19– Present   **Unsupervised Medical Image Enhancement** MASTER'S THESIS
Supervisor: Prof. R Krishna Kumar, Perry L. Blackshear Institute Chair, IIT Madras
- Implemented Generative Adversarial Network(GAN) based super resolution algorithm that increases the segmentation dice score by **17%** in comparison to industry standard bicubic interpolation.
- Ongoing development of an unsupervised algorithm to enhance the clinical efficacy of medical image enhancement techniques.

Jun'19– Aug'19   **Super Resolution of Ultrasound Images** RESEARCH INTERNSHIP
Supervisor: Prof. Jinman Kim, School of Computer Science, The University of Sydney
- Applied transfer learning to ResNet based architecture pre-trained on natural images and achieved an increase of **3 dB** in the peak signal to noise ratio (PSNR) of ultrasound images in comparison to bicubic interpolated images.
- Implemented and tested a Neural Texture Transfer algorithm on ultrasound images in cases where paired data is unavailable to achieve comparable results in comparison with supervised techniques using PyTorch.

Dec'18– May'19   **Deep Learning for Neuro-Imaging** UNDERGRADUATE RESEARCH
Supervisor: Prof. R Krishna Kumar, Perry L. Blackshear Institute Chair, IIT Madras
- Collaboratively designed a novel neural network architecture for segmentation of Ischemic Stroke which performs better than the state of the art for ISLES 2015 data by **10%**.
- Designed and implemented a modified Unet architecture for brain tumor segmentation that achieved a dice score of **90%** on Multimodal Brain Tumor Image Segmentation Benchmark (BRATS 2018) dataset.
- Implemented an encoder decoder architecture to segment 70 critical white matter tracts that are further used as masks for probabilistic fiber tracking to improve the neuro-surgical outcome of a patient.

Apr'17– Oct'17   **Image Processing for Sketch Simplification** UNDERGRADUATE RESEARCH
Supervisor: Prof. M Ramanathan, Advanced Geometric Computing Lab, IIT Madras
- Formulated a Delaunay Triangulation based algorithm for creating simplified vector sketches from rough raster hand drawn sketches that won **Best Paper Honorable Mention Award** at the Shape Modeling International'18.
- Implemented a stroke grouping algorithm in C++ that clusters points representative of a stroke by processing sampled point triangulation obtained using Computational Geometry Algorithms Library (CGAL).
- Developed an image processing algorithm to convert groups of strokes to continuous simplified sketches while retaining sharp features in the sketch.

Professional Experience

May'18– Aug'18   **Computer Graphics Programming Internship** CARTOSENSE
- Built an Interactive Volume Visualisation Toolbox for an augmented reality system that enables users to interact with 3D MRI data in real time using Unity3D(C#).
- Programmed a slice based volume renderer using compute shaders in Unity 3D that enables effective planning for neuro-surgery.

May'17– July'17   **Human Centric design of a Health Care Kiosk** HEALTH CARE TECHNOLOGY INNOVATION CENTRE
- Brainstormed and developed an ergonomic design to simultaneously measure blood pressure and SpO2 levels in a patient reducing the time taken for on spot diagnosis by 20%.
- Programmed a computational model of a hand to visualize and simulate hand movements based on an input stream of quaternions using Processing 3.0.

Teaching Experience

Aug'19   **ED6001: Medical Image Analysis** GRADUATE TEACHING ASSISTANT
Course Instructor: Prof. Ganapathy Krishnamurthi, Medical Imaging & Reconstruction Lab, IIT Madras
- Project mentor for 12 graduate student teams applying deep learning to medical image segmentation, classification and reconstruction problems.
- Conducted tutorials on PyTorch implementations and performance optimizations. Graded assignments and projects for 50+ students.

Awards and Scholarships

May'19   **Research Fellowship** THE UNIVERSITY OF SYDNEY
- One among 4 students selected from premier institutes of India to pursue a research internship.

June'18   **Best paper honorable mention award** SHAPE MODELING INTERNATIONAL
- Acceptance rate - 30%

Aug'18   **GEM Trailblazer Exchange** NANYANG TECHNOLOGICAL UNIVERSITY
- One among 4 students from IITM selected for an exchange semester at Nanyang Technological University.

June'18   **International Honors Program** TAIPEI MEDICAL UNIVERSITY
- Awarded the IHP scholarship to attend a summer school on Biomedical Frontiers in healthcare innovation.

Skills

Languages   Python, C++

Libraries   PyTorch, Tensorflow, OpenGL, CGAL

Tools   Unity3D, MATLAB, Docker, Anaconda, Git

Relevant Courses

Computer Science   Neural Networks and Deep Learning; Machine Learning; Multi-Variate Data Analysis; Computer Vision; Data Structures and Algorithms; Robotics; Digital Signal Processing

Mathematics   Series and Matrices; Probability, Statistics and Stochastic Processes; Differential Equations

Biomedical   Design of Monitoring and Diagnostic Systems; Design of Surgical and implantable devices

Publications

Under Review   Sharique, M. D., **Uday Pundarikaksha Bondi**, Pradeeba Sridar, RS Rama Krishnan, and Ramarathnam Krishnakumar. "Parallel Capsule Net for Ischemic Stroke Segmentation." bioRxiv (2019): 661132.

SMI 2018   Parakkat Amal Dev, **Uday Pundarikaksha Bondi**, and Ramanathan Muthuganapathy. "A Delaunay triangulation based approach for cleaning rough sketches." Computers & Graphics 74 (2018): 171-181. **[Best Paper Honorable Mention award]**

Expressive 2017   Parakkat Amal Dev, Sarang Anil Joshi, **Uday Bondi Pundarikaksha**, and Ramanathan Muthuganapathy. "Sketch and shade: an interactive assistant for sketching and shading." In Proceedings of the symposium on Computational Aesthetics, p. 11. ACM, 2017.

Extra Curriculars

2016-2017   **Member of Team Anveshak** CENTRE FOR INNOVATION, IIT MADRAS
Collaboratively designed our mars rover selected for University Rover Challenge 2017, Utah, USA.

2017-2018   **Marketing and Sales team** SAARANG, IIT MADRAS
Spearheaded a 20-member team managing the marketing and sales of Saarang, Annual Cultural festival of IITM, generating a revenue of INR 7 million.

2017-2018   **Committee for monitoring general facilities** IIT MADRAS
Negotiated deals with multiple businesses to enhance the amenities available for the student community at IITM.

2016-2017   **Member of Campus Palliative Care** IIT MADRAS
Teaching mathematics to children battling cancer at Adyar Cancer Hospital, Chennai.

2016-2018   **6th Kup in Hapkido** IITM HAPKIDO CLUB
Practised the art of Hapkido under the guidance of Prof. Muruganandam TM, Department of Aerospace Engineering