Uday Pundarikaksha Bondi

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EDUCATION

Programme	Institute	Year	CGPA/%
Btech + MTech Engineering Design *(Specialisation: Biomedical Engineering)*	Indian Institute of Technology Madras	2020	8.22/10.00 (link)
Semester Exchange	Nanyang Technological University, Singapore	2018	(link)
Higher Secondary School *(Board of Intermediate Education, A.P.)*	FIITJEE Junior College, Visakhapatnam	2015	96.8%
Secondary School, A.P. *(Secondary School Certificate, A.P.)*	The Presidential School, Visakhapatnam	2013	9.2/10

SCHOLASTIC ACHIEVEMENTS

- Awarded a **Research Fellowship** to pursue an internship at **The University of Sydney** during summer 2019.
- Awarded the **2nd Best paper award** at Shape Modeling International **SMI 2018** conference (acceptance rate-30%) (link)
- Awarded the **International Honors Program** 2018 scholarship to pursue a summer workshop on Biomedical Frontiers in healthcare innovation at **Taipei Medical University**, Taiwan. (link)
- Selected for a **Semester Abroad** at Nanyang Technological University **(NTU)** in Singapore during Aug – Dec'18

PUBLICATIONS

- Sharique, M.D., **Uday Bondi Pundarikaksha**, Sridar, P., Krishnan, R.R. and Krishnakumar, R., 2019. Parallel Capsule Net for Ischemic Stroke Segmentation. bioRxiv, p.661132. (link)
- Amal Dev Parakkat, **Uday Bondi Pundarikaksha**, Ramanathan Muthuganapathy. "A Delaunay triangulation based approach for cleaning rough sketches ", *Computers & Graphics (Elsevier C&G) as a special issue of Shape Modeling International (SMI 2018)* **[2nd best paper award]** (link)
- Amal Dev Parakkat, Sarang Anil Joshi, **Uday Bondi Pundarikaksha**, Ramanathan Muthuganapathy, "Sketch and shade: an interactive assistant for sketching and shading ", *Symposium on Sketch-Based Interfaces and Modeling (Expressive 2017)*. (link)

TEACHING

- **Graduate Teaching Assistant** for Medical Image Analysis (ED6001)
  - Teaching undergraduate students the basics of **Python**.
  - Mentoring students in projects involving the application of **advanced AI techniques** on medical images using **Pytorch**.

RESEARCH EXPERIENCE

- **Cerebral white matter fiber tracking for neuro surgical planning:*** *(Present)*
  Advisor: Prof. Krishnakumar R (Perry L. Blackshear Institute Chair), IIT Madras & Cartosense
  - Implemented an **encoder decoder based architecture** for white matter segmentation in healthy patients. These segmentations are used as masks for probabilistic fiber tracking.
  - Working on applying **deep learning** to estimate fiber orientation distribution functions and hence, improving the accuracy of fiber tracking.
- **Ultrasound image Super Resolution using Deep Learning:** *(June 2019 - Aug 2019)*)
  Advisors: Prof. Jinman Kim, School of Computer Science, The University of Sydney.

- Applied **transfer learning** to ResNet based architecture pre-trained on natural images to **improve the resolution** of Ultrasound images in the presence of paired low resolution and high resolution data using PyTorch.
- Implemented a **neural texture transfer** algorithm on ultrasound images to improve resolution in cases where paired data is unavailable.
- Conducted experiments to study the effectiveness of state of the art algorithms such as **EDSR, GAN based SR, SRNTT** on images with blur and speckle noise.

- **Deep Learning for Ischemic Stroke and Brain Tumor Segmentation:*** *(Dec 2018 - May 2019)*
  Advisor: Prof. Krishnakumar R (Perry L. Blackshear Institute Chair), IIT Madras & Cartosense.
  - Designed and implemented a modified **Unet** architecture for Brain Tumor Segmentation that achieved a dice score of 82% on Multimodal Brain Tumor Image Segmentation Benchmark (BRATS 2018) dataset.
  - 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%**. This work was submitted to International Conference on Medical Image Computing and Computer Assisted Intervention **MICCAI 19**.
  - Developed an interface to test our model in the clinical setting thereby assisting the radiologist. This interface would also add new labelled training data and help improve the accuracy of our model.

- **Image Processing for sketch simplification:** *(Apr 2017 - Oct 2017)*
  Advisor: Prof. M Ramanathan, Advanced Geometric Computing Lab, IIT Madras.
  - Developed and tested a **Delaunay Triangulation** based algorithm for creating vector strokes from rough artistic sketches.
  - Implemented an algorithm in `C++` that performs stroke grouping with the help of Computational Geometry Algorithms Library (CGAL). Stroke clustering is done by triangulating a set of points sampled from the image and iteratively clustering points representative of a stroke.
  - Developed an **image processing algorithm** to convert groups of strokes to continuous well defined sketches while retaining sharp features. This work won the 2nd best paper award in SMI 2018

- **Augmented reality for sketch based modelling:** *(July 2016 - December 2016)*
  Advisor: Prof. M Ramanathan, Advanced Geometric Computing Lab, IIT Madras.
  - Collaboratively developed an **augmented reality** based system that assists the user to draw and shade an input sketch.
  - Implemented an algorithm to sample any given sketch to a set of points and classify the junction points based on their properties using **MATLAB**.
  - Our algorithm generates a 2.5D mesh from an input sketch which is used to simulate effects of light from different directions. This is then used to assist the user in sketching the shading the image of interest using Augmented Reality.

- **Nanotechnology for lung cancer screening:** *(June 2018)*
  Advisor: Dr. Long-Sheng Lu, College of Biomedical Engineering, Taipei Medical University
  - Designed a link of concept for nano particle based breath analysis system to be used as an early screening mechanism for lung cancer.
  - Our idea was to create a portable screening solution for lung cancer that can be used in rural areas.
  - The proposed breath analyser uses gold nanoparticles to detect Acetone, which is higher in lung cancer patients.

PROFESSIONAL EXPERIENCE

- **Research and Development of Neuro-Navigation system:** *(May 2018 - Aug 2018)*
  Cartosense
  - Worked on the development of a **Mixed Reality System** for pre-operative planning and intra-operative assistance during neuro-surgery.
  - Built an Interactive Volume Visualisation Toolbox for the mixed reality system that enables user to **interact with 3D MRI data** in real time using Unity3D (C# and GLSL).

- Programmed a slice based volume renderer in Unity 3D which can be used for **planning a neurosurgery**.
- Worked with **compute shaders** to leverage the power of parallel computing.

- **Research Intern** *(May 2017 - July 2017)*
  Health Care Technology Innovation Centre (HTIC)
  - Collaboratively developed modules for a Health Care Kiosk through which vital signs of a patient are measured. This data is analysed for on-spot diagnosis.
  - Brainstormed and developed an ergonomic design to simultaneously measure blood pressure and SpO_2 levels in a patient.
  - Processing and Visualization of IMU data: Programmed a computational model of a hand to visualize and simulate movements based on an input stream of quaternions using Processing 3.0.

- **Mechanical Engineer** *(Nov 2016 - Jan 2017)*
  Team Anveshak, Centre For Innovation, IIT Madras
  - Objective: To participate in the **University Rover Challenge**, an annual student competition conducted by the Mars Society at Utah, USA.
  - Worked on the design and fabrication of a Mars Rover's Chassis.
  - Designed and analysed rocker bogie suspension system to make it suitable for rough terrain and steep falls using SolidWorks.
  - Studied the design of several rovers and designed central differential to create an articulated body suspension mechanism.

MAJOR ACADEMIC PROJECTS

- **Deep Learning for object recognition and text classification:** *(Aug 2018 - Dec 2018)*
  Advisor: Prof. Jagath C Rajapakse, School of Computer Science, NTU (CE4042)
  - Designed and tested convolutional neural network based architectures for object recognition.
  - Implemented recurrent neural network based word and character classifiers for understanding text.

- **AI powered bomb diffusing robot:** *(Aug 2018 - Dec 2018)*
  Advisor: Prof. Dr. Low Kin Huat, Robotics Research Centre, NTU (MA4825)
  - Designed a bomb diffusing robot with a moving base and robotic arm that uses real time object detection to diffuse the bomb.
  - Implemented deep learning based YOLO algorithm for real time object detection.

- **Multiplexed Quantum dots for cancer diagnosis:** *(Aug 2018 - Dec 2018)*
  Advisors: Prof Duan Hongwei and Prof Xu Chenjie, College of Chemical and Biomedical Engineering, NTU (BG4215)
  - Conducted research to understand the heterogeneity of cancerous tissue which poses several challenges to the traditional methods of treatment and diagnosis of cancer.
  - Proposed the use of multiplexed quantum dots for effective diagnosis and treatment of cancer.

- **Mechatronic Robotic Arm:** *(Feb 2017 - Apr 2017)*
  Advisor: Prof. Nilesh Jayant Vasa, Mechatronics Lab, IITM (ED5080)
  - Built a mechatronic system with a robotic arm for picking up objects using color detection.

RELEVANT COURSEWORK

- Neural Networks and Deep Learning (CE4042) (NTU)
- Multi-Variate Data Analysis (CH5440)
- Machine Learning (nptel)
- Robotics (MA4825) (NTU)
- Computational Methods in Design (ED5015)
- Digital Signal Processing (ED5017)
- Data Structure and Algorithms (BT3051)
- Probability, Statistics and Stochastic Process (MA2040)

- Functions of Several Variables (MA1101)
- Differential Equations (MA2020)
- Series and Matrices (MA1102)
- Introduction to Computation and Visualization (ED1021)
- Human Anatomy, Physiology and Bio Mechanics (ED5040)
- Design of Monitoring and Diagnostic Systems (ED5070)
- Computer Vision (CE4003) (NTU)
- Medical Image Analysis (ED6001)
- Biomedical Nanotechnology (BG4215)(NTU)

TECHNICAL SKILLS

- **Languages**: Python, C++
- **Libraries**: PyTorch, TensorFlow, CGAL, OpenGL.
- **Other Tools**: MATLAB, Unity3D, Docker, LaTeX, Autodesk Fusion 360.

POSITIONS OF RESPONSIBILITY

- **Marketing and Sales Super Coordinator:** *(2017 - 2018)*
  - Managed a team of **4 coordinators** to effectively implement a QR code based ticket verification and contributed to the generation of 70L INR revenue in Saarang, the Cultural festival of IITM.
- **The Committee for Monitoring General Facilities for Students Coordinator:** *(2017 - 2018)*
  - Procured tendors for new facilities in IITM.
  - Controlled the quality and hygiene of eateries in IITM.