Shreshth Saini

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Education

M.S. and Ph.D. in Electrical and Computer Engineering   *GPA: N.A./4.0*
University of Texas at Austin   *2022 – Present*
Supervisor: **Prof. Alan C Bovik**

B. Tech. in Electrical Engineering   *CGPA: 8.09/10*
Indian Institute of Technology Jodhpur, India   *2016 – 2020*
Supervisor: **Dr. Anil K Tiwari**

Research Interests

Computer Vision (CV), Video Engineering, Deep Learning (DL), Machine Learning (ML), Medical Image Analysis, Biometrics

Employment and Research Appointments

Graduate Research Assistant   **Austin,Texas**
Laboratory for Image and Video Engineering, UT Austin   *Aug. 2022 – Present*
Supervisor: **Prof. Alan C Bovik**
- Working with YouTube to develop new algorithms in the field of video engineering
- Recently exploring Tone Mapping and Inverse Tone Mapping between HDR and LDR video contents

Research Engineer   **Singapore**
BioMind   *Feb. 2022 – June 2022*
- Worked on brain disease segmentation and classification for more than **25+** tumor/non-tumor classes (**Products**)
- Exploited TFRecords for memory intense 4D datasets and proposed multi-task model tumor predictions

Research Engineer-AI   **Pune, India**
Arkray, Inc.   *Aug. 2020 – Dec. 2021*
- Developed efficient and state-of-the-art (SOTA) AI solutions for healthcare products with noisy pathological datasets
- Developed semi-supervised DL model for urine sediment analyzer and automated bodyfluid analysis (**Aution EYE**)

Research Assistant   **Singapore**
National University of Singapore   *May 2019 – July 2019*
Supervisor: **Dr. Mengling 'Mornin' Feng**
- Worked on large-scale public health datasets and published SOTA results with low cost for skin lesion analysis
- Helped in organising **NUS-MIT Datathon**, also participated and won medical imaging track

Undergraduate Researcher   **Jodhpur, India**
Image Processing and Computer Vision Lab, *IIT Jodhpur*   *Aug. 2018 – Aug. 2020*
Supervisor: **Dr. Anil Kumar Tiwari**
- Worked on developing ML methods aimed for AI based diagnosis and treatment support
- Developed novel DL models for retinal vessel, skin lesion -segmentation, and diagnosis of left atrium in 3D GE-MRIs.

Research Intern   **Mandi, India**
The Multimedia Analytics, Networks and Systems Lab, *IIT Mandi*   *May 2018 – July 2018*
Supervisor: **Dr. Aditya Nigam**
- Initiated my research work in the field of Biometrics, CV, and ML. Worked on NR-IQA and robust iris segmentation
- Volunteered in conducting and teaching CNN in international workshop on applied deep learning(**IWADL**)

Publications

Conferences:
- **M2SLAe-Net:Multi-Scale Multi-Level Attention Embedded Network for Retinal Vessel Segmentation**
  S. Saini, G. Agrawal.
  The IEEE International Symposium on Biomedical Imaging **(IEEE ISBI), 2021**
  (Abstract Presentation) Nice, Acropolis-France

- (M)SLAe-Net:Multi-Scale Multi-Level Attention Embedded Network for Retinal Vessel Segmentation[Paper]
  S. Saini, G. Agrawal.
  9th IEEE International Conference On Healthcare Informatics **(IEEE ICHI), 2021**
  (full Oral Presentation) Victoria, British Columbia, Canada
- B-SegNet Branched SegMentor Network for Skin Leison Segmentation[Paper]
  S Saini, YS Jeon, M Feng.
  Association for Computing Machinery Conference on Health, Inference, and Learning **(ACM CHIL), 2021**
  (full Oral Presentation)
- Detector-SegMentor Network for Skin Lesion Localization and Segmentation[Paper]
  S Saini, D Gupta, AK Tiwari.
  National Conference on Computer Vision, Pattern Recognition, Image Processing, & Graphics **(NCVPRIPG), 2019**
  (full Oral Presentation), twin of ICVGIP

Journals:
- PixISegNet:pixel-level iris segmentation network using convolutional encoder–decoder with stacked hourglass bottleneck[Paper]
  RR Jha[1], G Jaswal[1], D Gupta[2], **S Saini**[2], A Nigam.
  The Institution of Engineering and Technology **(IET Biometrics, 2019)**

Book Chapters:
- Iris Segmentation in the Wild using Encoder-Decoder based Deep Learning Techniques[Paper]
  S Saini, D Gupta, RR Jha, G Jaswal, A Nigam.
  AI and Deep Learning in Biometric Security: Trends, Potential and Challenge
  CRC Press (Taylor & Francis Group), 2020

Selected Talks and Achievements

- Oral presentation at **IEEE-ICHI, 2021**
- Oral and Poster presentation at **ACM-CHIL, 2021**
- Poster presentation at **IEEE-ISBI, 2021**
- Poster presentation at **NCVPRIPG, 2019**
- Skin Lesion Analysis, **NUS-Singapore, 2019**
- Awarded Cockrell Engineering (UT Austin) Graduate Fellowship for exceptional academic record, **2022-2027**
- Received Merit-Cum-Means Scholarship from IIT Jodhpur to cover undergraduate expenses, **2017-2019**
- Won medical imaging track at **NUS-MIT datathon**, led a team of 10 data scientists and clinicians, **2019**
- Established undergraduate research group **(LAMBDA)**, group publishes in international conferences, **2018**
- Letter of Appreciation from District Collector (Sirohi) for Academic Excellence, **2013**

Selected Coursework

Computer Science & Electrical	Mathematics	Others
▪ Machine Learning	▪ Probability, Statistics, and Random Processes	▪ Principles of Management
▪ Artificial Intelligence	▪ Linear Algebra and Calculus	▪ Professional Ethics
▪ Introduction to Data Science	▪ Complex Analysis and Differential Equations	▪ Basic of Leadership
▪ Information Theory and Coding	▪ Probability and Stochastic Processes[Ongoing]	▪ IP Management and Exploitation
▪ Digital Image Processing	▪ Statistical Methods I[Ongoing]	▪ Technology Management
▪ Computational Imaging		
▪ Digital Logic and Design		
▪ Vision Systems[Ongoing]		

Technical Skills

- ***Programming Languages:*** Python, MATLAB, Octave, C++
- ***Tools and Libraries:*** Tensorflow, Pytorch, Keras, Scikit-Learn, OpenCV, Bash, git, Tex, Docker

Position of Responsibilities

Student Leader   **Jodhpur, India**
LAMBDA, IIT Jodhpur   *Aug. 2018 – Aug. 2020*
- Formally established and led undergraduate search group of 30+ students
  "*Learning Approaches For Medical Big Data (LAMBDA)*"

Overall Student Head   **Jodhpur, India**
Entrepreneurship Cell, IIT Jodhpur   *May 2018 – May 2019*
o Led, Managed and Promoted entrepreneurial activities in and around the institute
o Organised IdeaSpark which witnessed the participation from across the state and established entrepreneurs as guests

Assistant Head   **Jodhpur, India**
Counselling Services, IIT Jodhpur   *May 2018 – May 2019*
o Organized events and workshops for maintaining positive atmosphere in college and mentored student guides
o I was given the responsibility to guide freshmen in their personal, professional and academic life

Vice Captain   **Jodhpur, India**
Astronomy Club, IIT Jodhpur   *May 2017 – May 2018*
o Organised and supervised the events for astronomy enthusiast within the institute

References

o Up to 4 references available on request

Additional Projects

Healthcare

Prognosis of Pneumonia and COVID-19[Compiling for Publication]   **Jodhpur, India**
*Supervisor: **Dr. Rajendra Nagar**, **Dr. Deepak Mishra**, IIT Jodhpur*   *Mar. 2020 – Aug. 2020*
o Proposed a variational autoencoder (VAE) based multi-task network for classification
o Embeddings from VAE were fed to LSTM for prediction of porgnosis
o Network was pretrained on MIMIC-III dataset and fine tuned on COVID-19 datasets

Cardiac Image Segmentation[Paper Under Review]   **Jodhpur, India**
*Supervisor: **Dr. Himanshu Kumar**, IIT Jodhpur*   *Jan 2020 – June 2020*
o Proposed an unique multi-decoder attention based segmentation model for sliced cardiac image segmentation
o Used contour and distance transforms (novel Expand & See block) for attention to boundary and background pixels
o Optimized model with a compound loss for multi decoder network

Skin Lesion analysis for Melanoma Detection[Paper]   **Singapore, India**
*Supervisor: **Dr. Mengling 'Mornin' Feng**, NUS-Singapore*   *May 2019 – July 2019*
o Proposed a novel multi-branched CNN for challenging skin lesion identification and segmentation task
o Branches emerging from main encoder served different purpose like localizing the lesion, focusing on lesion boundaries
o Achieved state of the art results on ISIC-2018/2017 and PH2 datasets

Segmentation of the left Atrial Cavity from 3D Gadolinium-Enhanced MRI Data   **Jodhpur, India**
*Supervisor: **Dr. Anil Kumar Tiwari**, IIT Jodhpur*   *Aug. 2018 – Dec. 2018*
o Proposed a 3D CNN to localize cavity in MRI data to produce tightly fit 3D volumetric samples
o Faster-RCNN based architecture was developed for the localization and producing cubic samples
o The cubes were then fed to a 3D UNet comprising of task specific hourglass network for generating 3D masks

Biometrics

No Reference Biometric Image Quality Assessment   **Mandi, India**
*Supervisor: **Dr. Aditya Nigam**, IIT Mandi*   *May 2018 – July 2018*
o Explored deep neural networks for hand based (palm, finger, and knuckle) biometric image quality assessment
o Network pipeline consisted of two parts: (i) Image-Re-constructor and (ii) The Quality Score Regressor
o The proposed Network on outperformed the practical classical methods

General

Multipath Super Resolution Network with Novel loss   **Jodhpur, India**
*Supervisor: **Dr. Rajendra Nagar**, IIT Jodhpur*   *Jan. 2020 – June 2020*
o Developed a multipath deep neural network for aggration of global and fine local features for super resolution
o Incorporated sub-pixel shuffling along with the novel weighted pixel-perceptual loss for sharp image reconstruction
o Model was trained in end-to-end manner from scratch on T91 and evaluated on BSDS100, Set14, and Set5