Abhi Lad

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Education

Pandit Deendayal Petroleum University **Aug 2016 – July 2020**
Bachelor of Technology in Computer Science and Engineering Gandhinagar, India
GPA 9.89/10 (Gold Medalist) | Awarded Merit Prize 2018-2020
Dissertation: fMRI Decoding for Perceived Image Reconstruction
Coursework: Artificial Intelligence, Machine Learning, Design and Analysis of Algorithms, Theory of Computation, Operating Systems, Data Structures, Operations Research, Calculus, Numerical and Statistical Methods, Algebra

Research Interests

Development of interpretable and explainable assistive healthcare AI systems with broader interest in AI for Social Good.

Research Experience

Research Assistant | Guide: Prof. Mehul Raval **May 2021 – Present**
- Trained a custom **YOLOv5** model on **GWHD'21** achieving SOTA performance of **0.715** ADA with **5x** efficiency.
- Developed a preprocessing technique for **domain invariant learning** in images using histogram matching and CLAHE.
- Explored issues with object detection model by conceptualizing task specific **XAI** with RGB and affine perturbations.

Work Experience

Origin Health **June 2021 – Present**
Lead Research Engineer Bangalore, India
- Developed a **multitask learning** based classification framework to detect anomalies in fetal axial plane USG images.
- Designed novel data augmentation techniques increasing segmentation performance upto **23**% for unseen USG devices.
- Developed interactive **UMAP** and **SHAP** analysis tool for holistic evaluation of AI models and **4M+** images.
- Led a study exploring segmentation of fetal brain structures in a **multi-domain** scenario which is accepted for **SPIE**.
- Developed POC for an end-to-end prenatal screening tool for collaboration with Texas Medical Center and UW, Seattle.

Kontiki Vision Labs **Feb 2021 – May 2021**
Computer Vision Engineer Bangalore, India
- Ported existing codebase from PoseNet to **Blazepose** pose detection model resulting in **20%** increase in fps.
- Developed **heuristic** approaches for tracking **50+** convoluted exercise poses from body landmark points.
- Developed a method for **equivalent scaling** of pose landmarks in virtual 2D space for online competitive exercise.

Institute of Seismological Research **June 2019 – Aug 2019**
Research Intern Gandhinagar, India
- Compiled hydrogeological and meteorological data of **42** sites in Kutch region from studies spanning **15** years.
- Processed data using techniques like **PCA**, **OHE**, **Spline** and reduced the dimensionality and sparseness of data.
- Utilized machine learning models like **Neural Network**, **SVM** to predict ground water level with ∼**80%** accuracy.

Projects

Research Challenge: KiTS'21 (MICCAI) **Aug 2021 – Sept 2021**
- Developed a custom **3D U-Net** with channel and spatial attention using **MONAI** framework.
- Reduced training time from 40 to **6** mins/epoch using **NVIDIA Clara** and patchwise data processing pipeline.
- Translated 3D data augmentation functions from **TorchIO** to Pytorch, eliminating data format constraints.

Alzheimer's Conversation Assistant **March 2021 – April 2021**
- Developed a conversation assistant with quizzing feature using **Tensorflow** & **Chrome TTS** for Dementia patients.
- Integrated **AWS Rekognition** to identify relatives and guide patients in identifying the entity with audio ques.
- Presented the demo among the **top 5** finalists at Aging Better with ICTs (**WSIS-GCOA**).

Research Project: fMRI Decoding for Perceived Image Reconstruction **Jan 2020 – Oct 2020**
- Performed literature survey and examined inherent non-linearity in fMRI data based on lower **Interstimulus Interval**.
- Built **GAN** based image generator models and evaluated generalizability using input layer **feature perturbation**.
- Developed a **multitask training** approach, improving image correlation winning % to **81**% from 78% of existing SOTA.

Patent Project: Blockchain-based Voting System | *IPR: 202021030105* **Aug 2019 – Dec 2019**
- Implemented a customized decentralized **blockchain** from scratch in **Python** and JavaScript frontend.
- Developed POC for approaches like **real time code deployment**, 2-way authentication etc. for tamper-proofing.
- Published **1 product patent** under Indian Patent Office in the Official Gazette of India.

Publications & Presentations

- **Lad, A.**, Narayan, A., Shankar, H. et al. (2022). *Towards a device-independent deep learning approach for the automated segmentation of sonographic fetal brain structures: a multi-center and multi-device validation.*. In SPIE, Medical Imaging 2022: Computer-Aided Diagnosis. https://spie.org/medical-imaging/presentation/12033-75
- Gohil, S., & **Lad, A.** (2021). *Kidney and Kidney Tumor Segmentation using Spatial and Channel attention enhanced U-Net.* In 2021 24th MICCAI: KiTS21 Challenge. (Accepted)
- **Lad, A.**, Jani, S., Modhani, H., Soumya, & Solanki, Y. (2021). *Perceptual Variation Stacking: Test Time Augmentations in Endoscopy Image Segmentation.* In 2021 IEEE 36th Image and Vision Computing New Zealand (IVCNZ). (Accepted)
- **Lad, A.**, Patel, R. (2021, September). *Decoding with Purpose: Improving Image Reconstruction from fMRI with Multitask Learning.* In 2021 IEEE 4th International Conference on Computing, Power and Communication Technologies (GUCON) (pp. 1-6). IEEE. https://doi.org/10.1109/GUCON50781.2021.9573575
- **Lad, A.**, & Raval, M. *Resolving Issues with Wheat Head Detection: A Use Case of XAI in Agriculture Scenario.* In 2021 9th International Conference on Big Data Analytics (BDA). (Accepted)
- **Lad, A.**, Kanaujia, P., Soumya, & Solanki, Y. (2021). *Computer Vision enabled Adaptive Speed Limit Control for Vehicle Safety.* In 2021 IEEE International Conference on Artificial Intelligence and Machine Vision (AIMV). (Accepted)
- **Lad, A.**, Patel, K., Soumya, & Solanki, Y. (2021). *Improving Machine Learning based Groundwater Level Estimation using Geological Features.* In 2021 IEEE International Conference on Artificial Intelligence and Machine Vision (AIMV). (Accepted)
- **Lad, A.**, & Raval, M. *Improving Wheat Head Detection: A Data-Centric Approach by Domain Variance Reduction.* In 2022 ACM 37th Symposium On Applied Computing (SAC). (Under peer review)
- Shankar, H., Narayan, A., **Lad, A.** et al. *Leveraging Clinically Relevant Biometric Constraints to Supervise a Deep Learning Model for the Accurate Caliper Placement to Obtain Sonographic Measurements of the Fetal Brain.* In 2022 IEEE 18th International Symposium on Biomedical Imaging (ISBI). (Under peer review)

Technical Skills

Languages: Python, Javascript, C++, HTML/CSS, SQL, LaTeX
Developer Tools: VS Code, AWS, Google Cloud Platform, WandB
Libraries/Frameworks: Tensorflow, Pytorch, MONAI, OpenCV, BrainDecoderToolbox

Leadership / Initiative

Summer Research School **May 2021 – Present**
Co-Founder & Guide PDPU

- Guided **5** students to pursue research through **Conference Research Challenges** and using benchmarking datasets.
- Trained students to use SOTA frameworks and write research papers and helped them present at **IEEE conferences**.

Encode (Coding Club) **Aug 2018 – Aug 2019**
President PDPU

- Managed team of **10** members and conducted monthly workshops and talks on emerging technologies for **60+** students.
- Developed and maintained **websites** and **servers** for university events and organized **interdisciplinary** events.

Training and Certification

- 6.871Jx: Machine Learning in Healthcare - MITx Edx (June 2021)
- Human Research - Data Or Specimens Only Research - CITI Program (March 2021)
- Machine Learning Engineer Trainee - MedTourEasy (Jan 2021)
- Machine Learning Scientist with Python - Datacamp (Jan 2021)
- 6.00.1x: Introduction to Computer Science and Programming using Python - MITx Edx (May 2018)

Extra-Curricular Activities

- Mentor of AI division at Seatizen (startup focusing on solutions for disorganized crowded scenario).
- Organizing member of Science & Cultural Committee at PDPU.
- Served under National Service Scheme (NSS) for 1 year.
- Social Service volunteer at Sai Setu Charitable Trust.

Interests

Sketch Art (Portfolio), Mythology & Culture, Manga