Vinay Ummadi

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Education

- **Indian Institute of Technology, Kharagpur** — Kharagpur, India
  Master of Technology - Medical Imaging & Informatics; GPA: 8.62 — *Aug 2021 - May 2023(Expected)*
  Courses: *Computer Vision, Neural Networks & Applications, Digital Image Processing, Data Analytics, Bio Statistics, Pattern Recognition & Machine Intelligence in Medicine, Design & Analysis of Algorithms*

- **Rajiv Gandhi University of Knowledge Technologies** — RK Valley, India
  Bachelor of Technology - Electronics and Communication; GPA: 8.9 — *Aug 2017 - Aug 2021*
  Additional: *Student Head @ Robotics Lab of RKV*

Skills Summary

- **Languages** Python, SQL, Matlab
- **Frameworks** PyTorch, scikit-learn, OpenCV, Keras
- **Tools** Git, Bash, Docker
- **Platforms** Linux, Web, Arduino, Raspberry Pi, AWS, Azure, Heroku
- **Other Skills** Product Development, Leadership, Event Management

Experience

- **Computer Vision & Medical Imaging Laboratory** — IIT Kharagpur
  Graduate Researcher — *Aug 2022 - Present*

  Continual Learning for Medical Image Segmentation : My current research focus is on developing and evaluating continual learning methods for medical image segmentation. Specifically working on a subset of replay learning algorithms multi site prostate segmentation.

  Our sampling methods for replay learning outperform all other tailored CL methods by a 4% mean Dice score.

- **Lab for Video and Image Analysis** — IIT Hyderabad
  Research Intern — *Sep 2020 - May 2021*

  Modeling of Methane to Methanol conversion : This is a joint work between Prof Sumohana of Electrical Engineering and Prof Subrahmanyam of Chemistry. Our goal is to accurately model the conversion process of methane to methanol using limited data and only a few process parameters.

  Experiments & Results : Thorough experiments have been done with traditional ML algorithms and modern 1D and 2D CNNs to accurately correlate Key Performance Indicators(KPIs) and Process Parameters. Finally a weighted ensemble of Kernel Regressor and Support Vector Regressor are found to be fitting well.

- **Head Teaching Assistant** — IIT Kharagpur
  CS60013 : Programming & Data Structures — *Autumn 2022*

  Taught Programming & Data Structures tutorials in Python for a class of 20+ masters medical students. Developed and maintained course webpage for delivering announcements, assignments and final projects. Also, setup auto-grading for programming assignments with GitHub Classroom and Python unittests.

Publications

- arXiv : **Autonomous Agriculture Robot for Smart Farming** (Aug 2022)
- arXiv : **U-Net and its variants for Medical Image Segmentation : A short review** (April 2022)

Research Projects

- **Continual Learning for Medical Image Segmentation** Deep learning models are prone to catastrophic forgetting when trying to learn over time. Continual Learning is the ability of the machine to learn the tasks/classes sequentially while preserving previous knowledge. Currently working on Multi Site Prostate Segmentation using Rehearsal/Replay based Continual Learning Methods. Evaluating following replay methods : Naive/Raw Replay, Representational Replay, Generative Replay, Hybrid Replay. (Aug 2022 - Present)
- **Semi-Autonomous Agriculture Application Robot** AAR is an semi-autonomous robot designed to roar in the agriculture fields to detect diseased plants, remove weeds, precision watering. This project has received a grant of INR 330,000 through MANAGE Hyderabad from Ministry of Agriculture, Govt of India. (Dec 2018 - Dec 2020)
- **AI based Tele-Pathology** Design, development and implementation of a fully functional telepathology web application. This application serves as a remote bridge for patients and pathologists. Features include registration, logging, pathology sample submission, AI-based sample classification, AI-based pathology tissue segmentation, and more. **Tech Stack** : Python, PyTorch, ReactJS, NodeJS, MongoDB, Git, Azure Cloud, Heroku Cloud. (Jan 2022 - April 2022)
- **Auto Diabetic Retinopathy Grading** This project involves automatic grading of retinal images into five classes. The following methods are thoroughly investigated : Traditional ML techniques, Image based feature extraction and classification, Deep ConvNets for end-to-end classification. **Tech Stack** : Python, Scikit-Learn, Matlab, PyTorch. (Feb 2022 - April 2022)

- **Image-to-Image Translation with Conditional Generative Adversarial Networks** This project is a re-implementation of Phillip Isola's original work Pix2Pix at MIT. This project was presented as a implementation project for neural networks and applications in autumn 2021 at IIT Kharagpur. **Tech Stack** : Python, PyTorch. (Sep 2021 - Nov 2021)
- **Malarial Image Classification** The aim of this project is to develop an image-based algorithm for the automatic classification of microscopic hemoglobin smear samples into malarial and non-malarial classes. Created using exclusively classic image processing algorithms. This is a class project for Digital Image Processing and Applications course in autumn 2021 at IIT Kharagpur. **Tech Stack** : Matlab. (Nov 2021)

Honors and Awards

- Awarded Student Scholarship for attending Asian Conference on Machine Learning (ACML) 2022 at ISB Hyderabad.
- Our startup *TechInAg* received seed grant of INR 330,000 for the development of Agriculture Application Robot for Smart Farming. (Dec 2020)
- Secured a Dual Degree(BTech+MS) admission at IIIT-Hyderabad. (Jul 2019)
- MRS Smart City Model Exhibition Award in the International Conference on Green Energy Technologies for Smart Cities. (Dec 2018)

Miscellaneous

- Attended 6th Summer School on AI With focus on Computer Vision & Machine Learning at IIIT Hyderabad (Jul 2022)
- Lead Organizer at Astronics 3.0 : Organized third sequel of 3-day Astronics workshop at RGUKT RK Valley. Attended by 250+ students. (Nov 2019)
- Competed in a 48-hour nationwide hackathon - ACI Challenge (Artificial Intelligence, Cloud, Internet of Things) at GRIET Hyderabad. (Oct 2018)
- Competed in Agri AI Hackathon organized by CDAC and Nvidia. (Oct 2020)