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● Naagar
in Sandeep Nagar

Sandeep Nagar

▬▬ Research Interests

Machine Learning, *AI for Healthcare*, Computer Vision, Deep Learning, Human-Computer Interaction.

▬▬ Education

2018 - present **MS by Research**, *Machine Learning Lab*, International Institute of Information Technology (IIIT), Hyderabad, India.

Advisor Prof. Girish Varma
Scholarship Student

2013 - 2017 **BTech, Computer Science and Engineering**, *Harcourt Butler Technological University (HBTU)*, Kanpur, India.

▬▬ Publication

Nagar, S., *Farahbakhsh, E., and Chandra, R.: Geochemical Anomaly Detection using Virtual Auto-Encoder*, pre-print.

Nagar, S., *Rohmetra, H., Beiser, D., and Ahuja, N.: Region of Interest Selection for the Remote PPG*, submitted: Engineering in Medicine and Biology Society (EMBS-22), pre-print.

Nagar, S., *Dufraisse, M. and Varma, G.: CInC Flow: Characterizable Invertible 3×3 Convolution. In 4th Workshop on Tractable Probabilistic Modeling*, UAI 2021, arXiv:2107.01358(code).

Nagar, S., *Pani, P., Nair, R., Varma, G.: Automated Seed Quality Testing System using GAN and Active Learning.*, In 9th International Conference on Pattern Recognition and Machine Intelligence (PReMI'21), arXiv:2110.00777(code)(selected for an oral presentation).

▬▬ Fellowship

MS by Research, *International Institute of Information Technology (IIIT)*, Hyderabad.
This fellowship is a competitive grant awarded to postgraduate (MS) students by IIIT-Hyderabad. The grant consisted of direct research costs, living expenses, stipend, and tuition fee.

▬▬ Experience

June 2021 – present **Research Intern**, *Lab: Computer Vision and Robotics Laboratory* , Department: Electrical and Computer Engineering (ECE), University of Illinois at Urbana-Champaign (UIUC), Champaign, IL.
Supervisor: Prof. Narendra Ahuja.
Project: Remote Sensing of Physiological Measurements Using Camera.

October 2021 – present **Research Intern**, Department: School of Mathematics and Statistics, University of New South Wales (UNSW) Sydney, Australia.
Supervisor: Prof. Rohitash Chandra in collaboration with Dr. Ehsan Farahbakhsh, The University of Sydney, Australia.
Project: Deep Variational Autoencoder for Geo-chemical Anomalies Detection.

Nov 2021 – present **Research Assistant**, *Deva Lab*, IIIT-Hyderabad.
Supervisor: Prof. U. Deva Priyakumar.
Research Project: Generative models for 3D molecules generation and generate molecular graphs using energy-based models.

June 2019 – present	**Research Assistant**, *Machine Learning Lab* , IIIT-Hyderabad. *Supervisor:* Prof. Girish Varma Computer Vision, Deep Learning, Theoretical Machine Learning.
October 2021 - present	**Associate Mentor (TA)**, TalentSprint, Hyderabad India. **PG Certification Program:** For mid-to-senior tech. professionals in AI and ML.
June 2021 – August 2021	**Teaching Assistant**, Great Learning, Hyderabad India. **Post Graduate Certificate in Software Engineering for Data Science (PGC-SEDS)**: To help professionals become data-proficient and build critical career competencies. The program enables participants to understand data science and software systems that companies widely use.
Jan 2019 – April 2019	**Research Assistant**, *Agents and Applied Robotics Group Lab*, IIIT-Hyderabad. *Supervisor:* Prof. Kamalakar Karlapalem. i.) work on *obstacle avoidance* for a group of Mobile Robots. ii.) designing of *low-cost* four wheels robot for indoor payload transportation with *efficient battery utilization* and high lifetime. iii.) work on indoor localization of a group of mobile robots Using the *triangulation algorithm*, DecaWave-DW1000, Gyro and Ultrasonic Sensor, ROS, Arduino. iv.) work on a robotic arm to increasing the degree of freedom from five to six.
Jan 2019 – present	**Teaching Assistant**, IIIT-Hyderabad, India. Maths for CS: Probability and Statistics, Instructor: Prof Girish Varma, Monsoon-21 Linear Algebra, Instructor: Prof Girish Varma, Spring-21 Probability and Statistics, Instructor: Prof Pawan Kumar, Monsoon-20 Probability and Statistics, Instructor: Prof Girish Varma, Monsoon-19 Computer Network , Instructor: Prof Shatrunjay Rawat, Spring-19
July 01, 2019 – July 15, 2019	**Computer Vision & Machine Learning Summer School**, IIIT-Hyderabad, India. *Topics*: Theory of NN, Generative models, Deep Learning Theory, Bayesian Deep Learning, RL, Optimisation, Neural Networks Architectures and Biases in ML Models, In top 20 out of 400 (Won cash prize).

Projects

Image-to-Image by Energy Based Models (EBMs), *Research project*.
Working on the EBMs training with Contrastive Divergence and Zero Shot Compositional Generation, Data Augmentation. EBMs on the task of identifying out-of-distribution data samples.

Generative models for 3D Molecules Generation, *Research project*.
End-to-end design of chemically and conformationally valid 3D molecules with high drug-likeness using graph-based generative models (Normalizing Flow).

Corn Seeds Image Dataset, *Research project*, ML Lab, IIIT-Hyderabad.
At ML Lab, with AdTech Corp., we introduced a new image dataset (labelled) to focus the application of computer vision and solve agriculture-related problems. We trained BigGAN (Cond. GAN) to generate fake corn seeds images to solve the unbalanced dataset and added fake images to create a balanced dataset. For details click here

Deep Web Crawling using Reinforcement Learning (A2C, ϵ-greedy), *Independent Research*.
Build a novel scrapy-based crawler model which uses RL methods to learn which links to follow. Start a crawl where reward is given by a classifier that returns a score with 'extracted text' and the 'wiki-page text' match score calculated using cosine similarity after tokenizing. code

3D Reconstruction, *Course project*: Mobile Robotics, Comp. Vision.
Camera Calibration, Camera Parameters, Reconstruction of a 3D-Structure using multiple images.

Text Extraction-OCR, Course project: *Computer Vision, Image Processing*.
Real time extraction of the title and the writer's name from the book cover (English) using OCR. code

Fine Grained Classification, *Pet project*.
I have developed a model to provide retail execution analytic by detecting/recognizing products on the shelf with the help of Deep Learning state-of-art. The dataset comprises images from the nut snacks category. code

Low-cost Four wheels Payload Mobile Robot, *Research project*.
Designing of the Payload Mobile Robot with DC motor and improved battery life, making a robot work in more different environments like slop of 20 degrees, potholes, and damaged floor/road.

Kinematic analysis of tendon-driven robotic mechanisms, *Course project*: Robotics mechanism.
The kinematic structure of tendon-driven robotic mechanisms is investigated with the aid of oriented graphs.

Swedish Wheels Mobile Robot, *Course project*: Adv. Robotics.
Designing and path planning of a mobile robot with the four Swedish/Mecanum wheels, ROS, Arduino, RealSence for the path planning and vision feedback, Wheel Encoder.

Face-Image classification, *Course project*: Statistical Methods in AI.
Performed PCA of all images combined of a dataset then classified using Naive Bayes Multi-class and Linear Multi-class Classifier (using python from scratch). code

Chroma key compositing, *Course project*: Digital Image Processing.
Implementation of Chroma key technique, Compare global thresholding and locally adaptive thresholding (using python, from scratch). code

Panoptic Segmentation, *Research project*.
Implementation of Panoptic Segmentation paper on the India Driving Dataset (IDD) dataset and Comparison to Existing Metrics(Semantic segmentation metrics, Panoptic quality) using PyTorch from scratch.

Technical Experience

Proficient With

languages   C, C++, Python, R, JavaScript, Matlab, HTML, CSS

technologies   LaTeX, Bash Scripting, Git, Vim, MySQL, jQuery, Bootstrap, Backbone, Windows, Ubuntu & Red Hat Linux, OSX, MLOps, and DevOps.

Have Experience With

PHP, Java, Objective C, Fortran, ML, Apache, Photoshop, SQL Server, ENVI, Visual Studio, Eclipse.

Robotics

SLAM, ROS, Pi-3, Gazebo, V-REP, FEM, Arduino: UNO and Mega, Abquas/CAE, RealSense.

Machine Learning

PyTorch(Lightning, Pyro), Tensorflow, RDKit, Keras, OpenCV, Scikit learn, Numpy, GPU programming.

Coursework

IIIT Hyderabad

Advance Mathematics Structure, Probabilistic Graphical Models, Statistical Methods in Artificial Intelligence, Adv. Robotics: Path Planning and Control, Mobile Robotics: Mechanism and Control, Computer Vision: Digital Image Processing,

MOOC

Topics in Applied Optimization, Optimization Methods, Reinforcement Learning, Deep Learning (GAN, Normalization Flow, VAE, EBMs), Active Learning, Finite Element Methods.

HBTU Kanpur

Programming in C, Digital Design, Probability and Statistic, Linear algebra, Machine language (MIPS), Computer networks, Programming languages, Computer Architecture, Algorithms and Data Structure, Compiler Design, Complexity Theory, Theory of Automata & Formal Languages Databases, Operating Systems, Discrete mathematics, Artificial Intelligence.

References (available upon request)

i). MS Thesis supervisor: Prof Girish Varma, CSTAR and Machine Learning Lab, IIIT-Hyderabad, India

ii). Research Intern supervisor: Prof Narendra Ahuja, Computer Vision and Robotics Lab, UIUC, Illinois

iii). Research Intern supervisor: Prof Rohitash Chandra, School of Mathematics and Statistics, UNSW Sydney, Australia