AVANI GUPTA

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Website

EDUCATION B.Tech (Hons.) + MS by research in Computer Science

International Institute of Information Technology, Hyderabad

8.18 CGPA

July 2019-May 2023 Hyderabad, India

WORK EXPERIENCE

Researcher

Centre for Visual Information and Technology (May 2020-Present)

Working on Computer Vision and Graphics under Professor P.J. Narayan. Work involves Neural rendering, ray tracing and 3D reconstruction of objects and scenes. Working on photo-realistic reconstructions and rendering of scenes from images using Deep Neural Networks. Currently working on NeRF(Neural Radiance fields) line of work. Implemented and reproduced results of several papers in neural rendering. Github(public): Relightable Neural Rendering: Free Veiw-point relighting

Independent Study (Dec 2020- Present)

Independent Study under Professor Avinash Sharma. Working on Realistic Human Body Reconstructions and Digital Humans. Github: PIFu

Crew Member and Mentee

Mars Colonization Program, Microsoft(June 2020 - July 2020) Winner all over India in the program

Worked on Automated mars rover web game. Developed the game in Agent Centric way. Used shortest path-finding algorithms like Collaborative Learning Agents, A*, Dijkstra, Best first search, IDA*, Jump-Point Finders and their bi-directional forms to make the AI rover navigate the mars. Applied Travelling salesmen algorithm and made the AI agent render multiple destinations in the shortest path avoiding all obstacles. Built using Object Oriented programming cocepts. Used Jquery, Rafael.js, and HTML, CSS and javascript. view project

Applied Deep Learning and Software Engineering Intern

Scrapshut (Jan 2020- May 2020)

Developed a web-app using Angular and Django where users can check genuineness of any site by providing it's URL and get other user's reviews along with predictions by DL model. Trained various Deep Learning models like LSTM, XGBoost and CNN on three datasets- Kaggle fake news net, Kaggle: getting real about fake news and Kaggle fake news Prediction. Also trained a passive aggressive classifier (online learning algorithm) and incorporated user-rated scraped reviews for real time prediction. view project

Researcher

Robotics Research Centre (Nov 2019- Jan 2020)

Worked on several SOTA RL algorithms in Robotics and Control under Professor Madhav Krishna. Implemented algorithms from Monte-Carlo to PPO, TRPO, DDPG etc from scratch. Also used open AI gym, RLib, Vowpall wabbit and engines like Gazebo, Mojuco for control in robotics. view project

PUBLICATIONS

Fake News Detection using Deep Learning based Natural Language Processing(Jan- May 2019)

Accepted as poster publication in 26th IEEE International Conference on High Performance Computing, Data and Analytics, Dec 2020, Hyderabad

Trained an artificial neural network with single hidden layer for Fake news detection. Used credit history of users: score based on what type of news shared by user in past. Trained on Liar's Dataset, optimized various hyper-parameters and achieved 30% increase in accuracy than baselines.

Reconstruction of the perceived visual stimuli using 3D Generative-Adversarial Modeling(August - Nov 2020)

Accepted in Neuromatch Conference 2020

Proposed a self-supervised 3D reconstruction pipeline which allows to train an end-to-end fMRI-to-3D object reconstruction using a 3D Generative-Adversarial Modeling technique. view abstract

Abstract representation of visual stimuli from neural recordings using deep generative models(June - August 2020)

Poster, Ernst Strüngmann Institutefor Neuroscience Conference(ESI Sync) in Cooperation with Max-Planck-Society

Reconstruction of perceived images from fMRI signals using VAE. view abstract

RELEVANT PROJECTS

Smart Library Management System(Jan 2020-August 2020)

Winner among thousands of teams all over India, Software edition, Smart India Hackathon 2020

Made Google's BERT Transformer based auto-tagger via live data extracted using google books api, collaborative filtering recommendation engine; contact-less library: QR based issuing of books, scheduling time-slots with allotted tables; Advance search with voice using Bitap Algorithm; admin dashboard; virtual guide: chatbot(made via dialogflow) which suggests books, option to issue/return, book slots. Used Flutter, Django, Firebase and self hosted AWS server.

Virtual Reality tours from smartphone captures(Nov 2020 - present)

Working on creation of indoor scenes VR tours in real-time from images/videos captures by users on smartphone with Chandrashekhar Balasubramanyam. Using image stitching(feature matching, relighting, toning) and interpolation(GANs and traditional techniques) to get the panorama of stitched views and rendering it in tour. Also working on object detection, segmentation labelling to make tour interactive.

Poisson Matting (Sept-Nov 2020)

Did matting for natural images in complex scenes by calculating the gradient of matte from image and solving Poisson equations. Refined matte using semi-supervised approach and alpha-blended to get complex images in new backgrounds. view project

Pose Graph Optimization in SLAM (Sept-Oct 2020)

Optimized robot's trajectory using pose graph optimization for 1D and 2D SLAM problems(Simultaneous Localization and Mapping). Implemented in python from scratch as well as using g2o and jax libraries. view project

Stereo reconstruction and Non-linear optimization (Nov 2020)

Generated a dense 3D point cloud reconstruction of a scene from stereo images.Synthesized a new image taken by a virtual monocular camera fixed at any arbitrary position and orientation and recovered the pose using iterative(Perspective-from-n-Points)PnP from scratch. Further implemented bundle adjustment and Structure from motion pipelines. view project

Adversarial Neural Cryptography (July -Sep 2020)

Inspired by Google brain paper "Learning to Protect Communications with Adversarial Neural Cryptography". Work on training neural networks for real time encryption in multi-agent transmission and multiple adversaries. Trained LSTMs Alice and Bob who transmit data protecting it from multiple adversaries trying various adversarial attacks. view project

Data Visualizations (Jan-April 2020)

Developed India State-wise rainfall vs greenhouse gas emissions visualization using Python library Bokeh. Also Visualized many graphs including spread of COVID19, Batsman ratings bar graph race, etc using D3. view project, view visualizations

Genetic Algorithm for optimizing weights of a ML model (March 2020)

Used weights of model as population, used MSE as fitness function to optimize the performance of model. Used Whole Arithmetic Recombination cross-over and rank based selection. view project

Wikipedia Search Engine (Sep 2019)

Included support for queries ranging from basic to advanced search based on topic, info-box, body, etc and ranked search results from Wikipedia Corpus. Wrote indexer from scratch and indexed entire Wikipedia English corpus.view project

Self Driving Car(in simulation) (Dec 2018)

Used Deep Q learning. Passed states of environment vectors as input to neural network. Used three sensors for direction and moment. Built in python from scratch without using libraries. view project

SKILLS

- **Programming Languages** Python, Java, C/C++, Javascript, Matlab, Dart
- **Web/App Development** Django, MongoDB, Express, React, Node,js (MERN stack), Angular, Flutter, Flask, SQL, HTML, CSS, JavaScript, Jquery, D3
- **Libraries** PyTorch, Tensorflow, bokeh, gym, vowpal-wabbit, RLlib, Open-3D, jax, g2o
- **Applications** COLMAP, OpenGL, Blender, Meshlab, Unity, Cuda, Matlab, Tungsten, Git, Firebase, Dialog-flow, WitAI, Gazebo, Mojuco, ARCore, Mitsuba
- **Environments** Linux, Windows, Arduino, Raspberry Pi

RELEVANT COURSES, WORKSHOPS AND TRAINING

- **Relevant courses** Optimization Methods, Computer Vision, Deep Learning Specialization, GANs Specialization, Computer Graphics, Statistical Methods in AI, Digital Image Processing, Mobile Robotics, Data Visualization, Machine-Data-Learning, Computational Intelligence, Calculus, Probability and statistics, Linear Algebra, Information Security, Information Retrieval and Extraction, Quantum Computation
- **Workshops/conferences** NeurIPS 2020, SocML 2020, NeuroMatch Conference, ICVGIP 2020, IEEE HiPC 2019, WIT Global conference 2020; ESI 2020, Qiskit Global Summer School on Quantum Computing by IBM 2020, NeuroMatch Academy, Resource-aware Machine Learning: International Summer School 2020, TU Dortmund, Germany

ACHIEVEMENTS

- Winner, Smart India Hackathon 2020
- Winner, Mars Colonization Program all over India, project Mars Rover webgame
- One of top performers in Microsoft Codess 2020; Selected as at Microsoft Engage 2020 Mentee.
- Winner of Deep Learning quiz by IEEE, NIT Raipur.
- Top team, CodeUtsav: 28 hour Hackathon, NIT Raipur. Built a Recommender System for AI centric Retail
- Teep Fellowship 2019: Selected for Internship under Taiwan Experience Education Program TEEP 2019 with Professor LEE Tzung-Hang in College of Engineering, Tamkang University.

POSITIONS OF RESPONSIBILITY

- **Volunteer** NeuRIPS: Coordinated in organization of workshops
- **Member** Events wing, Robotics club, IIIT Hyderabad
- **Programs and Events Head** E-cell: Planned and Organised various entrepreneurial events