Hari Prasad

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scholar.google.com/citations?user=mXTiylkAAAAJ
IELTS Band Score: 8.0 (C1 CEFR Level)

Career Objective

To pursue a career researching fundamental and theoretical Artificial Intelligence.

Research Interest

Deep Learning, Reinforcement Learning, Affective Computing, Computational Cognitive Science, Few-Shot Learning, Causal Analysis, Knowledge Representation, 3D Reconstruction, Generalization, and Optimization.

Education

TKM College of Engineering **9.78 CGPA**
Master of Technology (M.Tech) in Artificial Intelligence *September 2021 – July 2023*

College of Engineering Karunagappally **7.73 CGPA**
Bachelor of Technology (B.Tech) in Electrical and Electronics Engineering *August 2016 – September 2020*

Kendriya Vidyalaya No.2 Armapur, Kanpur **78.5%**
Senior Secondary (CBSE) *2015*

Kendriya Vidyalaya NTPC Ramagundam **10 CGPA**
Higher Secondary (CBSE) *2013*

Relevant Coursework

- Reinforcement Learning
- Deep Learning
- Pattern Recognition
- Machine Learning
- Data Structures and Algorithms
- Computer Vision
- Artificial Intelligence
- Optimization Theory
- Big-Data Analytics
- Randomized Algorithms
- Research Methodology
- Approximation Algorithms
- Soft Computing
- Digital Signal Processing

Work Experience

CROSS, University of California, Santa Cruz **May 2022 – December 2022**
Research Intern, Google Summer of Code (GSoC) *Santa Cruz, California (Remote)*

- **Mentors: Oskar Elek, Farhanul Hasan**
- **Skills: Graph Theory, Computer Vision, Optimization, Agent-Simulation**
- Developed PolyPhy, a Python implementation of PolyPhorm utilizing the MCPM algorithm inspired by Physarum polycephalum slime mold to analyze cosmic web structures comprising intergalactic gas and dark matter filaments.
- Implemented two methodologies within the project: one involved a custom graph extraction algorithm based on an agent-based approach, and the other utilized the TTK-Paraiew Library to create a pipeline for graph extraction and visualization using the Morse Smale Complex.
- The primary goal was to extract graphs representing the geometry and topology of the scalar field, with a focus on enhancing user-friendliness for library users by improving the graph extraction algorithm.
- The project aimed to enable easier analysis of the output and direct queries from the extracted graph for understanding cosmic web structures.

KSCSTE & Regional Cancer Centre **February 2021 – August 2021**
Research Fellow *College of Engineering Karunagappally, Kerala*

- **Mentors: Remya K S, Gopakumar C**
- **Skills: Generative Networks, Image Segmentation, Image Classification, Preprocessing**
- Worked on a KSCSTE-funded research project, "Development of a fully Automated Indigenous Software for Efficient Karyotyping for Chromosome Abnormality Detection", in association with Regional Cancer Center Trivandrum.
- Used 30+ semantic segmentation models to compare and analyze the performance and developed a novel U-Net-based lightweight encoder-decoder model with very good results, for the removal of interface cells from metaphase images.
- Developed a novel translational Conditional-GAN model to perform segmentation of overlapping chromosomes.

- Worked on enhancing chromosome metaphase images using image processing techniques and developed a technique to improve the classification performance to over 95% after enhancement.

Zellab Dynamics Pvt. Ltd. **Aug. 2020 – Present**
Co-Founder CTO *Kollam, Kerala*

- **Skills: PaaS, PHP, MySQl, JavaScript, Laravel, React-Native, ReactJS**
- Led the Engineering Team in developing a PaaS Multi-Tenant eCommerce Platform..
- Defined and implemented product development standards, up-to-date coding methodologies and best practices.
- Defined the technology stack and implemented an agile development culture.
- Designed and developed the User interface (UI) for the platform.
- Developed a platform for Virtual conference management.

Publications

- Hari Prasad, Chinnu Jacob, Imthias Parambath, *Appraisal-Guided Proximal Policy Optimization: Modeling Psychological Disorders in Dynamic Grid World*. (Under Review)
- Sathyan, RR, Menon, GC, Prasad, H, Sreedharan, H, Hemanth, DJ. *Deep learning-based semantic segmentation of interphase cells and debris from metaphase images*. International Journal of Imaging Systems and Technology. 2022; 32(6): 2017-2033. doi:10.1002/ima.22741.
- R. S. Remya, H. Prasad, S. Hariharan and C. Gopakumar, *Chromosome Image Enhancement for Efficient Karyotyping*, 2022 International Conference on Innovative Trends in Information Technology (ICITIIT), Kottayam, India, 2022, pp. 1-6, doi: 10.1109/ICITIIT54346.2022.9744195.
- R S Remya, S Hariharan, Hari Prasad, C Gopakumar, *ChromSeg-P3GAN: Pix2Pix Patch Generative Adversarial Network for Chromosome Segmentation* (Under Review)

Research Projects

- **(Master's thesis) Appraisal-Guided Proximal Policy Optimization: Modeling Psychological Disorders in Dynamic Grid World** (Python, PyTorch, Gym, Matplotlib, Numpy, OpenCV) **[2023]**
  - Developed a methodology for modeling psychological disorders in AI agents using Reinforcement Learning.
  - Utilized appraisal theory to train AI agents with emotional intelligence in a dynamic grid world environment.
  - Explored various reward-shaping strategies to simulate psychological disorders, such as Anxiety disorder and Obsessive Compulsive Disorder (OCD) in agents.
  - Conducted in-depth comparisons of modified Proximal Policy Optimization (PPO) algorithms to identify variants capable of replicating disorder-like behavior in AI agents.
  - Established evaluation criteria and metrics to analyze the behavior of AI agents and discussed the future possibilities of studying the psychology of artificial agents in AI and psychology contexts.

- **(Master's mini-project) Improving the fairness of deep learning models on image data by counterfactual analysis and causal intervention** (Python, Numpy, OpenCV, Keras, Tensorflow, NetworkX, Matplotlib) **[2022]**
  - Explored the use of deep neural networks for various tasks and recognized the importance of well-structured and unbiased data for training.
  - Investigated methods to identify and mitigate bias in numerical data, specifically through counterfactual analysis.
  - Developed a novel method to identify bias in image datasets and generate bias-mitigating training subsets (BMTS).
  - Evaluated the impact of using BMTS in combination with the original biased dataset on model generalization, comparing it to other existing techniques.
  - Analyzed various approaches for generating BMTS and assessed their effectiveness in improving model generalization in the context of bias mitigation.

- **Federated Online Synchronous Facial Recognition and Authentication (FOSFRA) System** (Python, Numpy, OpenCV, Keras, Tensorflow, Matplotlib) **[2022]**
  - Developed FOSFRA, a secure authentication system for online learning sessions, as part of the IEEE Student Challenge.

- Implemented facial recognition authentication using an Autonecoder-based CNN model and dynamic online learning for model updates.
- Ensured data privacy through a Federated learning scheme and incorporated focus and attention estimation using Gaze estimation and blink rate analysis.

- **(Bachelor's thesis) 6 DOF Robotic Arm-based Extended Autonomous 3D Printer** (Python, RoboDK, OpenCV, Tensorflow, Keras) [**2020**]
  - Developed a project that addresses limitations of traditional 3D printers by integrating a 6 DOF Robotic Arm.
  - Combined the Robotic Arm with existing 3D Printing technology to overcome conventional issues.
  - Achieved an extended 3D printer capable of overcoming dimensional limitations, enabling the printing of objects of any size.
- **A Gait-analysis based human detection and recognition system for secure authentication, using YOLO-v8 and MobileNet-v2)** (Python, OpenCV, Tensorflow, Keras, Matplotlib) [**2023**]
- **An YOLOv7-based face detection algorithm for classroom attendance tracking)** (Python, OpenCV, Tensorflow, Keras, Matplotlib) [**2023**]
- **Discrete Event Simulation and analysis using Python and Simpy)** (Python, Numpy, Simpy, Matplotlib) [**2022**]
- **Development of a fully automated Indigenous software for Efficient Karyotyping for Chromosome abnormality detection)** (Python, OpenCV, Keras, Tensorflow, PyQT, Nvidia Jetson) [**2021**]
- **Low-Light Image enhancement using Pix2Pix GAN** (Python, OpenCV, Tensorflow, Keras) [**2020**]
- **Deep Learning based Image segmentation for Dry-Dock Vessel Corrosion analysis** (Python, OpenCV, Tensorflow, Keras) [**2020**]
- **Time Series Rainfall analysis using Deep Learning** (Python, Pandas, Scikit-learn) [**2020**]

Technical Skills

Programming Languages: Python, C, HTML/CSS, JavaScript, SQL, PHP
Frameworks and Libraries: TensorFlow, PyTorch, Keras, Scikit-Learn, Laravel, Lumen, ReactJS, React Native, NodeJS, ExpressJS, MongoDB, SQL, Docker, Kubernetes
CAD/Designing Tools: AutoCAD, 3DS Max, DIALux Evo, PVSyst, Cinema4D

Awards / Recognitions

- 1st Prize (3000 USD) in IEEE P2834 Global Student Challenge, held at UPV Valencia, Spain (2022).
- IEEE PES Kerala Outstanding Young Professional Award 2021.
- IEEE PES Kerala Chapter Outstanding Student Volunteer Award 2020.
- Travel Grant to attend TPEC 2020 at Texas A&M University, College Station, Texas, USA.
- Received 1800 USD in Project Grant from IEEE PES (2018).

Leadership / Volunteering

- IEEE PES Kerala Chapter Entrepreneurship Committee Coordinator (2022 - Present).
- IEEE PES YP Kerala R&D Committee Coordinator (2020 - Present).
- Mentor, IEEE SB College of Engineering Karunagappally. (2020 - Present).
- IEEE Smart Grid R&D Committee Member (2019 - Present).
- Technical Chair, IEEE International Power and Renewable Energy Conference (IPRECON) 2020.
- IEEE PES Day Kerala Section Ambassador 2020.
- IEEE PES Day Global Design Team Lead 2020.
- Design Team Lead, IEEE SB College of Engineering Karunagappally (2017 - 2020).
- Technical Coordinator, IEEE IA/IE/PELS Jt. Chapter Kerala Section (2019 - 2020).
- Student Representative, IEEE IA/IE/PELS Jt. Chapter Kerala Section (2019 - 2020).
- Webmaster, IEEE SB College of Engineering Karunagappally (2018 - 2020).
- Chair IEEE PES SBC, College of Engineering Karunagappally (2019 - 2020) (Re-elected).
- Chair IEEE PES SBC College of Engineering Karunagappally(2018 - 2019).
- Vice-Chair IEEE PES SBC College of Engineering Karunagappally (2017 - 2018).
- Vice-Chair IAS SBC College of Engineering Karunagappally (2016 - 2017).