Hari Prasad

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IELTS Band Score: 8.0 (C1 CEFR Level)

Career Objective

To leverage my passion for fundamental and theoretical Artificial Intelligence in a research-focused career.

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*

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

Pi School, Rome, Italy **Dec 2023 – February 2024**
AI Fellow, School of AI Residency Program *Rome, Italy (Hybrid)*

- **Mentors: Cristiano De Nobili, Marcello Politi**
- **Skills: Time Series, LSTM, Temporal-GNNs**
- Selected as one of the 10 fellows, out of 350+ applications worldwide, for the 8-week fully funded fellowship program.
- Worked on time series data for intelligent inventory management, developing multiple models, for demand forecasting, discriminative analysis, and GIMROII optimization, using Statistical, Machine Learning, and Deep Learning based solutions.

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 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 e-commerce Platform, bridging technology and commerce by integrating cutting-edge business intelligence and image processing technologies.
- Developed the computer vision and data analytics layers of the platform.
- Defined the technology stack and implemented an agile development culture.
- Worked on the User interface (UI) design and development for various products.
- 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)
- Prithvi J, Hari Prasad, Ahamed T P, *A Comparative Study of Q-Learning and DQN on Large Grid World Environments*. (2023 IEEE International Conference on Modelling, Simulation & Intelligent Computing)
- 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)
- R S Remya, S Hariharan, Hari Prasad, C Gopakumar, *Multilabel chromosome classification based on Denver and chromosome information*. (9th IEEE International Women in Engineering (WIE) Conference on Electrical and Computer Engineering, 2023).

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).
  - 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.
  - 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]**
- **A 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).
- Post-Graduate Student Excellence Award (M.Tech 2023).
- 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).
- Prime Minister's Scholarship (PMSS) 2017.

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).
- Technical Chair, IEEE International Power and Renewable Energy Conference (IPRECON) 2020.
- IEEE PES Day Global Design Team Lead 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).
- Chair IEEE PES SBC, College of Engineering Karunagappally(2018 - 2020).
- Vice-Chair IEEE PES SBC, College of Engineering Karunagappally (2017 - 2018).
- Vice-Chair IAS SBC, College of Engineering Karunagappally (2016 - 2017).