Divyagna Bavikadi

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EDUCATION

Ph.D. in Computer Engineering   **2022 - Present**
Arizona State University   *GPA: 4.0*
- Neurosymbolic Artificial Intelligence; Advised by Paulo Shakarian

M.Tech/B.Tech in Computer Engineering   **2017 - 2022**
Central University of Karnataka   *GPA: 4.0; Valedictorian*
- Masters Thesis: Representational Learning and Analysis of Explainable Human Pose Recognition and Correction
- Bachelors Thesis: Speech Emotion Recognition with Deep Learning

EXPERIENCE

Research Associate   **2022 - Present**
Arizona State University, Tempe
- Generate narrative aware content using a framework with Large Language Models by leveraing symbolic reasoning [Funded by *Defense Advanced Research Projects Agency (DARPA)*].
- Design neurosymbolic frameworks (where reasoning meets learning capabilities) to induce rules from historical data to predict and reason about agentic behaviour [Funded by *Office of Naval Research (ONR)*].
- Developed an abductive inference-based method on geospatial temporal data to locate 'dark vessels' in the maritime domain to improve detection while reducing search area compared to machine learning approaches [In collaboration with *EpochGeo*].
- Architected a neurosymbolic framework for error detection and correction in movement trajectory classification, improving accuracy by 8% of classification models in zero-shot setting, and overall performance gains in out-of-distribution scenarios [Funded by *Intelligence Advanced Research Projects Activity (IARPA)*].
- Created a scalable AI system for generating human movement patterns, using abductive reasoning integrated with cloud-based infrastructure, geolocated knowledge graphs, and rule learning, enabling realistic undetectable agent trajectories for large-scale security simulations [In collaboration with *Leidos Inc*].
- Formulated and implemented a causality-based metric to identify key biomarkers for disease detection, resulting in a 13% improvement in performance compared to baseline methods [In collaboration with *BioDesign Center at ASU*].

Tools: PyTorch, Scikit-learn, Hugging Face, XGBoost, GIS, Statsmodels, Apache Spark, Kubernetes, Docker, AWS, Multiprocessing

Research Assistant   **2021 - 2022**
Indian Institute of Technology, Hyderabad, India
- Developed Pose Tutor, an explainable pose recognition and correction system (in the wild) using DenseNet-based vision model with K-Nearest Neighbors, enabling real-time pose classification and joint correction for exercises [In collaboration with *Variance AI*].
- Compiled two new datasets into the system, achieving promising results of an average accuracy improvement of 7% over the baselines along with explanations on the predictions that are expert validated.
- Investigated extracting actionable corrections to an input of an incorrect exercise pose using counterfactual explanations.

Tools: PyTorch, Caffe, OpenCV, Numpy, Pandas, Git

Research Assistant   **2020 - 2022**
International Institute of Information Technology, Hyderabad
- Built a brain atlas using deep learning methods by training a U-Net model on 2D MRI scans to automatically segment and create a high-quality brain template using a convolutional U-net for image registration, enabling medical imaging analysis to understand population variability.
- Implemented an emotion recognition system integrated into a web application, utilizing real-time 3D visuals and a backend powered by a audio feature extractor and Long Short-Term Memory network trained on 5 standard datasets, achieving 87% accuracy in recognizing 9 emotions by incorporating Mel-Frequency Cepstral Coefficients and prosodic features within a unified protocol flow.

Tools: Python, PyTorch, Tensorflow, Keras, Numpy, Pandas, CSS, HTML, Javascript

Data Science Intern   **2021**
DeveLearn Technologies Ltd, Mumbai
- Developed an end-to-end facial recognition attendance system using the MTCNN-Facenet framework, achieving 99.7% accuracy by fine-tuning with a curated dataset representing diverse user demographics.
- Engineered a robust, multi-platform (mobile/desktop) on-premises app with live facial recognition, motion detection, and features for attendance marking, and leave applications, designed to perform reliably under occlusions, varying environmental conditions, and in COVID-19 safety contexts, ensuring secure staff management.

Tools: Python, Pandas, Django, PostgreSQL, Matplotlib, Seaborn

PUBLICATIONS

1. [**CVPR**] Bhat Dittakavi, **Bavikadi, Divyagna**, Sai Vikas Desai, Soumi Chakraborty, Nishant Reddy, Vineeth N Balasubramanian, Bharathi Callepalli, and Ayon Sharma. Pose tutor: an explainable system for pose correction in the wild. In *Proceedings of the IEEE/CVF conference on computer vision and pattern recognition*, pages 3540–3549, 2022

2. [**AAMAS**;Accepted] **Divyagna Bavikadi**, Ezra Lee, Chad Parvis, and Paulo Shakarian. Sea-cret agents: Maritime abduction for region generation to expose dark vessel trajectories, 2024

3. [**IJCAI**; Under Review] Bowen Xi, Kevin Scaria, **Divyagna Bavikadi**, and Paulo Shakarian. Rule-based error detection and correction to operationalize movement trajectory classification, 2024

4. [**ICLP**] **Bavikadi, Divyagna**, Dyuman Aditya, Devendra Parkar, Paulo Shakarian, Graham Mueller, Chad Parvis, and Gerardo I Simari. Geospatial trajectory generation via efficient abduction: Deployment for independent testing. In *Proceedings of the 40th International Conference on Logic Programming (ICLP)*, 2024

5. [**PLOS**;Under Review] **Bavikadi, Divyagna**, Ayushi Agarwal, Shashank Ganta, Yunro Chung, Lusheng Song, Ji Qiu, and Paulo Shakarian. Machine learning driven biomarker selection for medical diagnosis. *arXiv preprint arXiv:2405.10345*, 2024

6. [**RTIP2R**] **Bavikadi, Divyagna**, A Manjunatha, Abhishek Pol, and Akshat Kadam. Real-time face recognition for organisational attendance systems. In *Recent Trends in Image Processing and Pattern Recognition: 4th International Conference, RTIP2R 2021, Msida, Malta, December 8-10, 2021, Revised Selected Papers*, page 134. Springer Nature, 2022

PATENTS

- M25-190P: U.S. Provisional patent 63/745,753 (Jan. 22 2025) "Sea-cret Agents: Maritime Abduction for Region Generation to expose Dark Vessels"

TECHNICAL SKILLS

Core: Applied Machine Learning, Logic in Artificial Intelligence, MLOps and ML Engineering
Programming Languages: C, Python, CSS, HTML, Javascript VHSIC Hardware Description Language, Verilog
Scientific softwares: MATLAB, Simulink, Scilab, Lab-VIEW
Tools: PyTorch, TensorFlow, Keras, Scikit-learn, Hugging Face, XGBoost, Caffe, OpenCV, Numpy, Pandas, Geographic Information System (GIS), Statsmodels, Matplotlib, Seaborn, Django, Apache Spark, Kafka, Kubernetes, Docker, PostgreSQL, Amazon Web Services (AWS), Git

PROJECTS

Neurosymbolic Reinforcement Learning- A logic-based inference with reinforcement learning in order to guide the agent in the maritime domain for search and rescue application.

AutoTask- IoT based voice controlled home automation system, that automates the appliances, monitors plants and detects home intrusion using raspberry pi via python.

RELEVANT COURSES

Planning and Learning in AI, Statistical Machine Learning, Knowledge Representation and Reasoning, Deep Learning for Computer Vision, Perceptual Reasoning and Symbol Grounding, Neurosymbolic Reasoning, Robotics and Automation, Industrial Internet of Things, and Computational Methods and Parallel Processing on Science and Technology.

AWARDS & ACHIEVEMENTS

- Awarded Fulton Fellowship (merit-based) at Arizona State University [Fall 2022]
- Awarded Prof.A.M.Pathan **gold medal** (given to one in the university) [2022]
- Awarded **two gold medals** for academic excellence in Bachelor and Master of Technology at Central University of Karnataka (given to one per department) [2022, 2021]
- Awarded INSPIRE Scholarship from Ministry of Human Resource Development, India [2014]

PROFESSIONAL ACTIVITIES

- **Advising**: 5 grad students, 1 high school student [2022 - Present]
- **Reviewing**: The International Conference on Knowledge Representation and Reasoning 2024 (KR-24); The Thirty-Ninth AAAI Conference on Artificial Intelligence (AAAI-25); 2nd Workshop on Metacognitive Prediction of AI Behavior at SDM (METACOG-25)
- **Teaching Assistantship**: Assisted with the course 'Deep Learning for Computer Vision' with 6000+ enrollments.