Joydeep **Medhi**

LEAD DATA SCIENTIST | MACHINE LEARNING RESEARCH ENGINEER

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Work Experience

Lowe's Companies Inc

Bengaluru, India

LEAD DATA SCIENTIST - AI/ML *July. 2022 - Present*

- Spearheaded advanced R&D initiatives, driving innovation in **Computer Vision** and AI solutions for omni-channel retailer.
- Led the Customer Experience Optimization project, including:
  - Developed real-time multi-person tracking systems, using trajectory analysis to map customer interactions and associate engagements.
  - Integrated **semi-supervised learning** and **active learning** frameworks to enhance object detection mAP by 15%.
  - Successfully implemented the Customer Service Alerting System, driving over $1M in incremental revenue, with an estimated enterprise impact of $500M.
- Pioneered Generative AI solutions, including:
  - Delivered a PoC for a Voice Assistant, leveraging **Retrieval-Augmented Generation (RAG)** and **Vision-Language Models (VLMs)**.
  - Developed VLM-based action recognition models PoC, automating complex behavioral analytics and improving in-store customer interaction statistics.
- Architected and led the R&D of **Multi-Camera Multi-Target Tracking (MTMC)** systems, designing models to enhance cross-camera tracking
- Optimized self-checkout systems by implementing cutting-edge self-supervised learning techniques for product recognition and counting, achieving over 25% efficiency gains.
- Drove enterprise-wide AI adoption by conducting workshops and interactive demos, empowering technical and non-technical teams to scale AI-driven solutions.

Mercedes-Benz Research and Development India

Bengaluru, India & Stuttgart, Germany

SENIOR ML RESEARCH ENGINEER *Dec. 2018 - June. 2022*

- Designed Computer Vision/Deep Learning based solution for Car Interior Scene Understating of **MBUX** Interior Assistant
- Key Technical researcher for **Multi-Camera Multi-Person Human Pose Estimation, Gesture Recognition**, Tracking and Occupancy Detection
  - Designed efficient CNNs from scratch for Human Pose Estimation to run on Embedded Hardware for real-time inference
  - Implemented CNNs inspired from Stack Hourglass, HR-Net and end-to-end training and validation pipeline for production
  - Improved PCKh accuracy of the model by adapting Student-Teacher training strategy, variable gaussian heatmaps, limb prediction
  - Designed the algorithm to handle corner cases such as Occlusion, Objects, Pets, etc. to achieve production KPIs
  - Proposed novel algorithms/modifications to improve accuracy of 3D detection for Sunroof Gestures, fingertip proximity to screen
- Lead Researcher and Developer for **Face Recognition and Authentication** Module for Mercedes Cars
  - Explored and Implemented different metric learning based approaches to train Face Recognition CNNs achieving high FAR & FRR
  - Worked on **Unsupervised Domain Adaptation and use of synthetic data** to reduce real data requirements
  - Defined Data Collection, Data Analysis, Data Annotation definition and pipelines, designed evaluation methods for KPI
- Used Torch7, PyTorch framework in a **Distributed/Multi-GPU** setting. Optimized production training code - saved 100s of GPU hours.
- Worked with different Hardware/FPGA & Software teams to ensure smooth integration of quantized deep learning models in **low-compute automotive embedded devices working in real time.**
- For a practical demonstration, please refer some video demo: **a) Door closing b) Gesture Sunroof**

Silversparro Technologies

Gurgaon, India

DEEP LEARNING RESEARCH ENGINEER *July. 2018 - Nov. 2018*

- Responsible for researching existing literature & developing new algorithms for computer vision applications (CCTV) in retail industry.
- Developed **Deep Learning** models to detect persons & classify their gender and Age-Group from CCTV footage for retail statistics.
  - 0.85 ROC-AUC achieved on imbalanced Age Data & 88% accuracy achieved on Gender Data using transfer learning with CNNs.
- Proposed and Implemented new techniques for anchor box initialization using **KMeans clustering in Faster-RCNN**.
  - Convergence time decreased by 50 % and mAP & F1-score increased by 6 % and 7.3 % respectively.
- Implemented new features for Tensorflow Object Detection API such as continuous validation during training & new validation metrics.

CBRC, KAUST

Jeddah, Saudi Arabia

RESEARCHER AT BIO-ONTOLOGY RESEARCH GROUP SUPERVISOR: PROF. DR. ROBERT HOEHNDORF *May. 2017 - July. 2017*

- Worked at the intersection of **Artificial Intelligence & Bioinformatics** with focus on developing Machine Learning solutions for Life Sciences.
- Classification of causative disease variants with mutation from genome on imbalanced datasets.
- Successfully implemented and explored different Deep Neural Network architectures utilizing large genome sequencing data and ontology and performed statistical tests for feature selection. Worked on High-Performance GPU clusters for implementation and fine-tuning of DNNs.
- Achieved significantly improved ROC-AUC of 0.967 and Avg. Precision 0.964 on test data for fine-tuned model.

Education

Indian Institute of Technology Delhi (IITD) *New Delhi, India*

B.Tech & M.Tech Dual Degree in Mathematics and Computing - EQF level 7 *July. 2013 – June. 2018*

- **Relevant Coursework** Probability and Stochastic Processes, Linear Algebra, Statistical Methods, Data Structures, Algorithm Design and Analysis, Machine Learning, Data Mining, Optimization Methods, DBMS, OS, Computer Networks, Bio-informatics, Image Processing.
- **Head Teaching Assistant** (Jul, 2017 - Dec,2017) of Computer Programming Class with 60 students.
- **Master's Thesis:** Calculus on Normed Vector Spaces **Supervisor:** Prof. Dr. Amit Priyadarshi, IIT Delhi

Skills

Programming Languages	Python, Lua, C++, MATLAB, JAVA, SQL, Weka, Git, Version Control, Linux, NVIDIA CUDA, GPU, Docker
Machine Learning	PyTorch, Torch7, Numpy, Tensorflow, Keras, OpenCV, Detectron, Pandas, Scikit-learn
	LLM, HuggingFace, Langchain, GenAI, NLP, Computer Vision, RAG, GraphRAG, Agentic AI, VLM, Deepstream
	Camera Calibrations, Image Processing, SLAM, 3D Vision

Publications and Patents Filed

- **End-to-end differentiable 6DoF object pose estimation with local and global constraints, DiffCVGP Workshop, NeurIPS 2020**
- **System and Method for Dynamic Adjustment of Sound Zone for A Passenger in a Vehicle, 2020**
- **System and Method for Hand Cropping for Hand Pose Recognition, 2020**
- **System and Method for Occupancy Detection within a Vehicle, 2021**
- **System for Predicting User Rating for in-car Entertainment Recommendation, 2021**
- **System and Method for 6DoF pose estimation of a Child-Seat inside a passenger vehicle, 2022**

Awards and Recognition

2024	**3rd Place in Lowe's Techwide AI Global Hackathon for Multimodal GenAI Application , Lowe's Companies Inc**	*Bengaluru, India*
2023	**2 ideas selected in Lowe's Top 5 AI Strategy , Lowe's Companies Inc**	*Bengaluru, India*
2022	**High Quality Patent Award, Mercedes-Benz Research & Development India**	*Bengaluru, India*
2022	**Implemented Product Patent Award, Mercedes-Benz Research & Development India**	*Bengaluru, India*
2021	**Product Innovation Award - Top 5 products, Mercedes-Benz Research & Development India**	*Bengaluru, India*
2020	**Silver Award - Best Performing Team Member, Mercedes-Benz Research & Development India**	*Bengaluru, India*
2012	**2nd Position, Chemistry Olympiad, Guwahati University**	*Guwahati, Assam*
2011 - 2013	**Top Board Performance - Class X & XII (Assam), National Merit Award, Govt. of India**	*New Delhi, India*

Organisational skills

- Excellent communication skills in English to present complex algorithms/ideas in simple terms
- Scientific team-leading and mentoring skills gained from current work experience
- Good organisational skills gained as Executive of the Sparks Forum, responsible for organising events and promoting events