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Alwyn Mathew

Senior Research Fellow, Department of Computer Science, IIT Patna

Education

Indian Institute of Technology (IIT) Patna, Bihar, India — *Aug 2021 (Expected)*
Ph.D. in Computer Vision (Awaiting Thesis Defense)
GPA: 8.63/10

College of Engineering Karunagappally, Kerala, India — *May 2016*
Masters in Technology, Image Processing
GPA: 8.4/10

Tamilnadu College Of Engineering, Coimbatore, India — *April 2012*
Bachelors in Technology, Information Technology

Research Interests

3D Computer Vision, Adversarial Machine Learning
Reinforcement Learning, Demand Side Management

Publications

Journal Articles

Mathew, A. and Mathew J., Monocular depth estimation with SPN loss, *Image and Vision Computing*, 2020.

Mathew, A., Roy, A., and Mathew, J., Intelligent Residential Energy Management System Using Deep Reinforcement Learning, *IEEE Systems Journal*, 2020.

Mathew, A., Jolly, MJ., and Mathew, J., Improved Residential Energy Management System Using Priority Double Deep Q-learning, *Sustainable Cities and Society*, 2021.

Mathew, A., and Mathew, J., MDDNet: Learn Depth and Ego-motion from Videos with Camera Distortion, *Computer Vision and Image Understanding*, 2020. *(Under-revision)*

Mathew, A., Patra, A., and Mathew, J., Monocular Depth Estimators: Vulnerabilities and Attacks, *IEEE Intelligent Systems*, 2020. *(Under-review)*

Mathew, A., and Mathew, J., Monocular Depth Estimation with Unknown Cameras, *Knowledge Based System*, 2021. *(Under-review)*

Mathew, A., and Mathew, J., Cheaper Depth Sensor Enhances Monocular Depth Estimation, *Information Fusion*, 2021. *(Under-review)*

Mathew, A., and Mathew, J., Efficient Demand Response in Residential Grid using Q-learning, *IEEE Systems Journal*, 2021. *(Under-review)*

Mathew, A., Gopugari, B., and Mathew, J., Improving Unsupervised Monocular Depth Estimation with Stereo Assistance, *IEEE Transactions on Intelligent Vehicles*, 2021. *(Under-review)*

Conference Proceedings

Mathew, A., Neeraj., and Mathew, J., UnkDisp: Monocular Depth Estimation with Unknown Baseline and Focal Length, *International Conference on Neural Information Processing*, 2021. *(Under-review)*

Mathew, A., Patra, AP., and Mathew, J., Self-Attention Dense Depth Estimation Network for Unrectified Video Sequences, *IEEE International Conference on Image Processing*, 2020.

Sanodiya RK, **Mathew, A.**, Mathew, J., and Khushi, M., Statistical and Geometrical Alignment using Metric Learning in Domain Adaptation, *IEEE International Joint Conference on Neural Networks*, 2020.

Srivastava, H., **Mathew, A.**, and Mathew, J., A Novel Frame Similarity Based Pedestrian Counting Approach in Surveillance Videos, *IEEE India Council International Conference*, 2018.

Mathew, A., Mathew, J., Govind, M., and Mooppan, A., An Improved Transfer learning Approach for Intrusion Detection, *International Conference on Advances in Computing Communication*, 2017.

Patents

Easa Z., Gupta D., Mathew J., and **Mathew A.**, Automated two wheeler parking system by detecting the location of the vehicle using sensor under the platform Appl.no. 201731036379. (2017 Indian Patent Pending)

Research Experience

Doctoral Research Experience **Patna, India**
Supervisor: Dr. Jimson Mathew *July 2016 – May 2021*

- Developed expertise in **camera models**.
- Developed expertise in self-supervised **depth estimation** from a single camera.
- Introduced direct depth estimation with a **distorted** camera lens.
- Studied the impact of **self-attention** in depth estimation network.
- Developed expertise in **adversarial samples** and their effect on deep neural networks.
- Studied the **vulnerabilities** of monocular depth estimators against Adversarial attacks.
- Introduced an intelligent agent for **shifting load** from no-peak to off-peak hours in residential grids.
- Studied the complexity of the RL-DSM environment and improved the learning curve of the agent.
- Presented results at departmental seminars to more than 30 attendees.

Ongoing Research works **Patna, India**
Collaboration with my Thesis supervisor (Dr. Jimson Mathew) *Since May 2021*

- **Dynamic moving object** masking for monocular depth estimation with video sequence.
- Handle **textureless** surface in photometric loss.
- **Light-weight** monocular depth network.

Experience in Research Guidance **Patna, India**
Indian Institute of Technology Patna *Since July 2017*

Mentored Junior Research Fellows

- Fisheye cameras are commonly used in applications like autonomous driving and surveillance to provide a large field of view. We developed per-pixel dense distance estimation on fisheye cameras for automotive scenes.
- Deep learning-based load prediction model on time series data. These models will be used for applications like Demand Side Management in Smart Grid.
- Designed algorithm to adapt classification task on unlabelled data with fewer know labelled data.

Mentored M.Tech. students in Computer Science Department

- Designed a system that distinguishes familiar/unfamiliar images from EEG (Electroencephalogram) captured using an eight electrode helmet. Extended future to deception detection using deep learning.
- We designed a fast multi-object hybrid tracking system using particle filter and neural network.
- We designed a light-weight deep learning-based facial recognition system.

Mentored B.Tech. students in Computer Science Department

- An advanced reinforcement learning-based system for load shifting in a residential grid.
- We developed a reinforcement learning-based system for load shifting in a residential grid.
- We developed deep learning-based light-weight object detection for embedded systems.
- We have developed a system that estimates depth from a single uncalibrated camera.

Master's Project Research Experience — **Kerala, India**
Supervisor: Dr. Binu VP — *May 2015–May 2016*

- Investigated super-resolution with Convolutional Neural Networks.
- Super-resolution in gray scale and color.
- Presented the final report to five member evaluation committee.

Teaching Experience

Teaching Assistance — **IIT Patna, India**
July 2016–Dec 2020

CS 225 Switching Theory	Jan–May, 2017
CS 229 Innovation Laboratory	Jan, 2017
CS 421 Computer Peripherals and Interfacing	July–Dec, 2017
CS 225 Switching Theory	Jan–May, 2018
CS 421 Computer Peripherals and Interfacing	July–Dec, 2018
CS 225 Switching Theory	Jan–May, 2019
EE 541 High Performance Computing	Jan, 2019
CS 421 Computer Peripherals and Interfacing	July–Dec, 2019
CS 225 Switching Theory	Jan–May, 2020
CS 421 Computer Peripherals and Interfacing	July–Dec, 2020
Mid and End-Semester Examination duties	2016–2020

Awards & Achievements

Scholarships & Sponsorship

Sponsorship from **Scheme for Promotion of Academic and Research Collaboration**, Ministry of Human Resource development, Government of India. Grant #P582. *April 2020*

Three year **Senior Research Fellowship** (SRF) at IIT Patna, Ministry of Human Resource Development, Government of India. *April 2018*

Two year **Junior Research Fellowship** (JRF) at IIT Patna, Ministry of Human Resource Development, Government of India. *July 2016*

Two year **Post Graduate Fellowship** at College of Engineering Karunagappally Institute of Human Resources Development, Government of Kerala. *July 2014*

Competitive Awards

Second Place, IoT Grand Challenge, Indian Institute of Technology (IIT) Patna. *2016*

Finalist, Bosch DNA Challenge, Bosch India. *2017*

Top 35, Patna Ideathon, Government of Bihar. *2018*

Competitive Examinations

Graduate Aptitude Test in Engineering (**GATE**) *2016*
All India Rank: 5493 out of 108495 candidates.

Talks

Generative Adversarial Networks and Adversarial Attacks *Dec, 2020*
sponsored by All India Council for Technical Education, Government of India.

Adversarial Machine Learning *Dec, 2019*
sponsored by APJ Abdul Kalam Technological University, Government of Kerala.

Machine Learning makes Smart Grids smarter *Sept, 2019*
sponsored by Scheme for Promotion of Academic and Research Collaboration (SPARC), Ministry of Human Resource development, Government of India.

Generative Adversarial Networks *July, 2019*
sponsored by Third phase of Technical Education Quality Improvement Programme, Government of India and IEEE.

Generative Adversarial Networks and Adversarial examples *July, 2019*
sponsored by Third phase of Technical Education Quality Improvement Programme, Government of India.

Introduction to Convolutional Neural Networks *Dec, 2018*
sponsored by Third phase of Technical Education Quality Improvement Programme, Government of India.

Professional Activities

Subreviewer of IEEE ICSCC. *2017*
Subreviewer of IEEE International Symposium on Electronic System Design. *2018*
Reviewer of IET Computer Vision. *2019*
Reviewer of IEEE International Conference on Data Science and Engineering. *2019*
IEEE Student Member, IEEE Membership Number: 96850267. *Since 2019*

Skills

Coding	Python, C++, Java, ASP.NET, C# .NET
Teaching	Conducted B.Tech and M.Tech classes at IIT Patna
ML Packages	Pytorch, TensorFlow, Keras

References

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