

Arafat Ali Mondal

Master's in AI

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About Me

I am an Assistant Professor at Swami Vivekananda University (SVU), Kolkata, India. I'm working in the field of Neuromorphic Computing and Neuro AI at the Indian Institute of Technology Roorkee, India. I have a strong interest in NeuroML, DL, computational cognitive development, multimodal learning, and embodied models of the self, closely aligned with the adaptive mind initiative. I aim to leverage these technologies to develop innovative solutions. I have also worked on DL/ML in agriculture, sensor technology and more. I have published my work in conferences, reviewed articles and peer-reviewed journals.

EDUCATION

Maulana Abul Kalam Azad University of Technology (WBUT), West Bengal, India.

[2022-2024]

- M. Tech. Artificial Intelligence | CGPA: 8.99/10 | Advisor: Prof. Dr. Nabarun Bhattacharyya.
- M. Tech Thesis: Quality grading of apples based on physical traits using image analysis.

Guru Nanak Institute of Technology (GNIT, JIS Group), Kolkata, India.

[2018-2021]

- B. Tech Electrical Engineering | Advisor: Mr. Shyamal Kumar | CGPA: 7.90/10
- B. Tech Thesis: Design and Analysis of P&O algorithm-based MPPT solar system in PSIM.

RESEARCH INTERESTS

Neuro AI, ML, Neuromorphic Computing, Brain-Inspired AI for Healthcare, Computational Cognitive Development, Multimodal Learning.

WORK EXPERIENCE

Assistant Professor- Swami Vivekananda University, Barrackpore, West Bengal, India

(December 2025-Present)

- **Research Focus:** Neuro AI, Neural Networks, Deep Learning, Computational Modeling, Genetic Algorithms.
- **Responsibilities & Achievements:** Conducting research in Neuro-inspired AI and Genetic Algorithms.
- **Supervising** undergraduate and postgraduate thesis projects.
- **Publishing** research papers in peer-reviewed journals/conferences

Research Intern -Indian Institute of Technology Roorkee, Uttarakhand, India

(Remotely, September 2025- Present)

Title: A Review of Neuroscience-Inspired Deep Learning and Genetic Algorithms.

- Reviewed neuroscience-inspired deep learning and genetic algorithms, focusing on adaptive learning, biological plausibility, and SNN vs. CNN efficiency. With applications in robotics, medicine and ML, highlighting future directions in neuromorphic computing and Neuro AI.
- **Advisor:** Dr. Ankush Kumar.

Faculty - ACES Infotech Private Limited, Alipore Road, Kolkata, India.

(Part-time, July 2025-November 2026)

- Teaching AI/ML and mentoring students on AI-driven projects, focusing on practical applications.

Research & Development- National Council of Science Museums in CRTL at Kolkata, India.

(Feb 2024- Feb 2025)

Title: Personalized Content Delivery System: An AI-Based Age Estimation Approach. (ICAECT, Taylor & Francis 2025)

- Designed a smart AI-based PCD model leveraging visitor characteristics such as height and facial images for age group classification, achieving 97% classification accuracy. Delivered personalized content with 95% accuracy based on visitor interests. **Published** a conference journal in 2025.
- **Advisor:** Mr. Shatadal Ghosh.

Title: Interactive Display system for Spatial content Exploration in Museums.

(ICICEC, IEEE 2024)

- Focused on immersive, topic-based learning for subjects such as geographic maps, human anatomy, and dioramas, fostering deeper exploration for users. Achieved almost 80% significantly improving the educational experience in our science museums. **Published** a conference journal in 2024.
- **Advisor:** Mr. Shatadal Ghosh.

RESEARCH WORK

Neuro-Evolutionary Reservoir Computing for Real-Time ECG Signal Prediction and Brain-Inspired Arrhythmia Detection

(Ongoing project)

- Working on **Neuro-Evolutionary Reservoir Computing (NERC)** to improve **real-time ECG prediction and automated arrhythmia detection**, focusing on efficient AI models suitable for wearable health monitoring devices.
- **Advisor:** Dr. Ankush Kumar (IIT Roorkee) and Dr. Payal Bose (SVU, Barrackpore).

A Review of Neuroscience-Inspired Deep Learning and Genetic Algorithms.

(Published 2nd March 2026)

- Our goal was to investigate how neuroscience-motivated learning (such as STDP and Hebbian learning) and genetic algorithms complement each other to improve SNNs. It emphasizes their potential for constructing brain-like AI systems and optimising them for practical applications in robots, healthcare, and brain-computer interfaces.
- **Advisor:** Dr. Ankush Kumar (IIT Roorkee)

Advanced Apple Sorting and Quality Grading Application Using Graph Neural Networks, Vision Transformers, and Convolutional Neural Networks.

(Published 12 January 2026)

- Developed an ML-driven apple sorting app using GNNs, CNNs, and ViTs within a probabilistic ML framework, achieving **97% accuracy** on a 360° apple image dataset, deployed for web and Android.
- **Advisor:** Dr. Prof. Nabarun Bhattacharyya.

A Low-Cost AI-Based Apple Quality Grading System Using Contour Analysis and Deep Learning for Real-Time Agricultural Applications.

(Presentation, 10 April 2026)

- Our research focus was on designing and implementing a low cost DL pipeline for apple quality grading, leveraging advanced image analysis techniques and DL architectures. Trained on a curated dataset of 10,000 apple images, the system achieved **99.98% classification accuracy**. Deployed as a real-time, web-based application, automated, and data-driven decision-making for precise agricultural quality assessment.

Comprehensive Review of Image-Based Apple Quality Grading Based on Physical Traits and Deep Learning Approaches.

- Developed an AI-driven system for apple quality grading using contour-based object detection and deep learning (ResNet-50). Achieved 95.98% **classification accuracy** and 97.5% detection accuracy on a dataset of 10,000 images. Implemented a web and Android application using Flutter and Flask for real-time deployment, providing an affordable solution for smallholder farmers.

PUBLICATIONS

Mondal, A.A., Kumar, A. & Bhattacharyya, N. A review of neuroscience-inspired deep learning and genetic algorithms. *BMC Artif. Intell.* 2, 5 (2026). <https://doi.org/10.1186/s44398-025-00019-0>

A. Mondal, N. Bhattacharyya and S. Ghosh, "Advanced Apple Sorting and Quality Grading Application Using Graph Neural Networks, Vision Transformers, and Convolutional Neural Networks," 2025 7th ISAECT, Mohali, Punjab, India, 2025, pp. 1-8, doi: [10.1109/ISAECT68904.2025.11318674](https://doi.org/10.1109/ISAECT68904.2025.11318674)

S. Ghosh, A. A. Mondal, A. Kumar, K. Grove, A. Chatterjee, and M. Bagchi, "Interactive Display System for Spatial Content Exploration in Museums," 2024 First International Conference on Intelligent Computing for Emerging and Converging Technologies (ICICEC), Davangere, India, 2024, pp. 1-6, doi: [10.1109/ICICEC62498.2024](https://doi.org/10.1109/ICICEC62498.2024).

A. A. Mondal, A. Chatterjee, S. Ghosh, and M. Bagchi, "Personalized Content Delivery Systems: An AI-Based Age Estimation Approach," in *Proceedings of the International Conference on Recent Advances in Electrical and Computer Technologies*, CRC Press (Taylor & Francis Group), 2025. (In process)

A. A. Mondal, N. Bhattacharyya, and S. Mondal, "A Novel Method for Breast Cancer Detection Using KNN," *YMER*, vol. 24, no. 1, pp. 807-813, Jan. 2025, doi: 10.37896/YMER24.01/57 <https://ymerdigital.com/uploads/YMER240189.pdf>

Ghosh, S., Mondal, A. A., and Guha, P. "A Review Paper on Increasing Efficiency of Solar Cells Using Artificial Intelligence and Nanotechnology." *International Journal of Research and Analytical Reviews (IJRAR)*, 10(1), 433-435. https://ijrar.org/viewfull.php?&p_id=IJRAR23A2791.

S. K. Roy, S. Ghosh, A. Chattopadhyaya, P. Banerjee, T. Baidya, T. Mondal, A. A. Mondal, S. Bhattacharya, "Design and Analysis of P&O Algorithm-Based MPPT Solar System in PSIM." *Ymer*, 21(6) <https://ymerdigital.com/uploads/YMER2106H9.pdf>.

TECHNICAL SKILLS

Programming and Tools: Python and R.

DL or ML Frameworks: TF, Pytorch, Fastai.

Data and Signal Analysis: NumPy, Pandas, Matplotlib, Signal Analysis.

Image Processing: OpenCV, image segmentation, object detection and ImageJ.

LANGUAGE SKILLS

Native: BENGALI, **Fluent:** ENGLISH.

AWARDS AND ACHIEVEMENTS

Merit-Based Fully Funded Scholarship by the Government of WB, India for higher studies (M. Tech in AI) [2022-2024]

JIS Innovation Award for Paper Publication Department of Electrical Engineering. [2021]

WEBINARS, SEMINARS AND WORKSHOPS

Brain Signals for Biometrics and Brain-Computer Interface (BCI).

[Kolkata (Online)]

Speaker-Dr. Rig Das, Assistant Professor, University of Wisconsin, La Crosse (UWL), USA.

AI and Pattern Recognition.

[Kolkata]

Speaker-Dr. Sankar Kumar Pal, President of the Indian Statistical Institute.

Convergence of IoT and AI for Emerging Applications.

[Computer Society of India, Kolkata Chapter]

Speaker-Prof. Nabarun Bhattacharyya, Former Senior Director at C-DAC, Kolkata.