

Curriculum Vitae

CONTACT INFORMATION

Dr. ARUN KUMAR SHARMA

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Profile Summary

Post-Doctoral Researcher, SMSS Lab, Dept. of Mechanical Engineering, IIT Kanpur.
September 2024 to Current.

Ph.D., Dept. of Electrical Engineering, IIT Kanpur.

Title: **Deep Learning Architecture Optimization and Application to Classification Problems.**

RESEARCH INTEREST

Deep Learning, Computer Vision, Pattern Recognition, AI in Engineering Design.
I am highly inclined towards research in AI for real time applications.

EDUCATION

January 2018–2024	Doctor of Philosophy, Date of Defense: August 27, 2024 Electrical Engineering, IIT Kanpur, U.P., India Thesis Title: Deep Learning Architecture Optimization and Application to Classification Problems.	CGPA: 10
July 2009–July 2011	Master of Technology Specialization: Instrumentation, Department of Electrical Engineering, IIT Kharagpur, W.B., India Thesis Title: Estimator Based Robust Stabilization of Uncertain Networked Control System.	CGPA: 8.86
July 2005–July 2009	Bachelor of Technology in Electrical Engg. BIT Sindri, Dhanbad, Jharkhand, India	Marks: 78.42%
Gate Score: GATE (2009)	All India Rank: 152	Score: 695

WORK EXPERIENCE

Sept. 2024–Current	Post-Doctoral Researcher, SMSS Lab, Dept. of Mechanical Engineering, IIT Kanpur, India. Responsibilities: Research on AI for Engineering Design.
June 2022–May 2023	R & D AI (Lead AI Scientist, Part-Time during PhD, Remotely), Avermass GmbH, Germany Responsibilities: Leading Machine learning / Deep learning R&D team.
July 2011–July 2013	Assistant Professor, IIMT College of Engineering, Greater Noida, India Responsibilities: Teaching & Research.
July 2013–Nov 2017	Assistant Professor, AKGEC, Ghaziabad, U.P., India Responsibilities: Teaching & Research.

RESEARCH DETAILS

Post-Doctoral Research

AI for Engineering Applications:

1. Developed Inverse design of metastructures for tailored vibration mitigation.
2. Current-aware multi-head attention model for actuation prediction of bioinspired SMA powered metamaterial-based elbow joint.
3. Cross-Spectral Vision Transformer for biometric authentication using Forehead Subcutaneous Vein Pattern and Periocular Pattern.

Ph.D. Research

Title: Deep Learning Architecture Optimization and Application to Classification Problems. The main contributions of the thesis are listed below:

4. Developed an improved and faster parameter optimization in parallel computational framework for “Aerodynamic Modelling of ATTAS Aircraft using Mamdani Fuzzy Inference Network”.
5. Developed a Quick Learning Mechanism with Cross-Domain Adaptation for Intelligent Fault Diagnosis. It opens the path for quick model evaluation required in model selection algorithms.
6. Developed an algorithm for architecture optimization (EvoN2N: Transfer Learning based Evolutionary Deep Neural Network for Intelligent Fault Diagnosis) using the quick learning mechanism.
7. Extended the work EvoN2N to a guided evolutionary algorithm: “Guided Sampling-based Evolutionary Deep Neural Network for Intelligent Fault Diagnosis”.
8. Further, extended a case study on A Novel Vision Transformer with Residual in Self-attention for Biomedical Image Classification.

Industrial Research

Worked on following Projects as R&D lead AI Scientist at Avermass GmbH, Germany (Remote):

1. **Face Forgery Detection:** Cascaded Twin models: ViT and YOLOv7 were trained to classify and detect the possible forgery/alteration in face image. The final model can detect the possible forgery with 95% accuracy.
2. **Image data synthesis:** Implemented DCGAN with pytorch for fake face data generation to increase the training database and **Image-to-Image Translation** using cycle GAN.
3. **End2End image forgery** detection using ViT and YOLOv7 model for the detection of image-based fake news stories circulated in form of forged images.
4. **Document AI:** Worked for development of CV processing and screening tool that can automatically shortlist CVs based on given JDs.

PUBLICATIONS

Journals

- 1) **Arun K. Sharma** and Nishchal K. Verma. "Guided Sampling-based Evolutionary Deep Neural Network for Intelligent Fault Diagnosis." *Engineering Applications of Artificial Intelligence*, Volume 128, 2024, 107498, ISSN 0952-1976, <https://doi.org/10.1016/j.engappai.2023.107498>.
- 2) **Arun K. Sharma** and Nishchal K. Verma. "Quick Learning Mechanism with Cross-Domain Adaptation for Intelligent Fault Diagnosis." in *IEEE Transactions on Artificial Intelligence*, Volume: 3, Issue: 3, June 2022.
- 3) **Arun K. Sharma**, Dhan Jeet Singh, V. Singh, N. K. Verma "Aerodynamic Modelling of ATTAS Aircraft using Mamdani Fuzzy Inference Network" in *IEEE Transactions on Aerospace and Electronic Systems*, Volume: 56, Issue: 5, October 2020.
- 4) A Dwivedi, G Ray, **Arun K. Sharma**, "Genetic Algorithm Based Decentralized PI Type Controller: Load Frequency Control" *Journal of The Institution of Engineers (India): Series B*, in May 2015.
- 5) **Arun K. Sharma**, G. Ray, "Robust Controller with State-Parameter Estimation Algorithm for Uncertain Networked Control System" published in *IET Control Theory & Applications*, Volume 6, Issue 18, 6 December 2012, p. 2775 – 2784.

Conferences

- 1) **Arun K. Sharma**, Dhanjeet Singh, and Nishchal K. Verma, "Data Driven Aerodynamic Modeling Using Mamdani Fuzzy Inference Systems", 2018 International Conference on Sensing, Diagnostics, Prognostics, and Control, Xiâ€™an, China.
- 2) **Arun K. Sharma**, Vikas Singh, Nishchal K. Verma and Jie Liu, "Condition Based Monitoring of Machine using Mamdani Fuzzy Network", 2018 Prognostics and System Health Management Conference, PHM-Chongqing, Chongqing, China, October 26-28, 2018.
- 3) **Arun K. Sharma**, S. Pandey, "Automatic Generation Control of Interconnected Power System using Internal & Variable System Controller", 2nd National Conference on Advancement of Electronics & Communication Technology and Engineering, Greater Noida, India, Feb 2012.
- 4) **Arun K. Sharma**, "Adaptive Algorithm for State and Parameter Estimation in a system with Parametric Uncertainties", National Conference on Advances in Electrical Power and Energy Systems, AKGEC, Ghaziabad, India, Sept. 2013.

Preprints

- 1) **Arun K Sharma**, Shubhobrata Bhattacharya, Motahar Reza , "Dual Channel Multi-Attention in ViT for Biometric Authentication using Forehead Subcutaneous Vein Pattern and Periocular Pattern", arXiv preprint arXiv:2412.19160.
- 2) Bishakh Bhattacharya, Tanuj Gupta, **Arun K. Sharma**, Ankur Dwivedi, Vivek Gupta, Subhadeep Sahana, Suryansh Pathak, Ashish Awasthi, "Inverse design of potential metastructures inspired from Indian medieval architectural elements", arXiv preprint DOI: arXiv:2412.12122. Submitted to Nature Communication Engineering.
- 3) **Arun K. Sharma** and Nishchal K. Verma, "A Novel Vision Transformer with Residual in Self-attention for Biomedical Image Classification," arXiv preprint, DOI: arXiv:2306.01594v1. [Submitted to IEEE Transactions on Medical Imaging].
- 4) **Arun K. Sharma** and Nishchal K. Verma. "Knowledge Transfer based Evolutionary Deep Neural Network for Intelligent Fault Diagnosis." arXiv preprint, DOI: arXiv:2109.13479, under review in IEEE transactions on Evolutionary Computations.

PROGRAMING SKILS

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|------|--------------------------------|-------|------------|
| (i) | Python with ML & DL Libraries, | (iii) | NI LabVIEW |
| (ii) | NLP tools | (iv) | MATLAB |

TEACHING WORK

During Ph.D.
(January 2018 - Present)

Teaching Assistant:

- 1) Control System Analysis
- 2) Electrical Machines/ Power System
- 3) Control Systems Lab
- 4) Artificial Intelligence, Machine learning, and Applications

Tutorship:

- 1) Introduction To Electronics
- 2) Control Systems Lab (Online version)
- 3) Control Systems Lab (Offline version)

As teaching
(July 2011 – Nov. 2018)

Instructor for

Theory Courses:

- 1) Control systems and applications.
- 2) Electrical Machines and Control
- 3) Measurement and Instrumentation
- 4) Sensor and Transducer

Lab courses:

- 1) Sensor and Transducer Lab
- 2) Electrical machines Lab
- 3) LabVIEW based Instrumentation Lab

LAB SETUP

Supervised the following Lab setups at AKGEC, Ghaziabad

- 1) Sensor and Transducer Lab
- 2) Electrical machines Lab

MENTORING

During Ph.D.

Student Intern name: Basant Kumar

Title: "Study of Net2Net transformation and image classification using Deep Learning"

During Teaching
(July 2011 – Nov. 2018)

Mentored B. Tech level projects on ML applications:

- 1) Credit Card fraud detection using ML algorithms (implemented in *scikit-learn*).
- 2) Lesion data classification using CNN (implemented in Pytorch).
- 3) Diabetic dataset classification (implemented in *scikit-learn*).
- 4) Information retrieval of news dataset using NLP: Classification and clustering of text dataset.
- 5) Word embeddings and sentiment analysis for Movie Review dataset: Tokenization, Lemmatization, Text Normalization, Word2vec embeddings, textblob, and SentimentIntensityAnalyzer.

ORGANISATIONAL / MANAGERIAL SKILLS

Organizing committee member:

- 1) 2nd National Conference on “Advancement of Electronics & Communication Technology and Engineering” at IIMT, Greater Noida, India.
- 2) 2013 IEEE Sponsored National Conference on Advances in Electrical Power and Energy Systems, Sept. 2013 at AKGEC, Ghaziabad, UP, India.
- 3) 2018 IEEE CIS Summer/Winter School on Deep Learning and Computational Intelligence, Dec 5-7, 2018, at EE dept. IIT Kanpur.
- 4) QIP Short Term Course on Artificial Intelligence and Fuzzy Systems: Theories, Concepts, and its applications, Dec. 9-13, 2019, at EE dept. IIT Kanpur.

Member of Model Club (2007-08) at BIT Sindri, Dhanbad.

TRAINING AND WORKSHOPS

- 1) Attended training program on “Sensor & Instrumentation” by AKGEC-NI LabVIEW Academy, Aug. 2013, Ghaziabad.
- 2) Attended UGC sponsored short term training program “Signal Processing in Modern Electrical Systems” at EE dept., DTU, Delhi, 9-13th Dec. 2013.
- 3) Attended Faculty Training Program “Advances in Sensors, Instrumentation and Control” organized by the dept. of EE 7-9th May 2014 at AKGEC, Ghaziabad (U.P) India.
- 4) Attended “Technical Teachers’ Role, Self-Esteem, Motivation and Professionalism Development through ICT” conducted by Media and Continuing Education Centre, 8-12th June 2015, AKGEC, Ghaziabad (UP), India.
- 5) Attended Training Program on “Recent Advances in Renewable Energy Technologies and Smart Micro-grids”, 13-17th Sept. 2016, at KNIT, Sultanpur, U.P., India.
- 6) Attended training Program on “Instrumentation and Automation with LabVIEW”, 9-10th Sept. 2016, at AKGEC-NI LabVIEW Academy, Ghaziabad, UP, India.

ADDITIONAL INFORMATION

LinkedIn URL <https://www.linkedin.com/in/arun-sharma-3684b112a>

Google Scholar page <https://scholar.google.com/citations?user=Lye6naYAAAAJ&hl=en>

ORCID id <https://orcid.org/0000-0003-2270-4714>

GitHub profile and Repo's <https://github.com/arnksh>