

# NILANJAN CHATTARAJ, Ph.D.

Room: FF-22, Department of Electronics and Communication Engineering  
National Institute of Technology Durgapur

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Nilanjan Chattaraj is Assistant Professor in the Department of Electronics and Communication Engineering of National Institute of Technology Durgapur. He is also an associated Faculty Member of Center for Biomedical Engineering and Assistive Technology, National Institute of Technology Durgapur, and visiting faculty of SP Jain School of Global Management. Prior to this, he worked as an Assistant Professor in the Department of Electrical and Electronics Engineering of Birla Institute of Technology and Science, Pilani, and a Post-Doc Fellow in the Department of Aerospace Engineering of Indian Institute of Science, Bangalore. He has also worked as Software Engineer Consultant in Motorola through Satyam Computer Services Ltd. He received B.E. in Electronics and Communication Engineering from National Institute of Technology Durgapur, M.S. from the Department of Electronics and Electrical Communication Engineering of Indian Institute of Technology, Kharagpur and Ph.D. from the Department of Aerospace Engineering of Indian Institute of Science, Bangalore. His research interest includes Smart-

materials based Sensors and Actuators, Structronics, Smart Mechatronics, Soft-Robotics, Smart Cyber Physical Systems following experimental approaches. Dr. Chattaraj is also serving as the Editor-in-chief of "Sukshma", the ISSS Newsletter. Institute of Smart Structures and Systems (ISSS).

## EXPERIENCE

2022 – TILL DATE

**ASSISTANT PROFESSOR GRADE-I**, NATIONAL INSTITUTE OF TECHNOLOGY, DURGAPUR

2023 – 2023

**VISITING FACULTY**, S. P. JAIN INSTITUTE OF MANAGEMENT AND RESEARCH, DUBAI

2018 – 2022

**ASSISTANT PROFESSOR GRADE-II**, NATIONAL INSTITUTE OF TECHNOLOGY, DURGAPUR

2016 – 2018

**ASSISTANT PROFESSOR**, BIRLA INSTITUTE OF TECHNOLOGY & SCIENCE, PILANI

2015 – 2016

**POSTDOCTORAL RESEARCH ASSOCIATE**, INDIAN INSTITUTE OF SCIENCE, BANGALORE

2005 – 2007

**SOFTWARE ENGINEER**, SATYAM COMPUTER SERVICES LTD.

## EDUCATION

2010 – 2015

**Ph.D.**, INDIAN INSTITUTE OF SCIENCE, BANGALORE

(Advisor: Prof. Ranjan Ganguli, Prof. G. K Ananthasuresh)

2008 – 2010

**M.S.**, INDIAN INSTITUTE OF TECHNOLOGY KHARAGPUR

2001 – 2005

**B.E.**, NATIONAL INSTITUTE OF TECHNOLOGY DURGAPUR

## RESEARCH INTEREST

- Smart materials based devices and Structronic Systems
- Electromechanical Devices and systems
- Mechatronic-Robotics
- Smart Cyber-Physical Instrumentation System Design and Product Development

## ACTIVITIES

### Sponsored Projects

1. Assistive technology on universal multimodalities, Dr. Nilanjan Chattaraj (As Principal Investigator), Sponsored by TCS Mumbai, Duration: 2022-2024, Status: Ongoing
2. Capacity building for human resource development in Unmanned Aircraft System (Drone and related Technology) (Multi Institute Project), Dr. Nilanjan Chattaraj (As Chief Investigator), funded by MeitY, Ongoing, 2022-2027
3. Performance evaluation of open source LID, speaker diarization and speech enhancement algorithms, Dr. Nilanjan Chattaraj (As Principal Investigator), Sponsored by DRDO, Status: Ongoing, 2023-2024
4. AI, ML, Edge computing Optimized AudioAI for Android, Dr. Nilanjan Chattaraj (As Co-Principal Investigator), Sponsored by Samsung, 2021-2021
5. Design of a Smart Material based Soft Lower Limb Exoskeleton to Assist Soldier, (As Co-Principal Investigator), Sponsored by DRDO, Duration: 3 years, Status: Completed
6. IoT based energy management system of a Microgrid with Vehicle to Grid (V2G) feature (As Co-Principal Investigator), Sponsored by DST, Duration: 3 years, Status: Completed

## PUBLICATION

### Journals (SCI)

1. Debabrata Bej, Nilanjan Chattaraj, and Rishiv Sahu, (2024). Design of an Economic, Portable, Compact, and Indigenous Instrument Setup for Measuring Sensing Characteristics of Thin Film Gas Sensors. *Review of Scientific Instruments (AIP)*, pp. 1-10 (Accepted)
2. Biswas, S., Mahanti, G. K., & Chattaraj, N. (2023). Investigation of Extreme Learning Machine-Based Fault Diagnosis to Identify Faulty Components in Analog Circuits. *Circuits, Systems, and Signal Processing*, 1-18.
3. Bej, D., Chattaraj, N., Mahapatra, R., Mondal, M. K., & Ghosh, C. (2023). Fabrication of a CO<sub>2</sub> Gas Sensor Based on ZnO Thin Film from the Perspective of Sensing Vehicle Tailpipe-Emitted Pollution. *Journal of Electronic Materials*, 52(6), 3983-3990.
4. Debabrata Bej, Nilanjan Chattaraj, "Air Pollution from Vehicle-Tailpipe Emissions and Diagnostic Approaches through Cyber-Physical Platform - A Review", *Microprocessors and Microsystems, Elsevier, (SCI)*, 2023 (Accepted)
5. Nilanjan Chattaraj, Ranjan Ganguli, "Mechatronic Approaches to Synthesize Biomimetic Flapping-wing Mechanisms: A Review", *International Journal of Aeronautical & Space Sciences (SCI)*, Springer, 2022,
6. Nilanjan Chattaraj, "Infra-Narrow Band Mechanical Oscillation Measurement System using Gravity-Loaded Piezoelectric Transducer ", *Journal of Vibration Engineering & Technologies*, Springer, pp. 1-11, 2022.
7. Harsh Dokania, Nilanjan Chattaraj, "An Assistive Interface Protocol for Communication between Visually and Hearing-Speech Impaired Persons in Internet Platform", *Disability and Rehabilitation: Assistive Technology*, pp. 1-14, 2022.
8. Arnab Roy Chowdhury, Soumyadeep Mondal, Aryan Kanu, Sanniva Bhattacharjee, Nilanjan Chattaraj, Nirmal Baran Hui, "Piezoelectric Energy Harvesting by Utilizing Angular Speed Variation in High-speed Rotating Beams ", *Journal of Vibration Engineering Technologies*, Springer, 2022.
9. Nilanjan Chattaraj, "Experimental Investigation and Empirical Analysis of a Shape Memory Alloy Actuated Electromechanical Oscillator", *Journal of Vibration Engineering & Technologies*, Springer, 1-10, 2021.
10. Nilanjan Chattaraj, G. K. Ananthasuresh, and Ranjan Ganguli. "Design of a distributed compliant mechanism using spring-lever model and topology optimization for piezoelectrically actuated flapping wings." *Mechanics of Advanced Materials and Structures* , Taylor & Francis, 28.2 (2021): 118-126.
11. Nilanjan Chattaraj, and Ranjan Ganguli. "Performance improvement of a piezoelectric bimorph actuator by tailoring geometry." *Mechanics of Advanced Materials and Structures*, Taylor & Francis, 25.10 (2018): 829-835.
12. Nilanjan Chattaraj and Ranjan Ganguli. "Multi-objective optimization of a triple layer piezoelectric bender with a flexible extension using genetic algorithm." *Mechanics of Advanced Materials and Structures*, Taylor & Francis, 25.9 (2018): 785-793.
13. Nilanjan Chattaraj and Ranjan Ganguli. "Effect of self-induced electric displacement field on the response of a piezo-bimorph actuator at high electric field." *International Journal of Mechanical Sciences, Elsevier*, 120 (2017): 341-348.
14. Nilanjan Chattaraj and Ranjan Ganguli. "Electromechanical analysis of piezoelectric bimorph actuator in static state considering the nonlinearity at high electric field." *Mechanics of Advanced Materials and Structures*, Taylor & Francis, 23.7 (2016): 802-810.
15. Nilanjan Chattaraj and Ranjan Ganguli. "Active filter driver for piezo-actuators for flapping-wing micro air vehicles." *International Journal of Micro Air Vehicles*, Sage, 8.1 (2016): 21-28.

## Conferences

1. Debabrata Bej, Nilanjan Chattaraj. (2024) "Design of a portable, customizable device with GPS integration to track location-specific real-time outdoor PM2.5 pollution". IEEE International Conference on Emerging Trends in Information Technology and Engineering (ic-ETITE'24). February 22-23, 2024
2. Bodhisattwa Rakshit, Rounak Das, Nilanjan Chattaraj, "Detection-Accuracy Enhancement of COVID-19 from Multi-Class Lung Diseases by Instrumenting CLAHE Integrated Deep Learning Technique", IEEE International Symposium on Sustainable Energy, Signal Processing and Cyber Security, 2022
3. Debabrata Bej, Nilanjan Chattaraj, "Scope of ZnO based gas sensors for sensing CO emission from vehicle tailpipe-A Short Review", IEEE MYSURUCON 2022, Mysore
4. Pawan Kumar, Nilanjan Chattaraj, "A Cyber-Physical RPM Variometer using MQTT Protocol for Real-time Continuous Data-Acquisition", *International Conference on Connected Systems & Intelligence*, August 31, September 1-2, pp. 1-9, 2022.
5. Sanniva Bhattacharjee, Aryan Kanu, Arnab Roy Chowdhury, Soumyadeep Mondal, Nilanjan Chattaraj and Nirmal Baran Hui, "Low frequency Vibration Energy Harvester using Compliant Mechanism driven Piezoelectric Transformer", *Second International Conference on Sustainable Energy, Environment, and Green Technologies*, pp. 1-12, 2022
6. Billah, Md. M., Nilanjan Chattaraj, "Road Condition Detection Using Adaptively Chosen Deep Learning Model and Precautionary Special Guidance for Driver-Safety", *IEEE International Conference on Electronics, Materials Engineering and Nano-Technology (IEMENTech)*, 1-6, 2021,
7. Nilanjan Chattaraj, and Ranjan Ganguli. "Enhanced Performance of Piezoelectric Bending Actuator by Material Redistribution." *2020 International Symposium on Devices, Circuits and Systems (ISDCS)*. IEEE, 2020.
8. Nilanjan Chattaraj, "Shape-Memory Alloy Actuated Low Frequency Astable Electromechanical Multivibrator." *2018 IEEE SENSORS*. IEEE, 2018.
9. Nilanjan Chattaraj G. K. Ananthasuresh, R. Ganguli, "A distributed compliant mechanism for a piezo-actuated flapping wing ", *2nd international and 17th National Conference on Machines and Mechanisms*, Kanpur, India, 16-19 Dec, 2015
10. Nilanjan Chattaraj and Ranjan Ganguli. "Multiobjective optimization of piezoelectric bimorph actuator with rigid extension." *Active and Passive Smart Structures and Integrated Systems 2015*. Vol. 9431. International Society for Optics and Photonics, 2015.
11. Nilanjan Chattaraj and Ranjan Ganguli. "Electromechanical analysis of tapered piezoelectric bimorph at high electric field." *Behavior and Mechanics of Multifunctional Materials and Composites 2015*. Vol. 9432. International Society for Optics and Photonics, 2015.
12. Nilanjan Chattaraj and Ranjan Ganguli, "Electromechanical analysis of bimorph piezoelectric actuator to estimate optimal geometry for flapping wing micro air vehicle", *Indian Conference on Applied Mechanics*, Indian Institute of Technology Madras, India, 4th - 6th July, 2013,
13. Nilanjan Chattaraj and Ranjan Ganguli. "Modeling of artificial dragonfly wing, and comparison of structural properties for various wing with different vein materials and venation patterns", *ACMFMS Proceedings of Mechanics of Functional Materials and Structures*, Delhi, India, pp. 95-98, 2012, *Narosa Publishing house - Delhi*, ISBN: 978-81 8487-248-4
14. Nilanjan Chattaraj and Anindya Sundar Dhar. "Random Access Analog Memory (RA2M) for Video Signal Application." *2012 25th International Conference on VLSI Design*. IEEE, 2012.

## PATENT

1. Nilanjan Chattaraj, Nirmal Baran Hui, Dr. Hardik Rajyaguru, *Automatically Pressurised Ambu Bag System*, ID: IN202031017748  
<https://patentscope.wipo.int/search/en/detail.jsf?docId=IN340501858& cid=P11-KXGFCS-05074-1>

## TEACHINGS

- |                                   |                    |
|-----------------------------------|--------------------|
| 1. Structronics                   | (ECO-840)          |
| 2. Mechatronics                   | (ECO540)           |
| 3. Biomedical Instrumentation     | (ECE 724, ECO-740) |
| 4. Measurements & Instrumentation | (ECE-621)          |
| 5. Electronic System Design       | (ECS-752)          |
| 6. IoT                            | (EC-9045)          |

## Ph.D. SCHOLARS

- |                     |   |                |
|---------------------|---|----------------|
| 1. Debabrata Bej,   | Air pollution monitoring system             | (2019-Ongoing) |
| 2. Suman Biswas,    | Fault diagnosis in circuit using AI/ML,     | (2020-Ongoing) |
| 3. Al mamun Sheikh, | Speaker Recognition using AI                | (2022-Ongoing) |
| 4. Neha Kumari,     | Smart actuator development for Micro Robots | (2023-Ongoing) |

## AWARDS AND RECOGNITIONS

- Received "[Outstanding Reviewer](#)" award for the *IEEE Transactions on Instrumentation and Measurement (TIM)*, *IEEE Society*, for the year 2023.
- "Best Paper Award" in the IEEE and ACM collaborative International conference (ic-ETITE'24) on Emerging Trends in Information Technology and Engineering (ic-ETITE'24). February 22-23, 2024, for the Design of a portable, customizable device with GPS integration to track location-specific real-time outdoor PM2.5 pollution.
- Received "[Outstanding Reviewer](#)" award for the *IEEE Transactions on Instrumentation and Measurement (TIM)*, *IEEE Society*, for the year 2022.
- Received "[Outstanding Reviewer](#)" award for the *IEEE Transactions on Instrumentation and Measurement (TIM)*, *IEEE Society*, for the year 2021.
- Received recognition as "Innovation Ambassador" by the *Ministry of Education's Innovation Cell, Government of India*, 2021
- Achieved recognition for developing a Low-cost Semi-automatic AMBU Bag Pressurization System through the publication in "Science & Technology -efforts in India on COVID-19", by *Department of Science and Technology*, Govt. of India, on 10th April, 2020 (Source)  
[https://www.indiascienceandtechnology.gov.in/research/pranesh-automatically-pressurized-ambu-bag?field\\_area\\_id=2396](https://www.indiascienceandtechnology.gov.in/research/pranesh-automatically-pressurized-ambu-bag?field_area_id=2396)  
[https://www.indiascienceandtechnology.gov.in/research/pranesh-automatically-pressurized-ambu-bag?field\\_area\\_id=2440](https://www.indiascienceandtechnology.gov.in/research/pranesh-automatically-pressurized-ambu-bag?field_area_id=2440)
- Won Best New Entrant Graduate Team award in *32nd International Student Design Competition* on Distributed Logistics in an Urban setting Using Small Unmanned Aerial vehicles organized by *American Helicopter Society, USA*, 2015.  
<https://vtol.org/files/dmfile/2015-student-design-press-release.pdf>

- Certificate of merit under National Scholarship Scheme by *West Bengal Board of Secondary Education* in recognition of the high position secured in *Secondary Examination, 1999*

## ADMINISTRATIVE RESPONSIBILITIES

### 2023-Present:

- Member of the Governing Council of Institute of Smart Structures and Systems (ISSS), Website: <https://isssonline.in/>

### 2022-Present:

- Faculty in Charge of *ECE Research and Development Lab*, National Institute of Technology, Durgapur
- Faculty in charge of *Web development of ECE departmental website*.
- Editor in chief of *Sukshma*, The ISSS Newsletter. Institute of Smart Structures and Systems (ISSS), Website: <https://isssonline.in/>

### 2021 - Present:

- Member of Centre for Digital Learning (CDL), National Institute of Technology, Durgapur 2021 - Present:
- Faculty advisor of Electronics and Communication Engineering Students' Society (ECESS), Department of Electronics and Communication Engineering, National Institute of Technology, Durgapur

### 2020 - Present:

- Executive Committee member of *Innovation and Incubation Cell*, National Institute of Technology, Durgapur

### 2019 - Present :

- Member of Networking and Computing Division, Computer Centre, National Institute of Technology, Durgapur
- Departmental Representative of Institute's Annual Performance Report Committee, National Institute of Technology, Durgapur

### 2019 - 2022 :

- Faculty in Charge of Embedded System Laboratory, National Institute of Technology, Durgapur

### 2017 - 2018 :

- Faculty in Charge of Instrumentation Laboratory, Birla Institute of Technology and Science, Pilani
- Member of Departmental Research Committee, Birla Institute of Technology and Science, Pilani

## MISCELLANEOUS

1. Organizing Committee Member of the *Student Contest* event in International Conference on Micro, Nano And Smart Systems IC-MNSS 2024, 9th to 12th July 2024, IISc, Bengaluru < <https://icmnss.in/> >
2. 3rd Energy System Modeling and Optimization Conference (ESMOC 2021), December 5-7, 2022, NIT Durgapur, India
3. Organizing Coordinator of 3rd Bootcamp on Unmanned Aerial Systems & Related Technology, organized by National Institute of Technology Durgapur, from 10-01-2024 to 14-01-2024. Supported by MeitY.
4. Organizing Coordinator of 2nd Bootcamp on Unmanned Aerial Systems & Related Technology, organized by National Institute of Technology Durgapur, from 24-07-2023 to 28-07-2023. Supported by MeitY.

5. Adjunct Faculty in S P Jain School of Global Management to teach subject entitled "Embedded AI and Robotics", 2023
6. Organizing Coordinator of 1st Bootcamp on Unmanned Aerial Systems & Related Technology, organized by National Institute of Technology Durgapur, from 08-05-2023 to 12-05-2023. Supported by MeitY.
7. Organizing Coordinator of DST Sponsored *Synergistic Training Program Utilizing the Scientific & Technological Infrastructure (STUTI)*, Department of Electronics and Communication Engineering, National Institute of Technology Durgapur, 19th-25th September, 2022
8. Organizing Committee Member of 3rd Energy System Modeling and Optimization Conference (ESMOC 2021), December 5-7, 2022, NIT Durgapur, India
9. Organizing Coordinator of "Research Scholar Day-22", Department of Electronics and Communication Engineering, National Institute of Technology Durgapur, 23rd September, 2022
10. Organizing Committee Member of 2nd International Workshop on Societal Computing for the Internet of Things & You (SoCleTY 2023), Co-located with ICDCN 2023, 7th January 2023
11. Organizing Coordinator of "Research Scholar Day-21", Department of Electronics and Communication Engineering, National Institute of Technology Durgapur, 28th-29th December, 2021
12. Organizing Committee Member of "1st International Workshop on Societal Computing for the Internet of Things & You (SoCleTY)" Co-located with ICDCN 2020, 4th January 2020
13. Organizing Coordinator of Summer course on "Robotics & AI", 24th June to 28th June, 2019

## INVITED TALKS

1. "The Hardware Based Approach of Smart Healthcare System Embedded with IoT and AI/ML" in the Advanced Entrepreneurship and Skill Development Programme (A-ESDP), on "Smart Healthcare System using IoT and AI/ML" during 27th Feb -2nd Mar 2024, NIT Sikkim.
2. "AI in Embedded Systems" in FDP on "Artificial Intelligence and Its Application in VLSI", SRM Institute of Science and Technology, Delhi NCR Campus, Ghaziabad, India, on 11-01-2024
3. "Embedded Mechatronics of UAV" in 2nd Bootcamp on Unmanned Aerial Systems & Related Technology, organized by National Institute of Technology Durgapur, from 24-07-2023 to 28-07-2023. Supported by MeitY.
4. "Embedded Mechatronics of UAV" in 1st Bootcamp on Unmanned Aerial Systems & Related Technology, organized by National Institute of Technology Durgapur, from 08-05-2023 to 12-05-2023. Supported by MeitY.
5. "Embedded Measurement System (EMS) and its adoption of AI & ML" in Synergistic Training Program Utilizing the Scientific & Technological Infrastructure (STUTI) programme organized by the Department of Electronics and Communication Engineering of National Institute of Technology Durgapur, in collaboration with the Indian School of Mines (ISM, IIT) Dhanbad, 19th-25th September, 2022.
6. Appeared as panelist in "Sikhai Sampad" panel discussion, organized by News18 Bangla TV network on 10th August, 2022.
7. "The assistive Robosapiens with human-like emotions: its fundamental and technological challenges" in International Symposium on Robotics in Industry, Agriculture, and Healthcare, jointly organized by Indian Institute of Technology Kanpur and Waseda University, on 9th and 10th April, 2022.
8. "Intellectual Property Rights (IPR) and IP management for start up" in "Workshop on Intellectual Property Rights (IPRs) and IP management for start up" organized by Innovation and Incubation Council, National Institute of Technology Durgapur, 16th December, 2021

9. "IoT and IIoT associated to Biomedical Applications" in "Online Short Term Course on Internet of Things (IoT) Opportunities, issues and challenges for control and Biomedical Applications" organized by National Institute of Technology Jalandhar, 6th to 10th October, 2021.
10. "Industrial IoT" in Training course on Industry-Oriented Internet of Things (IoT) organized by CSIR-CMERI Durgapur and National Institute of Technology, Durgapur, 15th to 19th February, 2021
11. "Sensors and Actuators on Assistive Devices" in AICTE Training And Learning (ATAL) Academy Programme on "Robotics and Assistive Technology" organized by National Institute of Technology, Durgapur, 24<sup>th</sup> -28<sup>th</sup> November, 2020
12. "Mechatronics: The way of Giving Life to Robotics" in Robotics lecture series organized by Department of Mechanical Engineering, Asansol Engineering College, Asansol, during 19th to Feb-23th Feb, 2020
13. "Industrial IoT and cyber manufacturing systems" in IoT Applications in Advanced Manufacturing Workshop organized by CSIR-Central Mechanical Engineering Research Institute (CMERI), Durgapur, 3th to 4Th February, 2020
14. "Integration Methods of Sensors and Actuators with Mechanisms" in AICTE Training And Learning (ATAL) Academy Programme on "Robotics" organized by National Institute of Technology, Durgapur, 9th to 13th December, 2019

## **PROFESSIONAL MEMBERSHIP**

- Life Member of Institute of Smart Structures and Systems (ISSS)
- Member of IEEE

## **REVIEWER**

- IEEE Transactions on Instrumentation & Measurement
- IEEE Robotics and Automation Letters
- IEEE/ASME Transactions on Mechatronics
- IEEE Transactions on Industrial Electronics
- IEEE Transactions on Ultrasonics, Ferroelectrics, and Frequency Control
- Journal of Intelligent Material Systems and Structures, Sage
- Journal of Vibration Engineering & Technologies, Springer
- Applied and Computational Mechanics
- Applied Sciences, MDPI
- Biomedical Signal Processing & Control

## **CONTACT**

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