SHORT ACADEMIC PROFILE
of
Dr. Anup Nandy (JSPS Fellow)

Machine Intelligence and Bio-Motion Laboratory
Research Laboratory: https://mibmnit.in/

Current Affiliation

Dr. Anup Nandy is an Assistant Professor (Gr. I) in Computer Science and Engineering Department at the National Institute of Technology (NIT), Rourkela, Sundargarh, Odisha-769008, India.

Financial Support Received:

- Robot-Assisted Automated Monitoring and Behavioural Intervention System for Children with Autism Spectrum Disorder funded by Science and Engineering Research Board (SERB), Govt. of India from **January 2022 – January 2025**. **[Role: Principal Investigator] (Ongoing)**

- Digital Mental Healthcare for Older Adults Via Visually-Induced Hippocampal Activation Therapy funded by Department of Science and Technology, Govt of India and Ministry of Science and ICT of the Republic of Korea **[February 2021-February 2024] (Ongoing) [Role: Principal Investigator]**

- Human Cognitive State Estimation through Multi-modal Gait Analysis, funded by Science and Engineering Research Board (SERB), Govt. of India from July 2017 – October 2020. **[Completed] [Role: Principal Investigator]**

- Development of a pathological healthcare system for early detection of neurological gait abnormalities, funded by DST, Govt. of India, International Division, Indo-Japanese Joint project, from September 2017 – September 2019. **[Completed] [Role: Principal Investigator]**

- Modelling and Simulation of Big Data in Gait Analysis for Detection of Bio-mechanical Abnormalities for Healthcare Applications funded by Technical Education Quality Improvement Programme-III (TEQIP-III), NIT Rourkela. **[January 2020 - September 2020] (Completed) [Role: Principal Investigator]**

- Development of E-learning Platform for Assisting Underprivileged (SC/ST) school students in Rourkela Region, Odisha by converging Cable TV Network and Broadband Technology funded by MeitY, Govt. of India **[April 2020-April 2023] (Ongoing) [Role: Co-Investigator]**

- Integrated Information System for Agriculture Monitoring and Crop Insurance, funded by ISRO, Govt. of India, from **January 2022 – January 2024. (Ongoing) [Role: Co-Investigator]**

Awards and Achievements

- Nominated candidate for MHRD, Govt. of India, External Fellowship (Japanese Government Scholarship) **MONBUKAGAKUSHO: MEXT** in 2011 as a research student.
- Received MHRD (**Govt. of India**) GATE Scholarship for M.Tech, from July 2008 to June 2010.
- Received MHRD (**Govt. of India**) Scholarship for Ph. D from November 2011 to July 2015.
- Secured **First Rank of** our batch in M.Tech (Robotics) 2008-2010.
- Received **Young Scientist Award** from Science and Engineering Research Board (SERB), Department of Science and Technology, Govt. of India in 2017.
- Received **NVIDIA GPU Grant** Award in 2018.
- Received Grant from MHRD for conducting GIAN Course in December 2017
- Nominated Wait Listed candidate for **ERCIM Alain Bensoussan Fellowship** for doing Postdoc at NTNU, Norway in November 2019 (2nd Call)
- Received "**Very Good**" Grade Award from **SERB, Govt. of India** based on research performance during review meeting held at IIT Madras in early March 2020.
- Selected as Indian Young Scientist by Govt. of India, for participating in 5th **BRICS Conclave** at Russia from Sept 21-25, 2020 in the thematic area of Artificial Intelligence (Virtual Mode).
- Invited as Speaker at **TED^{X}NI**T Rourkela in the Theme: "Learning from the Past" on March 13, 2021.
- Selected to receive prestigious Japan Society for the Promotion of Science (**JSPS) invitational fellowship** 2022 for short term research visit to Waseda University, Japan from May 17-July 15, 2022.
- Elevated to **IEEE Senior Member** in February 2022 with membership Id: 92653123.

Research Interest

- Machine Learning
- Artificial Intelligence
- Robotics
- Human Cognition

Copyright Applications

• Indian Software Copyright on "VizGaitAssist: A visualization based assistive tool for clinical human gait analysis" has been granted by Govt. of India with Diary Number: 8453/2020-CO/SW.

• Indian Software Copyright on "A Pathological Gait Detection Tool for Healthcare Application" has been filed with Diary No: 13384/2021-CO/SW; Dated:18/06/2021

List of Recent Publications (Last 5 Years)

2022

1) J. Chakraborty, S. Upadhyay, **A. Nandy**, "Musculoskeletal Injury Recovery Assessment using Gait Analysis with Ground Reaction Force Sensor," in **Medical Engineering & Physics**, Elsevier, vol. 103, pp. 103788, May 2022.

2021

1) S. Hazra, A. A. Pratap, D. Tripathy, **A. Nandy**, "Novel data fusion strategy for human gait analysis using multiple kinect sensors," in **Biomedical Signal Processing and Control**, Elsevier, vol. 67, pp. 102512, May 2021.

2) S. Hazra, A. A. Pratap, O. Agrawal, **A. Nandy**, "On Effective Cognitive State Classification Using Novel Feature Extraction Strategies, **Cognitive Neurodynamics**, Springer, pp. 1-31, June, 2021.

3). S. Hazra, S. Dutta, **A. Nandy**, "A Study On Understanding Cognitive States Through Gait Analysis", **Cognitive Systems Research**, Elsevier, vol. 69, pp. 41-49, October, 2021.

4) A. Balmik, M. Jha, **A. Nandy**, "NAO Robot Teleoperation with Human Motion Recognition", in Arabian Journal for Science and Engineering, **Springer**, August, pp. 1-10, 2021.

5) S. Chakraborty, S. Jain, **A. Nandy**, G. Venture, "Pathological Gait Detection Based on Multiple Regression Models Using Unobtrusive Sensing Technology", In **Journal of Signal Processing Systems, Springer**, vol. 93, pp. 1-10, 2021.

6) A. Balmik, A. Kumar, **A. Nandy**, "Efficient Face Recognition System for Education Sectors in COVID-19 Pandemic", in 12th International Conference on Computing Communication and Networking Technologies (ICCCNT), IIT Kharagpur, pp.1-8, 2021.

7) J. Chakraborty, H. S. DabbiruA. **A. Nandy**, "Speed Invariant Gait Event Identification using Dynamic Time Warping", in 18th India Council International Conference (INDICON), pp.1-6, 2021.

8) M. Pisipati and **A. Nandy**, "Human Emotion Recognition using EEG Signal in Music Listening", in 18th India Council International Conference (INDICON), pp.1-6, 2021.

2020

1.) S. Chakraborty and **A. Nandy**, "Automatic Diagnosis of Cerebral Palsy Gait Using Computational Intelligence Techniques: A Low-Cost Multi-Sensor Approach," in **IEEE Transactions on Neural Systems and Rehabilitation Engineering**, vol. 28, no. 11, pp. 2488-2496, Nov. 2020.

2.) J. Chakraborty, **A. Nandy**, "Discrete wavelet transform based data representation in deep neural network for gait abnormality detection", in **Biomedical Signal Processing and Control**, Elsevier, Volume 62: 102076, September 2020.

3.) S. Chakraborty, T. Yamaguchi, **A. Nandy**, V. Bonnet, G. Venture, "Accuracy of image data stream of a markerless motion capture system in determining the local dynamic stability and joint kinematics of human gait", in **Journal of Biomechanics**, Elsevier, vol. 104, pp. 109718 , 2020 (IF:2.576) .

4.) S. Chakraborty, **A. Nandy** and T. Kesar, " Gait Deficits and Dynamic Stability in Children and Adolescents with Cerebral Palsy: A Systematic Review and Meta-analysis" In Clinical Biomechanics, Elsevier, vol. 71, pp.11-23, 2020.

 5.) S. Dutta and **A. Nandy**, "An Extensive Analysis on Deep Neural Architecture for Classification of Subject-Independent Cognitive States", in 7th ACM IKDD CoDS and 25th COMAD, ISB, Hyderabad, India, pp. 180-184, 5-7 January 2020.

6) S. Hazra, P. Roy, **A. Nandy** and R. Scherer, "A Pilot Study for Investigating Gait Signatures in Multi-Scenario Applications," 2020 International Joint Conference on Neural Networks (IJCNN), Glasgow, United Kingdom, 2020, pp. 1-10 **(CORE RANKING: 'A')**

7) S. Chakraborty, N. Thomas and **A. Nandy**, "Gait Abnormality Detection in People with Cerebral Palsy using an Uncertainty-based State-space Model" in 20th International Conference on Computational Science, ICCS-2020, 3-5 June, 2020, Amsterdam, Netherlands, pp 536-549 . **(CORE RANKING: 'A')**

8) G. Kumari, J. Chakraborty and **A. Nandy**, "Effect of Reduced Dimensionality on Deep learning for Human Activity Recognition," 2020 11th International Conference on Computing, Communication and Networking Technologies (ICCCNT), IIT Kharagpur, India, 2020, pp. 1-7
9) S. Dutta, S. Hazra and **A. Nandy**, "A Smart Ambulatory Cognitive State Taxonomy System Through EEG Signal Analysis," 2020 11th International Conference on Computing, Communication and Networking Technologies (ICCCNT), IIT Kharagpur, India, 2020, pp. 1-7

10.) S. Chakraborty and A. Nandy, "An Unsupervised Approach For Gait Phase Detection," 2020 4th International Conference on Computational Intelligence and Networks (CINE), Kolkata, India, 2020, pp. 1-5

2019

1.) S. Chakraborty, R. Mishra, A. Dwivedi, T. Das, and **A. Nandy**, " A Low-Cost Pathological Gait Detection System in Multi-Kinect Environment," In 20th International Symposium on Optomechatronic Technologies (ISOT 2019), Springer, Goa, India, pp. 97-104, 2020

2.) S. Dutta, and **A. Nandy**, "Data Augmentation For Ambulatory EEG Based Cognitive State Taxonomy System With RNN-LSTM" in 39th SGAI International Conference on Artificial Intelligence (SGAI-2019), Cambridge, England, pp. 468-473, December, 2019.

3.) J. Chakraborty and **A. Nandy**, "Periodicity Detection of Quasi-periodic Slow-speed Gait Signal using IMU sensor", In 21st International Conference on Human Computer Interaction, HCII-2019, Florida, USA, pp. 140-152 , 2019.

4.) S. Dutta, S. Hazra, **A. Nandy**, "Human Cognitive State Classification through Ambulatory EEG Signal Analysis". 18th International Conference on Artificial Intelligence and Soft Computing (ICAISC-2019), pp. 169-181, Zakopane, Poland, June 2019.

5.) A. Nandy, "Statistical methods for analysis of Parkinson's disease gait pattern and classification" in Multimedia Tools and Applications, Springer, vol. 78, no. 14, pp. 19697–19734, 2019.

2018

1.) S. Chattopadhyay and **A. Nandy**, "Human Gait Modelling Using Hidden Markov Model For Abnormality Detection" in Proceedings of the 2018 IEEE Region 10 Conference TENCON-2018, pp. 0623-0628, 2018.

2.) S. Chakraborty, D. Mondal, **A. Nandy**, "A Study on Human Gait Kinematic Validation in Multi-Kinect v2 Environment", In in Proceedings of the 2018 IEEE Conference INDICON-2018, December 16-18, 2018.

3.) S. Chakraborty and A. Nandy, "Comparison of Local Dynamic Stability of Treadmill Gait Data in Three Different Planes through Maximal Lyapunov Exponent", In IEEE International Conference on Computing, Power and Communication Technology, pp. 96-100, 2018.

2017

1) **A. Nandy**, P. Chakraborty, "A study on human gait dynamics: Modeling and Simulation on OpenSim Platform", vol. 76, pp. 21365-21400, *Multimedia Tools and Applications*, Springer, 2017.

2016

1) **A. Nandy**, R. Chakraborty, P. Chakraborty, "Cloth invariant gait recognition using pooled segmented statistical features", vol.191, pp. 117-140, ***Neurocomputing, Elsevier***, 2016.

2) **A. Nandy**, A. Pathak, P. Chakraborty, "A study on gait entropy image analysis for clothing invariant human identification", *Multimedia Tools and Applications*, Springer, 2016.

Authored Book

A. Nandy, S. Chakraborty and J. Chakraborty, G. Venture "Modern Methods for Affordable Clinical Gait Analysis: Theories and Applications in Healthcare Systems", In Elsevier Publisher, July, 2021 **(Academic Press)**
https://www.elsevier.com/books/modern-methods-for-affordable-clinical-gait-analysis/nandy/978-0-323-85245-6

Edited Book Chapters

- S. Hazra, **A. Nandy**, "Biometric Gait Features Analysis using Deep Learning Approaches," in the Book of Deep Learning for Biomedical Applications, CRC Press Publisher, pp. 41-61, Taylor & Francis Group, June 2021.

- A. Tarun, **A. Nandy**, "Human Gait Classification Using Deep Learning Approaches," in the Book of "Proceedings of International Conference on Computational Intelligence and Data Engineering", Springer Publisher, pp. 185-199, 2021.

- S. Chakraborty, T.Suzuki, A. Das, **A. Nandy**, G.Venture, "Gait Abnormality Detection Using Deep Convolution Network", in Handbook of Research on Engineering, Business, and Healthcare Applications of Data Science and Analytics, IGI GLOBAL, pp. 363-372, 2021.

- S. Chakraborty, S. Sambhavi, **A. Nandy**, "Deep Learning in Gait Abnormality Detection: Principles and Illustrations", in Handbook of Bioinformatics and Medical Applications: Big Data Using Deep Learning Algorithms, John Wiley & Sons, Inc, pp. 63-72, 2022.