

Dr. Saugat Bhattacharyya

CONTACT INFORMATION	School of Computer Science and Electronics Engineering, University of Essex, CO4 3SQ, Colchester, UK. Mob: +44 – 7504255818 saugatbhattacharyya@gmail.com http://bhattacharyyasaugat.wordpress.com
CURRENT POSITION	Senior Research Officer, July 2017 to present Brain Computer Interfacing-Neural Engineering Lab, School of Computer Science and Electronics Engineering, The University of Essex, Colchester, UK. Project: Brain-computer-interface-assisted confidence estimation for group decision making, group selection and personnel training Supervisor: Professor Riccardo Poli
RESEARCH INTERESTS	<ul style="list-style-type: none">• Brain-computer Interfacing, Cognitive Neuroscience• Signal Processing: EEG, EMG, HRV, and EOG decoding (Feature Extraction and Features Selection); Blind Source Separation; Dimensional Reduction item Data Science, Big Data Analytics, Deep Learning• Machine Learning for Biomedical Signals• Rehabilitation Engineering and Robotics• Medical Imaging and Devices, Biomedical Instrumentation and Circuit Design
EDUCATION	Jadavpur University , Kolkata, India Ph.D., Engineering, Date of submission: 23rd August, 2014; Date of Defence: 21st August, 2015. <ul style="list-style-type: none">• Thesis Topic: <i>Human-Computer Interface for Motion Control of Artificial Limb(s)</i>• Advisors: Prof. Amit Konar and Prof. D.N. Tibarewala• Percentage of Marks in Course-work: 87.5% Jadavpur University , Kolkata, India Master of Engineering, Bio-medical Engineering, June 2011, Percentage of Marks: 80.00% West Bengal University of Technology , Siliguri Institute of Technology, Siliguri, West Bengal, India Bachelor of Technology, Biomedical Engineering, May 2009, DGPA: 8.6
RESEARCH AND WORK EXPERIENCE	Post-Doctoral Researcher November, 2015 - July, 2017 Institute name: INRIA CAMIN Team Laboratoire Informatique, Robotique, Microelectronique Montpellier, Montpellier, France Supervisor: Dr Mitsuhiro Hayashibe and Dr Maureen Clerc BCI-LIFT Project <ul style="list-style-type: none">• Study of the effect and integration of Functional Electrical Stimulation as neuro-feedback on Brain-machine Interfacing for motor learning

Visiting Researcher

October, 2014 - June, 2015

Institute name: INRIA

DEMAR Team

University of Montpellier, Montpellier, France

Supervisor: Dr Mitsuhiro Hayashibe**Erasmus Mundus-Svaagata Project Fellowship**

- Study of the probabilistic nature of Motor Imagery Electroencephalography signals and its correlation with Electromyography signals for closed loop control of a robotic manipulator

Guest Lecturer

August, 2011 - September, 2014

Duties: Co-taught post-graduate level courses. Shared responsibility for lectures, exams, homework assignments, and grades. Duties included shared administrative responsibilities with faculty instructor, fielding of student inquiries, and oversight of post-graduate students. Mentorship to undergraduate and postgraduate students on their final year project.

- Department of Electronics & Telecommunication Engineering, Jadavpur University, Kolkata, India
- School of Bioscience & Engineering, Jadavpur University, Kolkata, India

COURSES TAUGHT Guest Lecturer**Digital Image and Speech Processing**

M.Tech Course in Intelligent Automation and Robotics,
Department of Electronics & Telecommunication Engineering,
Jadavpur University, India.

Guest Lecturer**Advanced Digital Signal Processing**

M.Tech Course in Intelligent Automation and Robotics,
Department of Electronics & Telecommunication Engineering,
Jadavpur University, India.

Teaching Assistant**Medical Imaging and Image Processing**

with Prof. D.N. Tibarewala
M.E. Course in Biomedical Engineering,
School of Bioscience & Engineering,
Jadavpur University, India.

Lab Instructor**Bio-instrumentation & Programming Lab**

M.E. Course in Biomedical Engineering,
School of Bioscience & Engineering,
Jadavpur University, India.

A.I. and Robotics Lab

M.Tech Course in Intelligent Automation and Robotics
Department of Electronics & Telecommunication Engineering,
Jadavpur University, India.

Digital Control Lab

M.Tech Course in Intelligent Automation and Robotics
Department of Electronics & Telecommunication Engineering,
Jadavpur University, India.

Control Lab

M.Tech Course in Intelligent Automation and Robotics
Department of Electronics & Telecommunication Engineering,
Jadavpur University, India.

JOURNAL
PUBLICATIONS

1. Pal, K., K. Mitra, A. Bit, **S. Bhattacharyya** and A. Dey. (2018) *Editorial. Medical Signal Processing in Biomedical and Clinical Applications*, Journal of Healthcare Engineering, Article ID 3932471.
2. **Bhattacharyya, S.**, A. Konar, D.N. Tibarewala and M. Hayashibe. (2017) *A Generic Transferable EEG Decoder for Online Detection of Error Potential in Target Selection*, Frontiers in Neuroscience, 11: 226.
3. **Bhattacharyya, S.**, A. Konar and D.N. Tibarewala. (2017) *Motor Imagery and Error Related Potential Induced Position Control of a Robotic Arm*, IEEE/CAA Journal of Automatica Sinica, 4 (4): 639-650.
4. **Bhattacharyya, S.**, S. Shimoda and M. Hayashibe. (2016) *A Synergetic Brain-machine Interfacing Paradigm for Multi-DOF Robot Control*, IEEE Transactions on Systems, Man and Cybernetics: Systems, 46 (7): 957-968.
5. Mazumder, A., P. Ghosh, **S. Bhattacharyya**, P. Das, and D.N. Tibarewala. (2015) *Performance Analysis of Memory-Recollection and Problem Solving Cognitive Processes Using EEG Signals*, International Journal of Biomedical Engineering and Technology, 19 (4): 316-334.
6. **Bhattacharyya, S.**, M. Pal, A. Konar, and D.N. Tibarewala. (2015) *EEG-based Control of Wrist and Finger Movement using an Interval Type-2 Fuzzy Approach*, Biomedical Signal Processing and Control, 21: 90-98.
7. **Bhattacharyya, S.**, D. Basu, A. Konar, and D.N. Tibarewala. (2015) *Interval Type-2 Fuzzy Logic based Multiclass ANFIS Algorithm for Real-Time EEG based Movement Control of a Robot Arm*, Robotics and Autonomous Systems, 68: 104-115.
8. **Bhattacharyya, S.**, A. Konar, and D.N. Tibarewala. (2014) *Motor Imagery, P300 and Error Related EEG Based Robot Arm Movement Control for Rehabilitation Purpose*, Medical and Biological Engineering and Computing, 52(12): 1007-1017.
9. **Bhattacharyya, S.**, A. Konar, and D.N. Tibarewala. (2014) *A Differential Evolution Based Energy Trajectory Planner for Artificial Limb Control Using Motor Imagery EEG Signal*, Biomedical Signal Processing and Control, 11: 107-113.
10. **Bhattacharyya, S.**, A. Sengupta, T. Chakraborti, A. Konar, and D.N. Tibarewala. (2014) *Automatic Feature Selection of Motor Imagery EEG Signals using Differential Evolution and Learning Automata*, Medical and Biological Engineering and Computing, 52 (2): 131-139.
11. Chatterjee, S., A. Ganguly, and **S. Bhattacharyya**. (2010) *Characterization of HRV by Poincare Plot Analysis among the Female Tea Garden Workers of Northern Hilly Regions of West Bengal*, International Journal Healthcare Informatic System and Informatics, 5 (2): 49-59.

BOOK CHAPTERS

1. **Bhattacharyya, S.**, A. Khasnobish, P. Ghosh, A. Mazumder, and D.N. Tibarewala. *A Review on Brain Imaging Techniques for BCI applications*, N. Dey (eds.), Biomedical Image Analysis and Mining Techniques for Improved Health Outcomes, IGI Global, 2015, pp. 39-70.
2. A. Mazumder, P. Ghosh, A. Khasnobish, **S. Bhattacharyya**, and D.N. Tibarewala. (2015) *Selection of Relevant Features from Cognitive EEG Signals Using ReliefF and MRMR Algorithm*, S. Gupta, S. Bag, K. Ganguly, I. Sarkar, P. Biswas (eds.) Advancements of Medical Electronics Lecture Notes in Bioengineering, Springer India, 2015, pp. 125-136.
3. A. Khasnobish, **S. Bhattacharyya**, A. Konar and D.N. Tibarewala. (2015) *Performance Analysis of Feature Extractors for Object Recognition from EEG Signals*, S. Gupta, S. Bag, K. Ganguly, I. Sarkar, P. Biswas (eds.) Advancements of Medical Electronics Lecture Notes in Bioengineering, Springer India, 2015, pp. 249-261.
4. **Bhattacharyya, S.**, M.A. Hossain, A. Konar, D.N. Tibarewala, and R. Janarthanan. *Detection of fast and slow hand movements from motor imagery EEG signals*, M.K. Kundu, D.P. Mohapatra, A. Konar, A. Chakraborty (eds.), Advanced Computing, Networking, and Informatics Vol.1, Smart Innovation, Systems and Technologies Vol. 27, Springer International Publishing, Switzerland, 2014, pp. 645-652.
5. **Bhattacharyya, S.**, P. Rakshit, A. Konar, D.N. Tibarewala, and R. Janarthanan. *Feature Selection of Motor Imagery EEG Signals Using Firefly Temporal Difference Q-Learning and Support Vector Machine*, B. Panigrahi, P.N. Suganthan, S. Das, and S.S. Dash (eds.) Swarm, Evolutionary, and Memetic, Computing, Lecture Notes in Computer Science Vol. 8298, Springer International Publishing, Switzerland, 2013, pp. 534-545.
6. Chatterjee, S., **S. Bhattacharyya**, A. Konar, A. Khasnobish, D.N. Tibarewala, and R. Janarthanan. *Performance Analysis of Multiclass Common Spatial Patterns in Brain-Computer Interface*, P. Maji, A. Ghosh, M. Narasimha Murty, K. Ghosh, and S.K. Pal (eds.) Pattern Recognition and Machine Intelligence, Lecture Notes in Computer Science Vol. 8251, Springer Berlin Hiedelberg, 2013, pp. 115-120.
7. Khasnobish, A., A. Konar, D.N. Tibarewala, **S. Bhattacharyya**, and R. Janarthanan. *Object Shape Recognition from EEG Signals during Tactile and Visual Exploration*, P. Maji, A. Ghosh, M. Narasimha Murty, K. Ghosh, and S.K. Pal (eds.) Pattern Recognition and Machine Intelligence, Lecture Notes in Computer Science Vol. 8251, Springer Berlin Hiedelberg, 2013, pp. 459-464.
8. Rakshit, P., **S. Bhattacharyya**, A. Konar, A. Khasnobish, D.N. Tibarewala, and R. Janarthanan. *Artificial Bee Colony Based Feature Selection for Motor Imagery EEG Data*, J.C. Bansal, P. Singh, K. Deep, M. Pant, and A. Nagar (eds.) Proceedings of Seventh International Conference on Bio-Inspired Computing: Theories and Applications (BIC-TA 2012), Advances in Intelligent Systems and Computing Vol. 202, Springer India, 2012, pp. 127-138.

SUBMITTED
PUBLICATIONS

1. **S. Bhattacharyya**, and M. Hayashibe. *Systematic Enhancement of Functional Connectivity in Brain-Computer Interfacing using Common Spatial Patterns and Tangent Space Mapping*, Journal of Biomedical and Health Informatics, *Under Review*.
2. Pal, M., **S. Bhattacharyya** and S. Bandyopadhyay. *A Many-objective Optimization Approach for Single Source-trained Target EEG Classification*, Computers in Biology and Medicine, *Under Review*.

3. **S. Bhattacharyya**, and M. Hayashibe. *BCI-FES: From control to neurorehabilitation*, K. Pal (eds.), Bioelectronics and Medical Devices, Elsevier, *Under Review*.
4. R. Bose, K. Samanta, A. Khasnobish, S. Chatterjee, and **S. Bhattacharyya**. *Lower limb motor imagery recognition using EEG-BCI*, K. Pal (eds.), Bioelectronics and Medical Devices, Elsevier, *Under Review*.
1. D. Valeriani, **S. Bhattacharyya**, C. Cinel, L. Citi, and R. Poli. (2018) *Augmenting group decision making accuracy in a realistic environment using collaborative brain-computer interfaces based on error-related potentials*, In: 7th International BCI Meeting: "BCIs: Not Getting Lost in Translation", Asilomar, USA.
2. **S. Bhattacharyya**, M. Clerc and M. Hayashibe (2016) *A Study on the Effect of Electrical Stimulation During Motor Imagery Learning in Brain-Computer Interfacing*, In: IEEE International Conference on Systems, Man, and Cybernetics, Budapest, Hungary, DOI: 10.1109/SMC.2016.7844670 .
3. **S. Bhattacharyya**, M. Clerc and M. Hayashibe (2016) *A study on the effect of electrical stimulation as a user stimuli for motor imagery classification in Brain-Machine Interface*, Presented in: 20th Conference of International Functional Electrical Stimulation Society (IFESS) 2016, Montpellier, France. Published in: European Journal of Translational Myology, 26 (2): 165-168.
4. P. Ghosh, A. Mazumder, **S. Bhattacharyya**, D.N. Tibarewala, and M. Hayashibe. (2015) *Functional Connectivity Analysis of Motor Imagery EEG signal for Brain-computer Interfacing Application*, In: 7th International IEEE EMBS Neural Engineering Conference, Montpellier, France, pp. 210-213.
5. P. Ghosh, A. Mazumder, **S. Bhattacharyya**, and D.N. Tibarewala. (2015) *An EEG Study on Working Memory and Cognition*, In: 2nd International Conference on Perception and Machine Intelligence (PerMIn 2015), Kolkata, India, pp. 21-26.
6. M. Pal, **S. Bhattacharyya**, S. Roy, A. Konar, D.N. Tibarewala, and R. Janarthanan. (2014) *A Bacterial Foraging Optimization and Learning Automata Based Feature Selection for Motor Imagery EEG Classification*, In: 2014 International Conference on Signal Processing and Control (SPCOM-2014), Bangalore, India, pp. 1-5.
7. D. Basu, **S. Bhattacharyya**, D. Sardar, A. Konar, D.N. Tibarewala, and A. Nagar. (2014) *A Differential Evolution based Adaptive Neural Type-2 Fuzzy Inference System for Classification of Motor Imagery EEG Signals*, In: 2014 IEEE International Conference on Fuzzy Systems (FUZZ-IEEE'14), Beijing, China, pp. 1253-1260.
8. **S. Bhattacharyya**, A. Konar, D.N. Tibarewala, A. Khasnobish, and R. Janarthanan. (2014) *Performance Analysis of Ensemble Methods for Multi-class Classification of Motor Imagery EEG Signal*, In: 2014 International Conference on Control, Instrumentation, Energy and Communication (CIEC14), Kolkata, India, pp. 797-801.
9. D. Sardar, D. Basu, **S. Bhattacharyya**, A. Konar, A. Khasnobish, D.N. Tibarewala, and R. Janarthanan. (2014) *Embedded Realisation of Amplitude-Phase Adaptive Filter for Bio-Potential Signals*, In: 2014 International Conference on Control, Instrumentation, Energy and Communication (CIEC14), Kolkata, India, pp. 668-672.
10. M. Pal, **S. Bhattacharyya**, A. Konar, D.N. Tibarewala, and R. Janarthanan. (2014) *Decoding of Wrist and Finger Movement from Electroencephalography Signal*, 2014 IEEE International Conference on Electronics, Computing, Communication Technologies (IEEE CONECCT 2014), Bangalore, India.

11. **S. Bhattacharyya**, P. Rakshit, A. Konar, D.N. Tibarewala, S. Das and A.K. Nagar. (2013) *Differential Evolution with Temporal Difference Q-Learning Based Feature Selection for Motor Imagery EEG Data*, In: IEEE Symposium on Computational Intelligence, Cognitive Algorithms, Mind, and Brain (CCMB 2013), Singapore, pp. 138-145.
12. S. Chatterjee, **S. Bhattacharyya**, A. Khasnobish, A. Konar, D.N. Tibarewala, and R. Janarthanan. (2012) *Study of inter-session variability of long term memory and complexity of EEG signals*, In: 3rd International Conference on Emerging Applications of Information Technology (EAIT 2012), Kolkata, India, pp. 106-109.
13. G. Singh, A. Khasnobish, A. Jati, **S. Bhattacharyya**, A. Konar, D.N. Tibarewala, and R. Janarthanan. (2012) *Object-shape classification and reconstruction from tactile images using image gradient*, In: 3rd International Conference on Emerging Applications of Information Technology (EAIT 2012), Kolkata, India, pp. 93-96.
14. G. Singh, A. Jati, A. Khasnobish, **S. Bhattacharyya**, A. Konar, D.N. Tibarewala, and A.K. Nagar. (2012) *Object-shape recognition from tactile images using regional descriptors*, In: 4th World Congress on Nature and Biologically Inspired Computing (NABIC 2012), Mexico City, Mexico, pp. 53-58.
15. **S. Bhattacharyya**, A. Sengupta, T. Chakraborti, D. Banerjee, A. Khasnobish, A. Konar, D.N. Tibarewala, and R. Janarthanan. (2012) *EEG controlled remote robotic system from motor imagery classification*, In: 3rd International Conference on Computing, Communication and Networking Technologies (ICCCNT 2012), Coimbatore, India, pp. 1-8.
16. G. Singh, A. Jati, A. Khasnobish, **S. Bhattacharyya**, A. Konar, D.N. Tibarewala, and R. Janarthanan. (2012) *Negative emotion recognition from stimulated EEG signals*, In: 3rd International Conference on Computing, Communication and Networking Technologies (ICCCNT 2012), Coimbatore, India, pp. 1-8.
17. A. Khasnobish, A. Jati, G. Singh, **S. Bhattacharyya**, A. Konar, D.N. Tibarewala, E. Kim, and A.K. Nagar. (2012) *Object-shape recognition from tactile images using a feed-forward neural network*, In: International Joint Conference on Neural Network (IJCNN 2012), Brisbane, Australia, pp. 1-8.
18. T. Chakraborti, A. Sengupta, D. Banerjee, A. Konar, **S. Bhattacharyya**, A. Khasnobish, and R. Janarthanan. (2011) *Implementation of EEG Based Control of Remote Robotic Systems*, In: International Conference on Recent Trends in Information Systems (RETIS 2011), Kolkata, India, pp. 203-208.
19. A. Khasnobish, **S. Bhattacharyya**, A. Konar, D.N. Tibarewala, and A.K. Nagar. (2011) *A two-fold classification for composite decision about localized arm movement from EEG by SVM and QDA techniques*, In: International Joint Conference on Neural Network (IJCNN 2011), California, USA, pp. 1344-1351.
20. **S. Bhattacharyya**, A. Khasnobish, A. Konar, D.N. Tibarewala, and A.K. Nagar. (2011) *Performance analysis of Left/Right Hand movement classification from EEG signal by intelligent algorithm*, In: IEEE Symposium on Computational Intelligence, Cognitive Algorithms, Mind, and Brain (CCMB 2011), Paris, pp. 1-8.
21. S. Chandra, **S. Bhattacharyya**, D. Srivastava, A. Kaur, and D.N. Tibarewala. (2011) *Heart Rate Variability Data Mining to Study the Effect of Fun-Themed Audio-Visual Stimulus on Autonomous Nervous System*, In: National Conference on Instrumentation and Control (NATCONIC 2011), Kolkata, India, pp. 158-160.

Invited Talk

- *Brain-Computer Interfacing: An Introduction*, National Institute of Technology, Rourkela, India Feb 2018
- *Motor Imagery and Error Related Potential Induced Position Control of a Robotic Arm*, University of Essex Feb 2018
- *Natural user feedback in BCI with peripheral sensory stimulation toward efficient motor learning*, Laboratoire Informatique, Robotique, Microelectronique Montpellier, Montpellier, France March 2017
- *Bio-potential Signals: conditioning, analysis and Applications*, Narula Institute of Techology, Kolkata, India July 2015
- *A Synergetic Brain-computer Interfacing Paradigm for Multi-DOF Robot Control*, University of Montpellier, France June 2015

SEMINARS AND WORKSHOP ATTENDED

- *Neurostim 2016*, November 22, 2016, Sophia Antipolis, France.
- *Biopolymers in Biomedical Engineering*, November, 2013, Jadavpur University, Kolkata, India.
- *National Conference on Brain and Consciousness*, September 20-21, 2013, Indian Statistical Institute, Kolkata, India.
- *National Workshop on Medical Signal & Image Processing*, December 19-20, 2012, National Institute of Technology, Rourkela, India.
- *IEEE Seminar on Computational Intelligence in Information Systems, Imaging and Security*, August 3-4, 2012, St. Thomas College of Engineering and Technology, Kolkata, India.
- *National Workshop on Biomechanics*, October 4, 2007, Manipal Institute of Technology, Manipal, India.
- *National Technical Symposium on Biomedical Engineering*, April 7-8, 2006, Siliguri Institute of Technology, Siliguri, India.

INDUSTRIAL TRAINING

- Undertaken training in the form of **Observership** in Department of Biomedical Engineering at Rabindranath Tagore International Institute of Cardiac Sciences, Kolkata. **Duration- 3 weeks.**
- Undertaken a training programme on **Medical Equipments and Hospital Management Software** organized by Electrocure Services, Kolkata. **Duration- 2 weeks.**

TECHNICAL MEMBERSHIP

- Post-doctoral Member, The Brain Computer Interface Society, Since 2018.
- Associate Member, The Institute of Engineers (India), Since 2014.

EDITORIAL DUTIES

- Guest Editor: Special Issue on Medical Signal Processing in Biomedical and Clinical Applications, Journal of Healthcare Engineering, March 2018.
- Reviewer: IEEE Transaction on Neural Systems & Rehabilitation Engineering. Since 2016
- Reviewer: IEEE Transaction on Systems, Man & Cybernetics: Systems. Since 2016
- Reviewer: IEEE Transaction on Biomedical Engineering. 2016
- Reviewer: IEEE Access. Since 2016
- Reviewer: NeuroComputing, (Elsevier). Since 2013
- Reviewer: IEEE-SMC, Budapest. 2016
- Reviewer: IEEE-NER, Montpellier, France. 2015
- Reviewer: IEEE-IJCNN, FUZZ-IEEE, IEEE-CEC

TECHNICAL SKILLS

- Programming Skills: C, C++, C#, Python, Matlab, Labview.

- Application Softwares: Openvibe, Unity, Microsoft Visual Studio 2010, L^AT_EX, common Windows database, spreadsheet, and presentation software
- Operating Systems: Linux (Ubuntu, Fedora), Windows.

SKILLS SET

- Ability to work in team as well as in standalone environment
- Good communication and presentation skills
- Can adapt to new environments quickly

PERSONAL
INFORMATION

- **Date of Birth:** 16th June 1987
- **Place of Birth:** Dibrugarh, Assam
- **Gender:** Male
- **Marital Status:** Married
- **Nationality:** INDIA
- **VISA status:** UK, Tier-2
- **Languages known:** English, Hindi, Bengali, Assamese, French (Elementary)