# Sankha Subhra Mullick

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Google Scholar: https://scholar.google.com/citations?user=QnzlBI8AAAAJ
DBLP: https://dblp.org/pers/hd/m/Mullick:Sankha_Subhra
GitHub: https://github.com/SankhaSubhra

**Research Interests:**

Class imbalanced learning, deep generative models, adversarial learning, machine learning, deep learning, evolutionary optimization, few-shot learning, applications in bioinformatics and computer vision.

**Research Experience:**

1. Designed deep neural network and traditional classifiers which are resilient to the detrimental effects of class-imbalance, alongside theoretical analysis of their behavior. Investigated the effects of class imbalance on classification performance evaluation indices.
2. Designed classifiers which can resolve label ambiguities, retain their performance on small disjuncts, general scarcity of training instances, and/or relieve the user from parameter tuning.
3. Proposed new variants of Differential Evolution (DE) suitable for large scale optimization problems, and explored their applicability in optimizing a classifier's performance, adversarial attack, etc.

**Positions Held:**

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| *August, 2016-Now* | Senior Research Fellow, Electronics and Communication Sciences Unit (ECSU), Indian Statistical Institute (ISI). |
| *August, 2014-July, 2016* | Junior Research Fellow, ECSU, ISI. |

**Education:**

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| *Ph.D. in Computer Science*<br>*2014-Now*<br>*Thesis submitted: August, 2020* | On class imbalance learning: design of non-parametric classifiers, efficient performance indices, and deep oversampling strategies.<br>Supervisor: Dr. Swagatam Das. Associate Professor, ECSU, ISI. |
| *M.tech in Computer Science*<br>*2012-2014* | ISI, Kolkata, India.<br>Percentage: 81.5%. 1st Division with Distinction. |
| *B.Tech in Computer Science and Engineering*<br>*2008-2012* | Kalyani Government Engineering College (KGEC), West Bengal University of Technology (recently renamed as Maulana Abul Kalam Azad University of Technology).<br>Degree Grade Point Average: 8.56/10 |

**Projects and Internships:**

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| *Dissertation during M.Tech at ISI, for the partial fulfillment of the course*<br>*December, 2013-July, 2014* | Study on Integrative Clustering of Multiple Genomic Data to Discover Cancer Subtypes.<br>Supervisor: Prof. Pradipta Maji, Professor, Machine Intelligence Unit, ISI. |
| *Project as part of the Parallel processing: Architectures and Algorithms paper during M.Tech*<br>*September-November, 2013* | Exploring the scope of parallelism in matrix multiplication using CUDA.<br>Supervisor: Prof. Nabanita Das, Professor, Advanced Computing and Microelectronics Unit, ISI. |
| *Summer Internship at the Indian Institute of Technology (IIT), Delhi*<br>*May-June, 2013* | Prediction of replication origins of eukaryotic genes.<br>Supervisor: Dr. Kushal Shah, Assistant Professor, Department of Electrical Engineering (DEE), IIT Delhi, and Prof. B. K. Panigrahi, Professor, DEE, IIT Delhi. |

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| *Project during B.Tech at KGEC, for the partial fulfillment of the course*<br>*June, 2011-May,2012* | Time series prediction using fuzzy clustering.<br>Supervisor: Dr. Satyendra Nath Mandal, Assistant Professor, Department of Information Technology, KGEC. |

**Publications:**

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*2020:*

1. **Mullick, Sankha Subhra**, Shounak Datta,Sourish Gunesh Dhekane, and Swagatam Das. "Appropriateness of Performance Indices for Imbalanced Data Classification: An Analysis." Pattern Recognition 102 (2020) doi:10.1016/j.patcog.2020.107197.

*2019:*

1. **Mullick, Sankha Subhra**, Shounak Datta and Swagatam Das. "Generative adversarial minority oversampling." in proceedings of the International Conference on Computer Vision (ICCV), 2019.
2. Banerjee, Imon, **Sankha Subhra Mullick**, and Swagatam Das. "On convergence of the class membership estimator in fuzzy $k$-nearest neighbor classifier." IEEE Transactions on Fuzzy Systems 27(6) (2019): 1226-1236.

*2018:*

1. **Mullick, Sankha Subhra**, Shounak Datta and Swagatam Das. "Adaptive learning-based $k$-nearest neighbor classifiers with resilience to class imbalance," IEEE Transactions on Neural Networks and Learning Systems, 29(11) (2018): 5713 - 5725.

*2017:*

1. Ghosh, Arka, Swagatam Das, **Sankha Subhra Mullick**, R Mallipeddi, and AK Das. "A switched parameter differential evolution with optional blending crossover for scalable numerical optimization". Applied Soft Computing 57 (2017): 329-352.
2. Biswas, Nimagna, Saurajit Chakraborty, **Sankha Subhra Mullick**, and Swagatam Das. "A parameter independent fuzzy weighted $k$-Nearest neighbor classifier." Pattern Recognition Letters 101 (2017): 80-87.
3. Datta, Shounak, **Sankha Subhra Mullick**, and Swagatam Das. "Generalized mean based back-propagation of errors for ambiguity resolution." Pattern Recognition Letters 94 (2017): 22-29.

*2016:*

1. Das, Swagatam, **Sankha Subhra Mullick**, and Ponnuthurai N. Suganthan. "Recent advances in differential evolution–an updated survey." Swarm and Evolutionary Computation 27 (2016): 1-30.

*2015:*

1. Das, Swagatam, Arka Ghosh, and **Sankha Subhra Mullick**. "A switched parameter differential evolution for large scale global optimization–simpler may be better." Mendel 2015. Springer, Cham, 2015. 103-125.

*Communicated and archived manuscripts:*

1. Das, Swagatam and **Sankha Subhra Mullick**. "On Classification of Imbalanced Datasets: An Updated Perspective and Some Future Challenges". Submitted to ACM Computing Surveys (2020).
2. Ghosh, Arka, **Sankha Subhra Mullick**, Shounak Datta, Swagatam Das, R. Mallipeddi, and A. K. Das. "One Sparse Perturbation to Fool them All, almost Always!" arXiv preprint arXiv:2004.13002 (2020). Submitted to IEEE Transactions on Evolutionary Computation (2020).
3. Datta, Shounak, Sayak Nag, **Sankha Subhra Mullick**, and Swagatam Das. "Diversifying support vector machines for boosting using kernel perturbation: applications to class imbalance and small disjuncts." arXiv preprint arXiv:1712.08493 (2017).

Google Scholar: `https://scholar.google.com/citations?user=QnzlBI8AAAAJ&hl=en`

DBLP: `https://dblp.org/pers/hd/m/Mullick:Sankha_Subhra`

**Programming Languages and Tools:**

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1. Proficient in Python for machine learning applications using libraries such as numpy, scipy etc., and deep learning API/platform like Keras, tensorflow, etc.

2. Highly skilled in MATLAB.
3. Comfortable in using C/C++, R, and UNIX shell script as per requirement.
4. Extensive expertise in preparing academic documents using Latex.

GitHub: `https://github.com/SankhaSubhra`

**Academic Achievements:**

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1. A citation count of more than 880, with a h-index of 6.
2. Received ACM-India/IARCS travel grant. Selected as a student volunteer at ICCV 2019.
3. Receives a monthly fellowship as a research scholar from ISI.
4. Ranked 486-th among 156,780 students (99.7 percentile) in Graduate Aptitude Test in Engineering for Computer Science and Engineering in 2012. Received a scholarship providing full financial assistance during M.Tech in Computer Science, from ISI, Kolkata, and received special prize for extraordinary performance in the semester examinations.
5. Ranked 935-th in the West Bengal Joint Entrance Examination for Engineering, and 1304-th for Medical, in 2008. Received merit cum means scholarships from the state government providing partial financial assistance during B.Tech.
6. Passed the Higher Secondary Examination in 2008 (West Bengal Council of Higher Secondary Education), and Madhyamik Pariksha in 2006 (West Bengal Board of Secondary Education), with respective scores of 81%, and 80.75%. An alumnus of Hindu School, and The Scottish Church Collegiate School.

**Professional Activities:**

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*Teaching and Project Supervision:*
Supervised more than 10 undergraduate and graduate research interns from various notable academic institutes (such as ISI, IIT Delhi, Jadavpur University, IIT Guwahati, IIIT Guwahati, etc.) on projects leading to journal papers, technical reports and/or dissertations since 2015.
*Lectures:*

1. "Introduction to Deep Learning." Series of lectures. Sixth Summer School on Computer Vision, Graphics and Image Processing, May-July, 2019.
2. "Machine Learning using MATLAB." Series of lectures. Fifth Summer School on Computer Vision, Graphics and Image Processing, May-July, 2018.
3. "Basics of MATLAB, with a Focus on Machine Learning Applications." Forth Summer School on Computer Vision, Graphics and Image Processing, May-July, 2017.

*Reviewer Duties:*
I act as a regular reviewer in British Machine Vision Conference 2020, IEEE Access, IEEE Transactions of Evolutionary Computation, IEEE Transactions on Fuzzy Systems, IEEE Transactions on Systems, Man, and Cybernetics: Systems, IEEE Transactions on Neural Networks and Learning Systems, Swarm and Evolutionary Computation (Elsevier), and Neurocomputing (Elsevier), Pattern Recognition (Elsevier), Information Sciences (Elsevier).

**Personal Information and Contact Details:**

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| *Data of Birth* | 1st October, 1990. |
| *Interests* | Avid reader and a creative writer. High-altitude trekker. |
| *Office Address* | Electronics and Communication Sciences Unit, Room number-912, S. N. Bose Bhavan, Indian Statistical Institute, 203, Barrackpore Trunk Road, Kolkata, India, 700108. |
| *Residential Address* | 11/3B Hidaram Banerjee Lane, Bowbazar, Kolkata, India, 700012. |

Sankha Subhra Mullick
7th August, 2020