Sankha Subhra Mullick

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Education:

- **Ph.D. in Computer Science, Indian Statistical Institute, India: 2014-January, 2021**
  Thesis Title: On class imbalance learning: design of non-parametric classifiers, efficient performance indices, and deep oversampling strategies. *Supervisor:* Dr. Swagatam Das.
- **M.Tech in Computer Science, Indian Statistical Institute, Kolkata, India: 2012-2014**
- **B.Tech in Computer Science & Engineering, West Bengal University of Technology, India: 2008-2012**

Research Experience (GitHub: https://github.com/SankhaSubhra):
Broad areas of Expertise: Machine Learning, Deep Learning, Evolutionary Optimization

- **Senior AI Researcher, Dolby, India, February, 2024-Now**
- **Independent Researcher, April, 2021-Now**
  As a volunteer member of the Machine Learning Research Group, Electronics and Communication Sciences Unit, Indian Statistical Institute.
  - Improving accuracy of few-shot learning algorithms especially in few-task scenario.
  - Improving performance of Generative Adversarial Network for single image super-resolution task.
  - Improving image clustering performance using contrastive learning.

- **Senior Software Engineer - Machine Learning, LinkedIn, India, April, 2023-February, 2024**
  - Leading the efforts for further improving and extending the applicability of question-answering using Large Language Models (LLMs) in content quality moderation.
  - Actively engaged in foundational efforts for developing tailored LLM variants for content quality use cases.

- **Applied Research Engineer, LinkedIn, India, April, 2021-March, 2023**
  - Involved in research on natural language processing and tasked with designing deep text classifiers for maintaining the content quality in the platform. Till date launched four content classifiers to safeguard the members against spammy, harmful, and undesired contents.
  - Reformulated the content quality moderation problem and designed a new generation of LLM-based classifiers that alongside providing improved recall and greater explainability can adapt to content policy changes with negligible development effort.

- **Visiting Scientist, Indian Statistical Institute, Kolkata, January, 2021-March, 2021**
  - Designed deep classifiers for diagnosing respiratory diseases from chest radiography images keeping the impact of class imbalance in mind.
  - Performed black-box universal as well as image dependent adversarial attacks of varying sparsity on state-of-the-art deep classifiers using evolutionary optimization.

- **Senior Research Fellow, Indian Statistical Institute: 2016-2021**
  - Proposed adversarially learned generative network based artificial oversampling for handling class imbalance in deep image classifiers and achieved about 8% improvement over the state-of-the-arts on average.
  - Designed a couple of scalable self-adaptive variants of k-nearest neighbor type classifiers which offer improved performance as well as higher immunity against class imbalance.
  - Investigated the applicability of popular classification performance evaluation measures in presence of class imbalance especially for challenging applications involving concept drift or streaming data.
  - Formally defined the problem of label ambiguity and showed how that can be handled by a neural network.

- **Junior Research Fellow, Indian Statistical Institute: 2014-2016**
  - Proposed a couple of variants of Differential Evolution (DE) suitable for high dimensional optimization problems. Explored the applicability of DE in problems related to classical machine learning.

Publications (Google Scholar: https://scholar.google.com/citations?user=QnzlBI8AAAAJ):

- Datta, S., **S. S. Mullick**, A. Chakrabarty, and S. Das. "Interval Bound Interpolation for Few-shot Learning with Few Tasks". In proceedings of the International Conference on Machine Learning (ICML), 2023.
- **Mullick, S. S.**, M. Bhambhani, S. Sinha, A. Mathur, S. Gupta, and J. Shah. "Content Moderation for Evolving Policies using Binary Question Answering". In proceedings of the Annual Meeting of the Association for Computational Linguistics (ACL): Industry Track, 2023.
- Das, S., **S. S. Mullick**, and I. Zelinka. "On Supervised Class-imbalanced Learning: An Updated Perspective and Some Key Challenges". IEEE Transactions on Artificial Intelligence (2022).
- Basu, A., **S. S. Mullick**, S. Das, and S. Das. "Do Pre-processing and Class Imbalance Matter to the Deep Image Classifiers for COVID-19 Detection An Explainable Analysis". IEEE Transactions on Artificial Intelligence (2022).
- Ghosh A., **S. S. Mullick**, S. Datta, S. Das, A. K. Das, and R. Mallipeddi. "A Black-box Adversarial Attack Strategy with Adjustable Sparsity and Generalizability for Deep Image Classifiers." Pattern Recognition (2021).
- **Mullick, S. S.**, S. Datta, S. G. Dhekane, and S. Das. "Appropriateness of Performance Indices for Imbalanced Data Classification: An Analysis." Pattern Recognition 102 (2020).

- **Mullick, S. S.**, S. Datta and S. Das. "Generative adversarial minority oversampling". In proceedings of the International Conference on Computer Vision (ICCV), 2019.
- **Mullick, S. S.**, S. Datta and S. 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.
- Banerjee, I., **S. S. Mullick**, and S. Das. "On Convergence of the Class Membership Estimator in Fuzzy k-Nearest Neighbor Classifier." IEEE Transactions on Fuzzy Systems 27(6) (2018): 1226-1236.
- Biswas, N., S. Chakraborty, **S. S. Mullick**, and S. Das. "A parameter independent fuzzy weighted k-Nearest neighbor classifier." Pattern Recognition Letters 101 (2017): 80-87.
- Datta, S., **S. S. Mullick**, and S. Das. Generalized mean based back-propagation of errors for ambiguity resolution. Pattern Recognition Letters, 94, 22-29 (2017).
- Ghosh, A., S. Das, **S. S. Mullick**, R. Mallipeddi, and A. K. Das. "A switched parameter differential evolution with optional blending crossover for scalable numerical optimization". Applied Soft Computing, 57, (2017): 329-352.
- Das, S., A. Ghosh, and **S. S. Mullick**. "A switched parameter differential evolution for large scale global optimization–simpler may be better". In International Conference on Soft Computing-MENDEL, 2016.
- Das, S., **S. S. Mullick**, and P. N. Suganthan. "Recent advances in differential evolution–an updated survey." Swarm and Evolutionary Computation 27 (2016): 1-30.

Patents:
- Sinha, S., **S. S. Mullick**, A. Mathur, S. Gputa, and J. S. Shah. "Zero-Shot Training for Multimodal Content Classifier". US Patent App. 18/423,799 dated 01/26/2024, Status: pending.

Programming Languages:
Regularly use: Python (6+ years), PyTorch (4+ years), Keras/TensorFlow (4+ years), MatLab (8+ years).
Also familiar with: Scala, PySpark, C, C++, R, and shell scripting.

Academic Achievements and Professional Activities:
- *Published:* A total of 14 research articles with 2000+ citation count, h-index of 10 and i-10 index 10.
- *Teaching Assistant*: "Pattern Recognition and Image Processing", M.Tech. in Computer Science, ISI, Fall, 2020.
- *Supervised:* 15+ undergraduate and graduate research interns from various notable academic institutes (such as ISI, IIT Delhi, Jadavpur University, IIT Guwahati, IIIT Guwahati, etc.) since 2015.
- *Funding Secured:* Assisted Dr. Swagatam Das (Ph.D. supervisor) with the drafting of the successful grant applications: NVIDIA (2018) and Department of Science and Technology, Government of India (2020).
- *Regular speaker*: Fourth (2017), Fifth (2018), Sixth (2019), and Seventh (2022) "Summer School on Computer Vision, Graphics and Image Processing", an initiative by Electronics and Communication Sciences Unit, Indian Statistical Institute. "Lecture Series on Deep Learning" (2021) an Indian Institute of Information Technology, Pune initiative. Regular lecturer in the "Winter School on Deep Learning" (WSDL 2022, 2023, and 2024) an initiative by Electronics and Communication Sciences Unit, Indian Statistical Institute.
- *Additional*: Co-conceptualized and actively managed the "Winter School on Deep Learning" (2022, 2023, and 2024). A yearly initiative by the Electronics and Communication Sciences Unit, Indian Statistical Institute, that can be considered tremendously successful in terms of both the quality of knowledge sharing and the economic growth of the unit. Over its two sessions the online school catered 600+ candidates, arranged over 30+ plenary and special talks from the eminent researchers in deep learning, and conducted over 260+ hours of classes.
- *Achievements:* 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 Indian Statistical Institute, Kolkata. Received a fully funded fellowship as a research scholar between 2014-2021 from Indian Statistical Institute. Received ACM-India/IARCS conference travel grant. Selected as a student volunteer at ICCV 2019.
- *Reviewer Duties:* Acts as a regular reviewer in IEEE Transactions on Cybernetics (2021-now), British Machine Vision Conference (2020-Now), IEEE Access (2019-now), IEEE Transactions of Evolutionary Computation (2019-now), IEEE Transactions on Fuzzy Systems (2019-now), IEEE Transactions on Systems, Man, and Cybernetics: Systems (2018-now), IEEE Transactions on Neural Networks and Learning Systems (2018-now), Swarm and Evolutionary Computation (2018-now), Pattern Recognition (2017-now), Information Sciences (2017-now), etc.

Sankha Subhra Mullick
26th of February, 2024