



ICONIP 2023

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Tutorial for 30th International Conference on Neural Information Processing (ICONIP2023)

Title: Large scale SVM algorithms and applications

Duration: 03 hours

Organizer(s):

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M. Tanveer is Associate Professor and Ramanujan Fellow at the Department of Mathematics of the Indian Institute of Technology Indore. Prior to that, he worked as a Postdoctoral Research Fellow at the Rolls-Royce@NTU Corporate Lab of the Nanyang Technological University, Singapore. His research interests include support vector machines, optimization, machine learning, deep learning, applications to Alzheimer's disease and dementia. He has published over 130 refereed journal papers of international repute. His publications have over 4300 citations with h index 35 (Google Scholar, July 2023). Recently, he has been listed in the world's top 2% scientists in the study carried out by Stanford University, USA. He has served on review boards for more than 100 scientific journals and served for scientific committees of various national and international conferences. He is the recipient of the 2023 IIT Indore Best Research Paper Award, 2022 Asia Pacific Neural Network Society (APNNS) Young Researcher Award, 29th ICONIP 2022 Best Research Paper Award, 2017 SERB-Early Career Research Award in Engineering Sciences and the only recipient of 2016 DST-Ramanujan Fellowship in Mathematical Sciences. He is currently the Associate Editor - IEEE Transactions on Neural Networks and Learning Systems (2022 -), Associate Editor - Pattern Recognition, Elsevier (2021 -), Action Editor - Neural Networks, Elsevier (2022 -), Board of Editors - Engineering Applications of Artificial Intelligence, Elsevier (2022 -), Associate Editor - Neurocomputing, Elsevier (2022 -), Associate Editor - Cognitive Computation, Springer (2022 -), Editorial Board - Applied Soft Computing, Elsevier (2022 -), International Journal of Machine Learning and Cybernetics, Springer (2021 -). He has also co-edited one book in Springer on machine intelligence and signal analysis. He has organized many international/national conferences/symposiums/workshops as General Chair/Organizing Chair/Coordinator, and delivered talks as Keynote/Plenary/invited speaker in many international conferences and Symposiums. He has organized several special sessions in several conferences including WCCI, IJCNN, IEEE SMC, IEEE SSCI, ICONIP. Amongst other distinguished, international conference chairing roles, he was the General Chair for 29th International Conference on Neural Information Processing (ICONIP2022). He is the Elected Governor of the APNNS for the year 2023-2024. Tanveer is currently the Principal Investigator (PI) or Co-PI of 12 major research projects

funded by Government of India including Department of Science and Technology (DST), Science & Engineering Research Board (SERB) and Council of Scientific & Industrial Research (CSIR), MHRD-SPARC, ICMR.

Brief description of the tutorial/workshop topic:

With the explosive growth in technology, the amount and the variety of data has grown tremendously leading to new challenges in classification scenarios. Parallel hyperplane classifiers such as support vector machine (SVM) which was considered one of the most popular classification paradigm in Machine Learning owing to its strong mathematical background, has lately faced criticism due to its limitations such as unscalability, high time complexity and sensitivity to feature and label noise. Over the past decade, several advancements have been made in the form of non-parallel hyperplane models such as twin SVM which led to significant improvements in terms of fast learning speed, ease of implementation and ability to capture diversity among classes. These models have attracted considerable research attention due to promising results shown in the various real-world applications including Image Retrieval, Computer Vision, Financial Regression, Biomedical Analysis etc. However, there have emerged new challenges along with the existing ones such as high dimensionality in kernel implementations, need for large training data and sensitivity to outliers. There is, thus, a need to improve upon these methods and devise new ones to tackle the aforementioned limitations.

The main topics of this tutorial include, but are not limited to, the following:

- Introduction to twin support vector machine for classification problems
- Large scale twin SVM for classification problems
- Pinball twin SVM for classification problems
- Large scale twin SVM for class imbalance learning problems
- Intuitionistic Fuzzy twin SVM for classification problems
- Applications to Alzheimer's disease

Relevant Publications:

M. Tanveer, T. Rajani, Y.H. Shao, M.A. Ganaie (2022). Comprehensive Review on twin support vector machines, Annals of Operations Research, Springer. .

M.A. Ganaie, M. Tanveer, CT Lin (2022). Large scale fuzzy least squares twin SVMs for class imbalance learning, IEEE Transactions on Fuzzy Systems.

M. Tanveer, M.A. Ganaie, A. Bhattacharjee, C.T. Lin (2022). Intuitionistic fuzzy weighted least squares twin SVMs, IEEE Transactions on Cybernetics.

M. Tanveer, A. Tiwari, R. Choudhary, M.A. Ganaie (2022). Large-Scale Pinball Twin Support Vector Machines, Machine Learning, Springer.

M. Tanveer, S. Sharma, K. Muhammad (2020). Large scale least squares twin SVMs, ACM Transactions on Internet Technology.

M. Tanveer, A. Tiwari, R. Choudhary, S. Jalan (2019). Sparse pinball twin support vector machines, Applied Soft Computing, Elsevier, 78: 164-175.

M. Tanveer, A. Tiwari, R. Choudhary, S. Jalan (2019). Sparse pinball twin support vector machines, Applied Soft Computing, Elsevier, 78: 164-175.

Link to organizer's webpage:

Google Scholar: [M. Tanveer - Google Scholar](#)

Homepage: <https://www.iiti.ac.in/people/~mtanveer/>