

IEEE Signal Processing Society Talk

Quantum Computing and Machine Learning Tools for Information Processing



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Abstract: The rapid growth of data-intensive applications demands advanced computational tools capable of processing complex information efficiently. Quantum computing and machine learning (ML) are emerging paradigms with significant potential for next-generation information processing. Quantum computing exploits quantum principles such as superposition, entanglement, and interference to perform computations beyond the capabilities of conventional approaches for selected problems. Machine learning enables automated extraction of patterns, representations, and predictions from large and complex datasets. Their integration has given rise to quantum machine learning, which explores quantum-enhanced methods for learning and intelligent information processing. This talk will provide an overview of important quantum computing and ML tools with emphasis on hybrid quantum-classical architectures that combine quantum processors with classical ML algorithms for practical applications. These approaches are explored for data representation, feature extraction, classification, optimization, and decision-making in domains such as healthcare, signal processing, communications, and intelligent sensing. The talk also discusses key challenges and emerging opportunities for future information processing applications.

Biodata: Dr. Priya Ranjan Muduli completed his Ph.D. in Signal Processing from the Department of Electrical Engineering, Indian Institute of Technology Kharagpur, India, in 2019. Since 2020, he is with the Department of Electronics Engineering, Indian Institute of Technology (BHU), India as a faculty member. He is a silver medallist from the National Institute of Technology, Rourkela. The broad research areas of Dr. Muduli are Signal Processing, Machine Learning, Image Processing, Biomedical Instrumentation, Internet-of-Medical Things. He had received the outstanding reviewer award from IEEE I&M society in 2019. He is the recipient of IEEE Uttar Pradesh Section Young Professional Star award 2021. He is an Associate Editor and editorial board member of IEEE Transactions on Instrumentation and Measurement and Scientific Reports, Springer Nature, respectively. He is also the Faculty Advisor of the IEEE Signal Processing Society student branch chapter, IIT(BHU) Varanasi, that received the IEEE UP Section SPS Outstanding Student Branch Chapter Award and Activity-based Branch Incentive Award for the year 2023.



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