



IEEE ENERGY CONVERSION CONGRESS & EXPO **Nashville, TN | OCT.29-Nov.2**

Tutorial Title

Shallow Neural Networks and Deep Learning Applications in Power Electronics and Electrical Drives

Instructor Team

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Abstract

This tutorial aims to provide an overview of the application of shallow and deep neural based approaches in the field of power electronics and electrical drives. Power electronics and electrical drives have traditionally relied on conventional control methods, however, with advancements in machine learning, shallow and deep neural based strategies have shown great potential to improve the performance and efficiency of these systems. Shallow neural architectures are often preferred for power electronics and electrical drives due to their simplicity and real-time processing capabilities. On the other hand, Deep learning techniques provide a more sophisticated approach to modeling and controlling these systems as well as explainability, which can lead to better performance and accuracy. In this tutorial, we will discuss the recent advances and applications of shallow and deep neural-based approaches in various domains within power electronics and electrical drives. Additionally, we will highlight some of the challenges and opportunities for further research in this field.



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Instructor Biography



Giansalvo Cirrincione received the “Laurea” degree in electrical engineering from the Politecnico di Torino, Turin, Italy, in 1991 and the Ph.D. degree (with the congratulations of the jury) from the Laboratoire d’Informatique et Signaux de l’Institut National Polytechnique de Grenoble, Grenoble, France, in 1998. In 1999, he was a Postdoctoral Scholar with the Department of Signals, Identification, System Theory and Automation (SISTA), Leuven University, Leuven, Belgium. Since 2000, he has been an Associate Professor with the Department of Electrical Engineering, University of Picardie “Jules Verne,” Amiens, France. His current research interests include deep learning, neural networks, data analysis, electrical drives, computer vision, system identification and diagnostics.



Rahul R Kumar received his Bachelor’s degree in Electrical and Electronic Engineering from the University of the South Pacific, Suva, Fiji (USP) in 2014. From 2014-2017, he has been a Teaching and Research assistant at USP. In 2016, he completed his Master of Science in Engineering degree from USP. For both his degrees, he received gold medals for being the outstanding graduate and the best MSc thesis, respectively. From 2017 to 2020, he was awarded a prestigious Doctoral fellowship at the University of Padova (UNIPD), Padova, Italy for Ph.D in Industrial Engineering. He successfully defended his Ph.D thesis on 30th March, 2021 (with congratulations from jury). He has also been the reviewer for a number of IEEE and Springer Journals. From 2016, he has also held the position as the chair of IEEE USP Student Chapter. Currently, he works as a Lecturer in Electrical/Electronic Engineering at USP. His research interests mainly include neural networks (LSTM, Attention Mechanisms and Transformers), computer vision, system identification, fault diagnosis (rotating machines and fuel cells), robotics (armed robots) and data analysis (general).

His research & reviewer profiles can be viewed here: [ResearchGate](#) | [Google Scholar](#) | [Publons](#) | [ORCID](#) | [Scopus](#)