



# Power Converters and AC Electrical Drives with Linear Neural Networks (Energy, Power Electronics, and Machines)

*By Maurizio Cirrincione, Marcello Pucci, Gianpaolo Vitale*

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**Power Converters and AC Electrical Drives with Linear Neural Networks (Energy, Power Electronics, and Machines)** By Maurizio Cirrincione, Marcello Pucci, Gianpaolo Vitale

The first book of its kind, **Power Converters and AC Electrical Drives with Linear Neural Networks** systematically explores the application of neural networks in the field of power electronics, with particular emphasis on the sensorless control of AC drives. It presents the classical theory based on space-vectors in identification, discusses control of electrical drives and power converters, and examines improvements that can be attained when using linear neural networks.

The book integrates power electronics and electrical drives with artificial neural networks (ANN). Organized into four parts, it first deals with voltage source inverters and their control. It then covers AC electrical drive control, focusing on induction and permanent magnet synchronous motor drives. The third part examines theoretical aspects of linear neural networks, particularly the neural EXIN family. The fourth part highlights original applications in electrical drives and power quality, ranging from neural-based parameter estimation and sensorless control to distributed generation systems from renewable sources and active power filters. Simulation and experimental results are provided to validate the theories.

Written by experts in the field, this state-of-the-art book requires basic knowledge of electrical machines and power electronics, as well as some familiarity with control systems, signal processing, linear algebra, and numerical analysis. Offering multiple paths through the material, the text is suitable for undergraduate and postgraduate students, theoreticians, practicing engineers, and researchers involved in applications of ANNs.

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## **Editorial Review**

### **Review**

"I am not aware of [a] book as thorough as the present book. ... I am teaching Power Electronics and Drives Control and I will strongly recommend this book for my students."

?Prof. Mohamed Benbouzid, LBMS-IUT of Brest, France

"I sincerely hope that this novel and state-of-the-art book on power electronics and motor drives gets wide and enthusiastic acceptance from the professional community of power electronics consisting of R&D professionals, practicing engineers, university professors, and even graduate students. ... This state-of-the-art book, authored by Maurizio Cirrincione, Marcello Pucci, and Gianpaolo Vitale, is the first book that systematically explores the application of neural networks in the field of power electronics. It emphasizes, particularly, neural network applications in sensorless control of AC drives, including their applications in active power filtering."

?From the Foreword by Dr. Bimal K. Bose, Life Fellow, IEEE, Condra Chair of Excellence/Emeritus in Power Electronics, Department of Electrical Engineering and Computer Science, The University of Tennessee, Knoxville, USA

### **About the Author**

**Maurizio Cirrincione**, PhD, is a full professor of control and signal processing at the University of Technology of Belfort, Montbeliard, France. His current research interests include neural networks, modeling and control, system identification, intelligent control, and electrical machines and drives.

**Marcello Pucci**, PhD, is a senior researcher at the Institute of Intelligent Systems for Automation (ISSIA) section of Palermo of the National Research Council of Italy (CNR). His current research interests include electrical machines and drives, power converters, wind and photovoltaic generation systems, intelligent control, and neural networks applications.

**Gianpaolo Vitale** is a senior researcher at the Institute of Intelligent Systems for Automation (ISSIA) section of Palermo of the National Research Council of Italy (CNR). He has been professor of power electronics and applied electronics at the University of Palermo, Italy. His current research interests include power electronics, generation from renewables, and related problems of electromagnetic compatibility.

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