Preface

The Deep Learning-Based Predictive Modeling for Intelligent Decision Support Systems in Complex Environments explores the growing role of artificial intelligence in transforming complex data into meaningful predictions and informed decisions. It presents the fundamental principles of deep learning architectures, including convolutional neural networks, recurrent neural networks, long short-term memory networks, and transformer models, alongside their applications in predictive analytics and intelligent decision support. Particular attention is given to data processing, temporal forecasting, uncertainty management, model optimization, explainable artificial intelligence, and performance evaluation. The book also examines practical applications across healthcare, industrial manufacturing, financial services, transportation, environmental monitoring, and energy management. Emerging developments in adaptive learning, distributed computing, human–AI collaboration, and trustworthy AI highlight opportunities for improving predictive reliability and operational efficiency. Designed for researchers, postgraduate students, academicians, and professionals, this book provides a structured foundation for understanding and applying deep learning techniques to real-world decision challenges. It aims to encourage further research into scalable, transparent, and responsible predictive systems that support effective decision-making in increasingly dynamic environments.