Suddhananda Engineering and Research Centre,Bhubaneswar, organized a one day FDP on the topic "Machine Learning for XG Wireless Network " under the aegis of Dr. Chhitaranjan Panda, Prof. Debanand Sahu, Prof. Smruti Ranjan Pradhan of Electronics and Telecommunication Engineering (ETC) Division on 18th November 2021.

Dr. Chhitaranjan Panda welcomed the dignitaries and participants present. In his address on "Machine Learning for XG Wireless Network " and explained various aspects as a key technique for enabling artificial intelligence, machine learning (ML) is capable of solving complex problems without explicit programming. Motivated by its successful applications to many practical tasks like image recognition, both industry and the research community have advocated the applications of ML in wireless communication.

This FDP comprehensively surveys the recent advances of the applications of ML in wireless communication, which are classified as: resource management in the MAC layer, networking and mobility management in the network layer, and localization in the application layer. The applications in resource management further include power control, spectrum management, backhaul management, cache management, and beam former design and computation resource management, while ML-based networking focuses on the applications in clustering, base station switching control, user association, and routing. Moreover, literatures in each aspect are organized according to the adopted

ML techniques. In addition, several conditions for applying ML to wireless communication are identified to help readers decide whether to use ML and which kind of ML techniques to use. Traditional approaches are also summarized together with their performance comparison with ML-based approaches, based on which the motivations of surveyed literatures to adopt ML are clarified. Given the extensiveness of the research area, challenges and unresolved issues are presented to facilitate future studies. Specifically, ML-based network slicing, infrastructure update to support ML-based paradigms, open data sets and platforms for researchers, theoretical guidance for ML implementation, and so on are discussed .Next-generation wireless networks must be able to support ultra-reliable, low-latency communication and intelligently manage the internet of things (IoT) devices in real-time dynamic environment. Such communication requirements and mobile edge and core intelligence can only be realized by integrating fundamental notions of artificial intelligence (AI) and machine learning across the wireless infrastructure and end-user devices. In this context, this tutorial introduces the use of comprehensive concepts of machine learning, in general, and artificial neural networks (ANNs), in particular, and their potential applications in wireless communications. For this purpose, we present a comprehensive overview on a number of key types of neural networks that include feed-forward, recurrent, spiking, and deep neural networks. For each type of neural network, we present the basic architecture and training procedure, as well as the associated challenges and opportunities. Then, we provide a panoramic overview on the variety of wireless communication problems that can be addressed using ANNs. For each application, we present the main motivation for using ANNs along with their associated challenges while also providing a detailed example for a use case scenario. Meanwhile, for each individual application, we present a broad overview on future works that can be addressed using ANNs. In a nutshell, this article constitutes a comprehensive overview of machine learning tailored to the demands of communications and network engineers. Our society is experiencing a digitisation revolution, with a drastic growth in Internet users and connected devices. Next-generation wireless networks should provide ultra-reliable, low-latency communication, and intelligently control Internet of Things (IoT) devices in real-time scenarios. Wireless network applications like real-time traffic data, sensor readings from driverless cars, or entertainment streaming recommendations generate extreme volumes of data that must be collected and processed in real-time. These communication requirements and core intelligence can only be achieved through the integration of machine learning techniques in wireless infrastructure and end-user devices. In recent times, machine learning algorithms have gained significant interest in the area of wireless networking and communication. Machine learning driven algorithms and models can enable wireless network analysis and resource management and can be of advantage in handling the increasing volume of communication and computation for evolving networking applications. Nevertheless, the application of machine learning techniques for heterogeneous wireless networks is still under debate. More endeavours are needed to link the gap between machine learning and wireless networking research. The aim of this Special Issue is to explore recent advancements in machine learning concepts to address practical challenges in wireless networks. This Special Issue will bring together researchers and academics to present new network modelling and architecture, networking applications, security and privacy, resource management, load balancing, and various challenges related to the design of future wireless networks with the help of machine learning. Machine Learning for Future Wireless Communications provides a comprehensive and highly accessible treatment to the theory, applications and current research developments to the technology aspects related to machine learning for wireless communications and networks. The technology development of machine learning for wireless communications has grown explosively and is one of the biggest trends in related academic, research and industry communities. Deep neural networks-based machine learning technology is a promising tool to attack the big challenge in wireless communications and networks imposed by the increasing demands in terms of capacity, coverage, latency, efficiency flexibility, and compatibility, quality of experience and silicon convergence. It covers a wide range of topics including system architecture and optimization, physical-layer and cross-layer processing, air interface and protocol design, beam forming and antenna configuration, network coding and slicing, cell acquisition and handover, scheduling and rate adaption, radio access control, smart proactive caching and adaptive resource allocations.