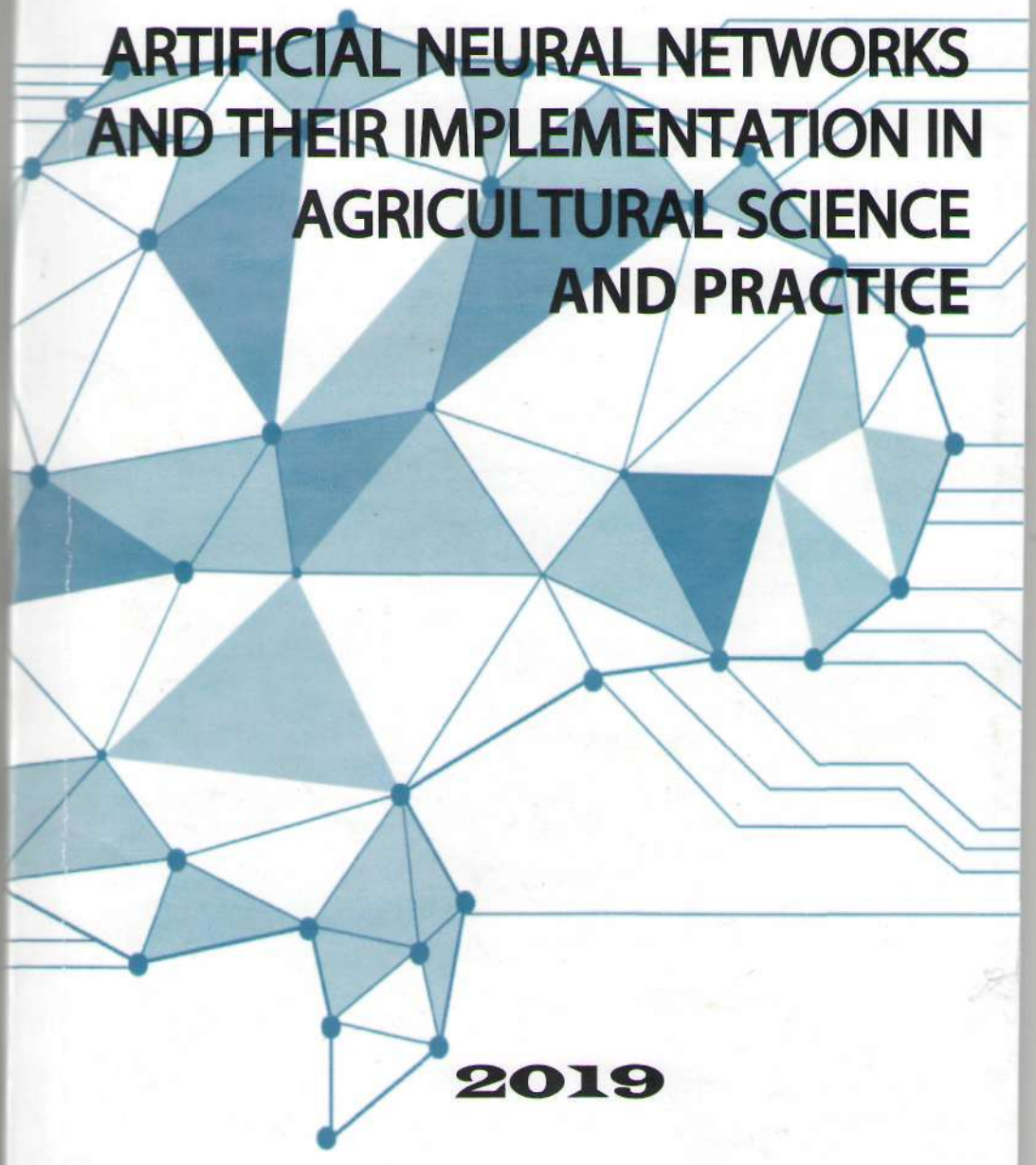
ARTIFICIAL NEURAL NETWORKS AND THEIR IMPLEMENTATION IN AGRICULTURAL SCIENCE AND PRACTICE



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ARTIFICIAL NEURAL NETWORKS AND THEIR IMPLEMENTATION IN AGRICULTURAL SCIENCE AND PRACTICE

The monograph is dedicated to the overview of the core and peculiarities of practical use in agricultural science of the newest data processing tool – artificial neural networks. The issue contains necessary systematized information about the essential properties, methodology, key features of artificial neural networks, provides the reader with information about historical path and incipience of the computation technique, its main advantages, drawbacks, and pitfalls, further prospects of development and implementation in different branches of agricultural science and practice. A special attention is paid to the practical usage of artificial neural networks within various computer software applications for solving the tasks of different compacity and difficulty level related to agricultural science. The publication is targeted on the wide range of specialists in the field of agriculture including scientists, students, and agricultural producers.

Keywords: agriculture, agricultural statistics, artificial neural network, classification, forecasting, modeling, simulation.

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INTRODUCTION

We are standing at the threshold of the Fourth Industrial Revolution, which is mainly instigated by the wide implementation of informational technologies in almost all branches of modern science, technology and industry, including agriculture. Agricultural science and practice in the well-developed countries like the United States of America, Canada, leading countries of the European Union, Australia, etc., is strongly connected with development of informational technologies for their purposes. And the positive effect of informational technologies on the agricultural sector of these countries is not a debatable question: implementation of these innovative technologies caused a huge leap of agricultural production in the above-mentioned countries. Joint applying of the achievements of modern agricultural science and informational technologies opens new possibilities for further development of both branches. Ukraine as one of the leading agricultural countries of the world should also attend to the experience of scientific innovations connected with deep percolation of informational technologies, and reap the benefits of the conceptually new way of conducting agriculture.

First of all, informational technologies connected with simulation and forecast of the processes, which take place in agricultural ecosystems, are developed and presented to farmers and scientists in the form of various computer software applications, which are easily to understand and use even for people who are not very good in complicated mathematical statistics. These applications are used for better agricultural resources management directed to promotion of environmental sustainability and preservation of natural resources simultaneously with stable development of agricultural production (for example, water and land management). Besides, various models of simulation and prediction of the natural processes in biosystems under the impact of agricultural activities of mankind are successfully used for better planning of agricultural production, understanding of the current tendencies in environmental changes both on the local and global scale, forecasting and prevention of possible negative phenomena of biogenic and anthropogenic origin, estimation of the economic prospects, etc. Lots of the achievements of modern informational technologies are also used in automation of the technological processes during the crop's cultivation, for example, irrigation management, fertilizers application, light, air humidity and temperature management in green-houses, etc. Informational technologies related to versatile, accurate simulation and prediction of natural processes, crops productivity under the various cultivation technology treatments and weather conditions, efficient resources management and economic prediction are of the most importance and interest to modern agricultural science. One of the most well-developed, widely spread, accurate and easy-in-use tool for the above-mentioned purposes are artificial neural networks that are nowadays realized within a number of software applications, both commercial and free. Artificial neural networks are a new word in mathematical sta-

tistics, therefore, the mission of this paper is to introduce the method to wide auditory of people who are interested in modern tendencies of agricultural science and practice and have a wish to learn about the peculiarities of their use in solving different questions related to efficient farming.

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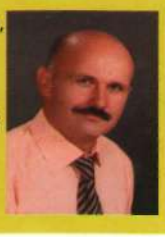

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