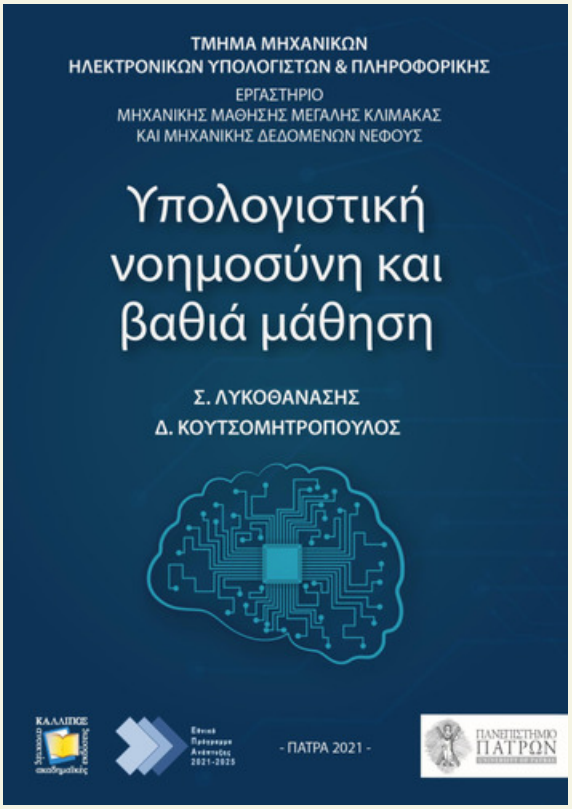

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Abstract

The objective of this book is to be a basic educational material in “Computational Intelligence and Deep Learning”. At first the basic concepts of Artificial Neural Networks and Genetic Algorithms are presented. The association with Artificial Intelligence and the traditional search and optimization methods is discussed, as well as with the biological systems that they have inspired. The basic concepts of learning theory and the two learning paradigms (supervised and unsupervised learning) are provided. It follows the presentation of the basic training algorithms of the Artificial Neural Networks, with focus on the well-known algorithm, Error Back Propagation – EBP). The Deep Learning Networks, models and training, conclude the presentation of feedforward artificial neural networks. Next the Genetic/Evolutionary algorithms are founded and a case study is discussed - their combination in a hybrid algorithm-, and how to design and train an evolutionary neural network as well. Also, it is presented a short introduction to Genetic Programming (GP), that is a permutation of Evolutionary Algorithms, based on the Darwin’s evolution theory. Finally, two different unsupervised learning paradigms are presented. More specifically, the Hopfield Networks (a kind of autocorrelated memory) and Kohonen Networks (a kind of self-organized maps for data clustering) are presented, as well as their training algorithms. In all the chapters the objectives and the learning results are referred and it is quoted a sufficient number of examples, exercises and activities, that help in better understanding of the presented subjects. It will be very helpful for the readers to have basic knowledge of discrete mathematics, linear algebra, combinatorics and programming. Those who are interested to use these technologies for problem solving have to take care to access these skills. Otherwise, they will have troubles with the easy understanding of the material.

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