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# A NEW CLASS OF NEURAL NETWORK OPERATORS FOR APPROXIMATION THEORY

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## ABSTRACT

Neural network operators have become an interesting topic in approximation theory because they provide a different approach to approximating continuous functions. Their construction is closely related to the activation function and the choice of suitable weights. In this paper, we introduce a new class of neural network operators and study their approximation properties. The proposed operators are defined by using a suitable activation function together with a sequence of weights. We first examine the basic properties of the operators and give conditions under which they are well defined, positive and bounded. We then study their convergence to the function being approximated. The convergence is considered in an appropriate function space and is described in terms of the usual tools of approximation theory. In addition, we investigate the rate of approximation of the proposed operators by using the modulus of continuity. This gives an estimate of the error between a function and its corresponding approximation. The effect of the parameters involved in the operators is also discussed, since these parameters have an important role in the quality of approximation. Under suitable choices of the activation function and the parameters, the proposed operators include some known neural network-type approximation processes as special cases. The results obtained in this work provide a mathematical framework for studying neural network operators from the point of view of classical approximation theory. They may also be useful for further investigations of generalized neural network operators and their applications to the approximation of continuous and nonlinear functions.

**Keywords** Approximation theory · neural network operators · activation functions · positive operators · convergence · modulus of continuity · rate of approximation · continuous functions

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