# Korovkin-Type Approximation Theorems for Neural Network Operators in Neutrosophic Sequence Spaces

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**Abstract**

The classical Korovkin approximation theory, which provides powerful criteria for the convergence of sequences of positive linear operators, has seen remarkable extensions in recent years toward generalized normed structures. In this work, we establish Korovkin-type approximation theorems for neural network operators defined over neutrosophic sequence spaces, a framework that simultaneously captures truth, indeterminacy, and falsity membership components, thereby offering a richer setting for approximation under uncertainty [1, 2]. Neural network operators, constructed via sigmoidal and related activation functions, are shown to satisfy the three-condition Korovkin test in the neutrosophic normed setting, yielding uniform convergence results that generalize their classical counterparts [3, 6]. We further investigate the rate of convergence of these operators by means of the modulus of continuity adapted to neutrosophic norms, and derive quantitative estimates expressed in terms of neutrosophic membership functions [4, 5]. The proposed framework unifies tools from approximation theory, neural network analysis, and neutrosophic mathematics, and opens new directions for the study of operator sequences in non-classical normed spaces.

**Keywords:** Korovkin-type theorems, neural network operators, neutrosophic normed spaces, sequence spaces, statistical convergence, approximation theory.

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