

ON THE CATEGORIES OF NEUTROSOPHIC SETS AND NEUTROSOPHIC TOPOLOGICAL SPACES

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(Received: Jun. 14, 2025 Accepted: Jul. 25, 2026 Published: Aug. 30, 2026)

Abstract: This paper develops a categorical framework for neutrosophic sets and neutrosophic topological spaces. We first redefine the category $\mathbf{NSet}$ of neutrosophic sets and investigate its fundamental categorical properties, proving in particular that it is concretely cartesian closed. We also establish relationships among several natural subcategories of $\mathbf{NSet}$. We then introduce the category $\mathbf{NTop}$ of neutrosophic topological spaces and prove that it is a topological category. Furthermore, we show that the category of intuitionistic fuzzy topological spaces embeds into $\mathbf{NTop}$, and we identify important subcategories, including $\mathbf{CNNTop}$ and the category $\mathbf{SNTop}$ of stratified neutrosophic topological spaces, together with their coreflective properties. We identify the Sierpiński object in $\mathbf{NTop}$ and prove that it serves as the open-set classifier for neutrosophic topological spaces. Finally, we establish that the neutrosophic Sierpiński space characterizes $\mathbf{NTop}$ as a category of sets with structures and show that the category $\mathbf{NTop}_0$ of T_0 neutrosophic topological spaces is the epireflective hull of the Sierpiński object in $\mathbf{NTop}$.

Keywords and Phrases: Neutrosophic set, Neutrosophic topology, Category, Functor, Sierpiński object.

2020 Mathematics Subject Classification: 03E72, 54A40.

1. Introduction

Neutrosophic set theory, introduced by Smarandache [23], extends Atanassov's