

***T*-FUZZY SUBBIGROUPS AND NORMAL *T*-FUZZY  
SUBBIGROUPS OF BIGROUPS**

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**Abstract:** In this article, we present the idea of fuzzy subbigroups by using  $t$ -norm  $T$  and some interesting results of them are given. By utilizing this new idea, we further introduce the notion normal fuzzy subbigroups and characterizations of them are explored. Next we investigate the intersection of them and we obtain some new results about them. Finally, we consider the image and pre image of them under group homomorphisms.

**Keywords and Phrases:** Groups, bigroups, fuzzy set theory, fuzzy groups, norms, homomorphisms.

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## **1. Introduction**

Fuzzy mathematics forms a branch of mathematics related to fuzzy set theory and fuzzy logic. It started in 1965 after the publication of Zadeh's seminal work Fuzzy sets [41]. Usually, a fuzzification of mathematical concepts is based on a generalization of these concepts from characteristic functions to membership functions. Fuzzy subgroupoids and fuzzy subgroups were introduced in 1971 by Rosenfeld [39]. Hundreds of papers on related topics have been published. Recent results and references can be found in [10] and [4]. In mathematics, a  $t$ -norm (also  $T$ -norm or, unabbreviated, triangular norm) is a kind of binary operation used in