

**INTRODUCTION TO THE GANITA ALGORITHM IN
KR-INTUITIONISTIC FUZZY EQUIVALENCE RELATION:
DESIGN, EFFICIENCY, AND APPLICATION**

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Abstract: In recent years, Artificial Intelligence (AI) has revolutionized a wide range of fields; however, challenges related to uncertainty, computational efficiency, and reliability continue to remain. This paper introduces a novel KR-Intuitionistic Fuzzy Equivalence Relation, developed through the reconstruction and refinement of existing intuitionistic fuzzy relational models. The proposed relation incorporates a Known-Restriction (KR) under which the degree of belongingness is maintained above the degree of non-belongingness, providing a framework for handling uncertain and conflicting information in multi-compositional settings. In addition, the paper proposes the Ganita Algorithm as an efficient computational approach for reducing the computational effort associated with multi-composition of intuitionistic fuzzy relations. A detailed comparative study of fuzzy, intuitionistic fuzzy, and KR-intuitionistic fuzzy frameworks is presented, together with an analysis of the distinguishing characteristics and advantages of KR-intuitionistic fuzzy sets over conventional fuzzy and intuitionistic fuzzy approaches. The proposed framework is further examined through a potential application AI in safety, where the KR restriction can help preserve reliable associations while processing uncertain information and repeated relational compositions.

Keywords and Phrases: Intuitionistic Fuzzy Set, Intuitionistic Fuzzy Relation, Decision Making, Risk Optimization.

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