

The Impact of Fuzzy Integration on Explainable Artificial Intelligence

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Abstract

Artificial Intelligence (AI) has made significant advances in recent years and has reached an exponentially increasing level of adoption. Although AI-based systems are highly powerful, their black-box nature has led to a lack of transparency and has made their decisions difficult to explain. Accordingly, the field of Explainable Artificial Intelligence (XAI) has emerged to develop tools, techniques, and algorithms that provide high-quality, interpretable, intuitive, and human-understandable explanations for AI-driven decisions. In recent years, interest in XAI has increased substantially, and numerous studies have been published on the explainability of black-box models. In particular, integrations of fuzzy methods with XAI, leveraging interpretability and subjective reasoning capabilities, have emerged as a highly promising research direction. This study systematically reviews fuzzy-integrated XAI studies published between 2022 and 2026 using the PRISMA methodology. The Web of Science Core Collection and Scopus databases were used in this study. The document types were limited to articles, proceeding papers, book chapters and review articles, and the analysis was restricted to English-language publications. In accordance with the PRISMA methodology, irrelevant studies and duplicate records indexed in both databases were excluded, and the remaining eligible studies were analyzed. Furthermore, the main open challenges and future research directions are discussed in detail.

Keywords

Explainable artificial intelligence, Fuzzy, Interpretability, Black-box models and Machine learning.

Biographies

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