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| Abstract |  |
| The Metaverse, a transformative digital realm, holds immense promise for reshaping industries and human interactions while potentially addressing global challenges and democratizing opportunities. However, it also introduces a spectrum of complexities that demand careful navigation. To establish trustworthiness within the Metaverse ecosystem, gaining a deep understanding of its applications, challenges, and existing solutions is imperative. In this comprehensive survey, we first delve into Metaverse applications, drawing insights from existing literature. Subsequently, we explore the diverse challenges the Metaverse presents, analyzing them through the lens of existing research. We then scrutinize the overall trustworthiness of the Metaverse environment and investigate existing solutions to previously identified challenges through a thorough review and analysis of pertinent literature. Lastly, we discussed future research directions aimed at fostering a trustworthy Metaverse environment. This comprehensive review can provide an overview of the Metaverse, its application domains, challenges, existing solutions and research directions for many multidisciplinary studies | |