

Integrating microbiome data and artificial intelligence algorithms to enhance therapeutic outcomes

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Abstract

Background and Aim: The microbiome plays a crucial role in overall health and well-being, influencing how various conditions are anticipated, managed, and treated. However, its complex and multidimensional nature makes maintaining efficiency a challenging task. In recent years, significant focus has been placed on the potential of artificial intelligence particularly machine learning and deep learning to analyze microbiome data more effectively and enhance treatment outcomes.

Methods: A comprehensive search was performed across the PubMed, Scopus, and Web of Science databases, covering studies published from 2022 to 2024. The search utilized keywords including microbiome, artificial intelligence, machine learning, deep learning, and therapeutic outcomes to identify pertinent literature. Studies focusing on AI-driven approaches in microbiome analysis and their influence on personalized therapy were included in the review.

Results: The integration of artificial intelligence with microbiome data has led to remarkable advancements in understanding the connection between gut microbiota and various diseases, including gastrointestinal disorders and neurological conditions. Machine learning methods, such as linear regression, random forests, and support vector machines, have been successfully employed for tasks like classification, phenotyping, and monitoring chemical interactions.