

AI-Driven Analysis of Gut Microbiome in Nutrition and Human Health

Anugya Shukla¹, Arpita Shukla¹, Mohit Nigam¹, Neeraj Mishra^{1*}, and Lalit Kumar Singh²

¹Department of Biotechnology, School of Pharmaceutical & Biological Sciences,
Harcourt Butler Technical University, Kanpur-208002, U.P., India

²Department of Biochemical Engineering, School of Chemical Technology,
Harcourt Butler Technical University, Kanpur-208002, U.P., India

*Corresponding author

ABSTRACT

The human gut microbiome consists of a diverse community of microorganisms that live in the gastrointestinal tract and play an important role in maintaining overall human health. These microorganisms support essential functions such as digestion, nutrient absorption, metabolism, and immune system regulation. The composition of the gut microbiome is influenced by factors including diet, lifestyle, environment, and daily habits. An imbalance in gut microbiota can lead to several health problems, including metabolic disorders such as type 2 diabetes. Recent research has shown that changes in gut microbiota can affect glucose metabolism, insulin resistance, and inflammation, which are key contributors to the development of type 2 diabetes. However, analysing gut microbiome data is challenging due to the presence of a large number of microbial species and complex interactions among them. Traditional data analysis methods often face limitations in handling such high-dimensional biological data. Artificial intelligence (AI) has emerged as an effective tool to overcome these challenges. AI-based techniques such as machine learning and data mining can efficiently analyze large microbiome datasets and identify meaningful patterns. These techniques help researchers better understand the relationship between gut microbes, dietary habits, and health conditions. The integration of AI in gut microbiome research has significant potential in nutrition and human health. By analysing individual microbiome profiles, AI can assist in developing personalized dietary and lifestyle recommendations. This approach supports improved gut health, better disease prevention, and effective management of chronic conditions like type 2 diabetes.

Keywords: Gut microbiome, Artificial intelligence, Nutrition, Type 2 diabetes, Human health

