Gut Instinct: An AI-Driven Approach to Inflammatory Bowel Disease Prediction Using Microbial and Metabolite Data

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Today, up to 3.6 million Americans suffer from Inflammatory Bowel Disease (IBD) —a group of debilitating conditions, including Crohn's disease and ulcerative colitis, that cause chronic inflammation in the gastrointestinal (GI) tract. The prevalence of IBD and lack of a cure underscore the need for a predictive tool that could provide insight into solutions for the disease. This project explores the interactions between basic demographic, metabolic, and microbiomic data and IBD in patients using multiple advanced AI models. Additionally, the usage of synthetic data generation introduces an aspect that could be universally applicable to the field of healthcare. The research mapped correlations between certain data labels and IBD, was able to predict IBD with accuracies up to 86%, and demonstrated the application of SMOTE and oversampling techniques for synthetic data generation. This research has the potential to enhance our understanding of IBD pathophysiology and contribute to the development of precision medicine approaches.

Awards Won: