***Supplementary Material***

1. **HC inclusion and exclusion criteria**

**Inclusion criteria**

1) Age: 18-65 years;

2) Healthy subjects without clinical signs or symptoms of disease, including evidence of viral hepatitis and metabolic syndrome, among others. (i) a healthy subject with no clinical signs or symptoms of disease, including evidence of viral hepatitis and metabolic syndrome

3) Imaging evidence of hepatic steatosis can be excluded.

**Exclusion criteria**

1) Men who have not consumed alcohol in the past 12 months or have consumed less than 140 grams of ethanol per week (70 grams for women);

2) Those with an "abnormal" diet (e.g., vegetarian) in the past 12 months, or those who have been exposed to drugs such as antibiotics that disrupt the composition of the gut microbiome in the past 3 months.

1. **Supplementary Figures**

Supplementary Figure 1. Intestinal flora structural changes and Functional analysis. The top 10 representative phyla (A), genera (B) and species (C), as well as their proportions in each of the both groups. Differential analysis of intestinal microbes at the phyla (D) level. (E) KEGG orthology metabolic pathway analysis. (F) MetaCyc metabolic pathway analysis.

Supplementary Figure 2. Model error rate and parameter tuning of MAFLD diagnosis model. (A)Metabolomics data (B) Gut metagenomics data (C) phenomics data (D) Combinations of phenomics and metabolomics

Supplementary Figure 3. Calibration analysis of MAFLD diagnosis model. (A)Metabolomics data (B) Gut metagenomics data (C) phenomics data (D) Combinations of phenomics and metabolomics

Supplementary Figure 4. Beta diversity of Gut microbiota in MAFLD volunteers. (A) different ethnic groups (P=0.41) (B) different HS (P=0.05) (C) different body types (P=0.439) (D) different age groups (P=0.348) (E)different genders (P=0.437) (F) Urban or rural areas(P=0.28)