Department of Veterinary Medicine: Non-Funded PhD

Project Title: Modelling the multi-kingdom diversity of the human gut microbiome in health and disease

Supervisor: Dr Alexandre Almeida

Supervisor profile page: https://www.vet.cam.ac.uk/staff/dr-alexandre-almeida

The human gut microbiome represents a complex community of microorganisms inhabiting the intestinal tract, which has been strongly linked with the incidence of numerous human diseases and phenotypes. Therefore, it is becoming increasingly clear that the human gut microbiome contains tremendous diagnostic potential that is yet to be fully explored. For instance, even though the gut microbiome consists of microbial members from all domains of life, most research so far has focused on understanding the specific role and predictive power of the bacterial component of the gut microbiome. Recent efforts have provided a massive expansion in our understanding of the viral/phage diversity within the human gut, but further research is needed to explore their contribution to host health and their potential for building accurate disease prediction models, especially when considered alongside the bacterial fraction.

This project will leverage a large-scale dataset of tens of thousands of microbial genomes and metagenomes from the human gut microbiome to evaluate and identify multi-kingdom biomarkers of health and disease, and improve diagnostic models of diverse clinical phenotypes. This will involve the development and application of computational genomics methods, combined with machine learning and advanced biostatistics. Because of the high dimensionality of gut metagenomics data (i.e., containing thousands of species and millions of genes), machine learning represents a powerful approach to build predictive models with clinical relevance. Through optimisation of supervised and deep learning models, this project will investigate the predictive power of the gut microbiome composition (including both bacteria and viruses) in datasets from a wide range of diseases, such as inflammatory bowel disease and colorectal cancer. By integrating a variety of features (e.g., species, functions or genes) this approach will not only enable the identification of candidate biomarkers of health and disease, but may also provide new mechanistic insights into microbial interactions linked with host status..

For further information about the project, please contact Dr Almeida

Funding: This project is non-funded and open to applicants seeking funding elsewhere. Applicants that apply for a start in 23/24 will be considered for the University of Cambridge funding competition if they apply before the deadline (early January 2023)

How to apply:

Contact the Supervisor to discuss the project before submitting a formal application.

More here on application process here: PhD in Biological Sciences at the Department of Veterinary Medicine | Postgraduate Admissions (cam.ac.uk)