Universitat Pompeu Fabra Barcelona | Master in Bioinformatics for Health Sciences

Master project 2024-2025

Personal Information

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Group	Microbiome Research

Project

Computational genomics

Project Title:

Development of bioinformatics and statistical tools to integrate meta-omics data to characterize the human microbiome in Health and Disease

Keywords:

Human Microbiome; Metagenomics; Metatranscriptomics; Metabolomics; Composition and functions

Summary:

Meta-omics approaches have been intensively used over the last 20 years to study the composition and functions of the human microbiome (the other Human Genome) in health and disease conditions. The aim of the present work is to develop and/or implement bioinformatics tools: To analyze and integrate meta-omics data. To use data before, during, and after the onset of disease for training machine learning algorithms for creating valid predictive models which link specific microbiome taxa or function to the determination of disease susceptibility or protection. • You will work in the dry lab conducting bioinformatics and biostatistical research. You will be integrated into a young and collaborative environment: medical doctors, nutritionists, molecular biologists, bioinformaticians, and statisticians. • You will learn from your colleagues and take responsibility in writing your conclusions into academic papers, which will eventually be published in High Impact Journals. We want to help you build solid foundations on the research method, so you will be assisted by more experienced colleagues.

References:

https://manichanh.vhir.org/publications.php

Expected skills:

Fluent in English; Strong theoretical and practical understanding of statistical inference and machine learning is required. Proficiency in coding, particularly in web development, is highly valued.

Possibility of funding:

Yes

Possible continuity with PhD:

Yes

Comments:

We are looking for a motivated student who is seeking to pursue his/her career in research. The candidate will be remunerated

>900 euros/month during his/her master's internship and will be offered the possibility to apply for a Ph.D. fellowship (INPhINIT “la Caixa”, FPU, PFIS, AGAUR, VHIR...). Here are recent articles co-authored by students from this master (student’s name in bold): 1. Molano L-AG, Vega-Abellaneda S, Manichanh C. GSR-DB: a manually curated and optimized taxonomical database for 16S rRNA amplicon analysis. mSystems. 2024 Feb 20;9(2):e0095023. doi: 10.1128/msystems.00950-23. 2. Xie Z, Canalda-Baltrons A, d'Enfert C, Manichanh C. Shotgun metagenomics reveals interkingdom association between intestinal bacteria and fungi involving competition for nutrients. Microbiome. 2023 Dec 14;11(1):275. doi: 10.1186/s40168-023-01693-w. 3. Rosell-Mases E, Santiago A, Corral-Pujol M, Yáñez F, Varela E, Egia-Mendikute L, Arpa B, Cosovanu C, Panosa A, Serrano-Gómez G, Mora C, Verdaguer J, Manichanh C. Mutual modulation of gut microbiota and the immune system in type 1 diabetes models. Nat Commun. 2023 Nov 27;14(1):7770. doi: 10.1038/s41467-023-43652-x. 4. Oyarzun I, Le Nevé B, Yañez F, Xie Z, Pichaud M, Serrano-Gómez G, Roca J, Veiga P, Azpiroz F, Tap J, Manichanh C. Human gut metatranscriptome changes induced by a fermented milk product are associated with improved tolerance to a flatulogenic diet. Comput Struct Biotechnol J. 2022 Apr 5;20:1632-1641. doi: 10.1016/j.csbj.2022.04.001. 5. Serrano-Gómez G, Mayorga L, Oyarzun I, Roca J, Borruel N, Casellas F, Varela E, Pozuelo M, Machiels K, Guarner F, Vermeire S, Manichanh C. Dysbiosis and relapse-related microbiome in inflammatory bowel disease: A shotgun metagenomic approach. Comput Struct Biotechnol J. 2021 Dec 2;19:6481-6489. doi: 10.1016/j.csbj.2021.11.037. 6. Lleal M, Sarrabayrouse G, Willamil J, Santiago A, Pozuelo M, Manichanh C. A single faecal microbiota transplantation modulates the microbiome and improves clinical manifestations in a rat model of colitis. EBioMedicine. 2019. doi: 10.1016/j.ebiom.2019.10.002 7. Pascal V, Pozuelo M, Borruel N, Casellas F, Campos D, Santiago A, Martinez X, Varela E, Sarrabayrouse G, Machiels K, Vermeire S, Sokol H, Guarner F, Manichanh C. A microbial signature for Crohn's disease. Gut. 2017 PMID:28179361