Universitat Pompeu Fabra Barcelona | Master in Bioinformatics for Health Sciences

Master project 2020-2021

Personal Information

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Project

Computational genomics

Project Title:

Analysing human microbiomes: towards personalized medicine

Keywords:

microbiome nutrition health-care

Summary:

The study of the microbiomes present in the human body is of fundamental importance as it is highly relevant for clinical applications. For instance, dysbiosis in distinct communities has been related to some diseases. Traditionally, studying these populations required the isolation and culture of each individual microorganism, which is a significant limitation considering that small portion prokaryotes are culturable. However, using sequencing technologies allows the study of these populations in a high-throughput manner. These technologies have been essential for the development of metagenomics, which is defined as the culture-independent genomic analysis of all the microorganisms in an environmental niche. Human microbiomes are taxonomically different whether they come from the gut, skin, vagina or from the mouth. For instance, the genus Bacteroides is very abundant in the gut while it is Lactobacillus in the vagina. Changes in the normal microbiota composition (dysbiosis) have been linked to some diseases such as diabetes (gut), obesity (gut), autism (gut), fertility (vagina), acne (skin), Parkinson (gut), among others. About 16,000 samples from the American Gut Project (AGP) have been already analysed with Gaia to obtain the taxonomic profile of the samples. Metadata for these 16,000 samples is available. With this taxonomic matrix and the available metadata, the student will develop methods, especially related to machine-learning, that will help doctors to diagnose. Therefore, the final aim of the project is the development of models to classify a sample (e.g. from a patient) to specific groups (e.g. potentially diabetic, Parkinson-like profile, etc.).

Expected skills::

The student considering this thesis proposal must have a strong Bash (command-line) and Python/R knowledge.

Possibility of funding::

No

Possible continuity with PhD: :

No