



Master project 2024-2025

Personal Information

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Institution Barcelona Supercomputing center

Website <https://www.bsc.es/discover-bsc/organisation/scientific-structure/transcriptomics-and-functional-genomics-lab-tfgl>

Group Transcriptomics and Functional Genomics Lab

Project

Computational genomics

Project Title:

Understanding human individual variation in alternative splicing at single-cell resolution

Keywords:

Transcriptomics, differential gene expression, single-cell transcriptomics, human populations, splicing, ribosome profiling, posttranscriptional processing, RNA binding proteins.

Summary:

Summary: The candidate will join Marta Melé's Transcriptomics and Functional Genomics lab in the Life Sciences Department at the Barcelona Supercomputing Center. The lab is interested in understanding how individual variation in gene expression and splicing profiles can explain phenotypic differences between individuals both in the context of health and disease. To address this question, we use large-scale transcriptomic analysis and the latest single-cell sequencing technologies combined with the development of novel methods to study gene expression, splicing and cell type composition variation across human tissues and phenotypes. In this project, we will perform a large-scale analysis of splicing variation between individuals with different phenotypes and from different ethnic groups. In previous studies, we observed that in certain contexts splicing varies more between individuals than between tissues. Also, we have found that ancestry contributes more to explain splicing differences between individuals than other traits such as age. Remarkably, we observe that ribosomal proteins have strikingly large splicing variation between individuals of different ancestries. This pattern could have functional consequences for the translation machinery that we will explore further both in bulk and at single-cell resolution. Ultimately, the question that we want to tackle in this project is what is the role of splicing in determining why human individuals are different from one another. What you will learn: Development of computational pipelines to analyse and interpret large omics datasets such as RNA-Seq, single-cell RNA-seq, ribosome profiling, and CLiP-seq. Working in a High Performance Computing environment. Scientific collaboration in the context of international consortia, effective communication of research findings in internal and external meetings, scientific writing, and critical thinking. Also the master student will join the Melé lab journal clubs, lab meetings and lab lunches to talk about science but also have fun and discuss non-science related topics with the group.

References:

1. Garcia-Perez R, Ramirez JM, Ripoll-Cladellas A, Chazarra-Gil R, Oliveros W, Soldatkina O, Bosio M, Rognon PJ, Capella S, Calvo M, Reverter F, Guigó R, Aguet F, Ferreira PG, Ardlie KG, & Melé M§. The landscape of expression and alternative splicing variation across human traits. § corresponding author. *Cell Genomics* 0: 100244. 2. Melé, M. et al. The human transcriptome across tissues and individuals. *Science* (80-.). 348, 660-665 (2015).

Expected skills:

Strong programming skills in bash, python, R, perl, or similar. Some experience working in HPC clusters Some experience with Next Generation Sequencing data analysis Excellent communication skills in spoken and written English Capacity to contribute to research projects with novel research ideas and analysis Capacity to work as a team in a highly collaborative and diverse environment. Availability to start in July 2024 is preferred

Possibility of funding:

Yes

Possible continuity with PhD:

To be discussed

Comments:

We are located at the 4th floor of the Barcelona Supercomputing center which has great views over Barcelona. We all go to work at least twice a week - most students go every day -but working from home is allowed a few days per week. For a list of selected publications from the lab see: <https://www.bsc.es/mele-marta/publications> All master students accepted in the lab will be offered a work contract as well as a practice agreement with the university.