Title of Master Thesis

Comparative epigenomic analyses in plants

Description of student´s tasks

Epigenetics is a rapidly growing field of research with the potential to revolutionize various areas of biology, including genomics. However, the functional annotation of complex plant genomes is far from complete. Comparative epigenomic analyses can help researchers understand the regulatory functions of genomes and the impact of epigenetic modifications on gene expression.

In this academic project, the student will have the opportunity to participate in research focused on the generation and comparative analysis of transcriptomic, non-coding RNA, and genome-wide chromatin modification profiles. Specifically, the project will focus on the comparative epigenomic analysis of histone modifications and non-coding RNAs conserved in the model plant Arabidopsis thaliana and related Brassica crops. The project will also involve interspecies comparison of epigenome states to identify conserved and divergent epigenetic features across different plant species.

To achieve these goals, the student will analyze and compile transcriptomic (RNA-seq) and chromatin immunoprecipitation (ChIP-seq) data from both our laboratory and publicly available sources. The project will provide the student with hands-on experience in computational biology tools for analyzing large scale genomic data and will contribute to our understanding of the epigenetic regulation of gene expression in plants.

Prerequisites: *(languages, informatics skills, bioinformatic skills, other knowledge, etc)*

Student in the Grade of Biochemistry, Biotechnology or Computational Engineering Science with a

strong interest in computational biology analyses of genomic data. Experience regarding ChIP-seq or RNA-seq data analysys and knowledge of R or Python are desirable.

Training Project

EXTERNAL PRACTICES/MASTER THESIS. The fundamental goal of the external practices is to guide the student in applying his previously acquired knowledge to real tasks in a group work environment the realistically represents the work conditions the students will encounter in their future roles. In this way, the student will be able to get familiar with a working environment (work schedule, responsability, attitude, organization, etc.), and with the adequate working methodology in professional reality, contrasting and applying the acquired academic knowledge.

Activities that will be performed in the academic internship/ Master Thesis:

Activities to be developed by the student:

- Transcriptomic data analysis using computational biology tools such as HISAT2, HTseq, and DEseq2. These tools will allow investigation of how genes are expressed and identify differentially expressed genes between different conditions or species.

- ChIP-seq data analysis using computational biology tools such as MACS2 and SICER. These tools will be used to map histone epigenetic modifications genome-wide.

- Gene ontology analysis in genomic data. This will help understand the functions and relationships of the genes identified in the different genomic analyses performed.

- Integrative analysis: multiple types of epigenomic data from different species, such as histone modifications and gene expression profiles, will be combined to provide a more comprehensive understanding of the epigenetic landscape and its impact on gene regulation. These analysis, along with advanced bioinformatics tools and statistical approaches, will help us to identify conserved and divergent epigenetic features across species.

- Familiarization and/or performance of molecular biology experiments related to the analyzed genomic data. This will include techniques such as nucleic acid extraction, chromatin immunoprecipitation, and preparation of genomic libraries for sequencing.

The student will join the EPIGENETIC REGULATION OF AGRONOMICALLY IMPORTANT TRAITS group at CBGP and will work in laboratory 171. Although some of the computational analyses may be carried out remotely.

Nº of positions offered:	**1**
Has the student dealings with underage persons?	**No**
Starting date:	**Flexible (to be discussed with the student)**
Fecha de fin: (End date)	**Flexible (to be discussed with the student)**
Horas semanales: (Weekly hours)	**25 h**
Horario jornada laboral: (Working hours)	**Flexible (to be discussed with the student)**
Importe Ayuda/Bolsa de estudio: (Amount of fellowship / remuneration)	**No €/mes**
Tutor académico: (Academic tutor (UPM)) Email:	

Departamento tutor académico: **(Dept. of academic tutor)**	
Tutor empresa: **(External tutor)**	**Pedro Crevillén Lomas**
Email tutor empresa: **(Email external tutor)**	**pedro.crevillen@inia.csic.es**
Departamento tutor empresa: **(Dept. of external tutor)**	**INIA/CSIC**
Ubicación de la estancia de las practicas **(Location of the internship)**	**CBGP, Campus de Montegancedo UPM,** **28223, Madrid, Spain**
ENTIDAD COLABORADORA: **(Collaborating Entity)**	**Centro de Biotecnología y Genómica de Plantas UPM – INIA/CSIC**
A cumplimentar por Oficina Prácticas ETSIAAB: **Créditos a reconocer (Nº ECTS):**	