**Título de las prácticas/*Practice Title*:**

Applications of a Deep microbiome latent space

**Descripción de las funciones del alumno/*Description of student functions***

The main goal of the project will be to define and apply a microbiome code, which reduces the dimensionality of the data, using the novel and powerful Deep Learning approaches.
The code or latent space will be defined, using Autoencoder and Embedding architecture. Then, to demonstrate the usefulness of the novel latent space, several applications will be developed, and compared with state of the art approaches to evaluate the advantages of the microbiome code. For example, to visualize microbiome samples with the reduced dimensionality given by the code; to identify microbiome states from the code; to take code as input to predict a particular phenotypic feature available in the microbiome meta-data; or to define interpretability methods to explain the meaning of the code. Those applications will facilitate the use of the defined computational-based microbiome code by experimentalists, making easier the use of the microbiome data in multiple scenarios.

***Requisitos:*** *(indicar titulación y curso); otros requisitos adicionales (idiomas, informática, otros conocimientos, etc)/**Required formation and skills of the student***

- Computational Biology Master student, computational biology and data science specialization
- Programming knowledge in python and R
- Interest in microbiome research
- Basic Machine Learning knowledge

**Proyecto formativo/*Student Formation Program***

**EXTERNAL PRACTICE module**. The fundamental objective of the External Practices is to teach the student to apply in the real world the knowledge that have been previously acquired in a group work environment that reproduces in a realistic way the things that can be found in his future place of work. The student can become familiar with the working world (schedules, responsibility, attitude, organization, etc.), and with the work methodology appropriate to the professional reality, contrasting and applying the academic knowledge acquired.
**MASTER THESIS module**.

***Actividades a desarrollar en la práctica académica/Activities to carry out during the academic practices***

- Become familiar with microbiome and Deep Learning (Keras/Tensor Flow) software
- Find a microbiome dataset for which to define the code
- Run experiments to build the Deep Learning model
- Develop new applications of the microbiome code
- Evaluate the advantages of the new implemented functionalities
- Integrate the developed software, providing a reproducible system in a docker container
- Writing master thesis and preparing oral presentation

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| **Nº de plazas/*Nº of positions*** | **1** |
| **¿El alumno tendrá trato habitual con menores?/*Will student work with under 18 years old children?*** | **No** |
| **Fecha de inicio/*Starting date*:** | **February** |
| **Fecha de fin/*End date*:** | **Mid June (until satisfying required ECTS)** |
| **Horas semanales/*Hours per week*:** | **25** |
| **Horario jornada laboral/Workday:** | **Flexible (proposal: 9-14h)** |
| **Importe Ayuda/Bolsa de estudio/Fellow* (€):** **(It is not mandatory)* | **0 €/mes** |
| **Tutor académico/*Academic Supervisor*:** | **Mark D. Wilkinson** **mark.wilkinson@upm.es** |

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|---|---|
| Email: | |
| **Departamento tutor académico/*Academic Supervisor Department*:** | **Biotechnology and Bioinformatics** |
| **Tutor empresa/*Enterprise Supervisor*:** | **Beatriz García Jiménez** |
| **Email tutor empresa/*Email Enterprise Supervisor*** | **beatriz.garcia@upm.es** |
| **Departamento tutor empresa/*Department of Enterprise Supervisor*:** | **Biotechnology and Bioinformatics** |
| **Ubicación de la estancia de las practicas/*Location for Practices*** | **Centre for Plant Biotechnology and Genomics UPM** |
| **ENTIDAD COLABORADORA/*COLLABORATOR ENTITY*:** | |
| ***A cumplimentar por Oficina Prácticas ETSIAAB/To be fulfilled by the ETSIAAB Practice Office :*** **Créditos a reconocer (Nº ECTS)/*ECTs to be recognised*:** | |