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| Une image contenant dessin, signe  Description générée automatiquement | Internship position (Engineer / M2)  Building microbiota similarity matrices to evaluate microbiome impacts on livestock production traits |

*The French National Research Institute for Agriculture, Food, and the Environment (INRAE) is a public research establishment. It is a community of 12,000 people with more than 200 research units and 42 experimental units located throughout France. The institute is among the world leaders in agricultural and food sciences, in plant and animal sciences, and is 11th in the world in ecology and environment. INRAE’s main goal is to be a key player in the transitions necessary to address major global challenges. In the face of the increase in population, climate change, scarcity of resources and decline in biodiversity, the institute develops solutions for multiperformance agriculture, high quality food and sustainable management of resources and ecosystems.*

**WORKING ENVIRONMENT AND ACTIVITIES**

◾ You will be welcomed in the GenPhySE research lab at Castanet-Tolosan (31) in quantitative genetics teams, near Toulouse.

◾ As for humans, the microbiota is nowadays investigated in most livestock productions, in order to understand its interaction with the host. These links between the host and its microbiota being so multiple and complex - the genes of the host shape the microbiota and these microbiota impact the host’s traits - that the concept of Holonbiot, was proposed by Margulis (1993) to assemble the host with its microbiome community as a single unit.

In quantitative genetics, the purpose of studying the microbiotas is to improve the genetic prediction of animal’s traits, particularly those which are complex and difficult and expensive to measure. Depending on the trait and the animal studied, different microbiota could be relevant such as fecal of ruminal one. Whatever, the main step is to estimate the impact of microbiota on trait of interest. For this purpose, Difford et al. (2018) proposed to estimate the proportion of phenotypic variance of traits due to microbial composition and called it “microbiability” doing the parallel with the heritability. Regarding the complexity and special features of the microbiota data, the microbial relationship matrix (M) used for microbiability estimation can be constructed in different ways (He et al., 2022), but the type of M matrix can impact estimates values.

◾ The internship goal is to test several M matrices to estimate microbiability and quantify the impact of M matrix on the estimates.

According to actual bibliography, the M matrix could be built as the classical square of abundance matrix proposed by Ross et al. (2013), as ecological distance such as Bray-Curtis and Jaccard, as kernel functions (Montesinos-Lopez et al., 2021) or thanks to the Poisson-lognormal model (Chiquet et al., 2021).

◾ You will have to:

* Conduct a literature review of methods to build similarity matrix from microbiota data
* Program these different methods or use software’s to build the M matrix
* Estimate the microbiability of traits of interest in the 2 datasets provided

◾ To carry out those tasks, you will have access to the following tools and data:

- Two large datasets were available: 1- on 1000 pigs, from fecal microbiota to estimate microbiability of feed efficiency; 2- on 800 dairy ewes, from ruminal microbiota to estimate microbiability of fine milk composition.

- bio-informatics tools: R software and genetic softwares ...

If interested you will be able to take part in a sampling campaign and visit the experimental facilities.

**TRAINING AND SKILLS REQUIRED**

◾ Recommended training: Engineering/ Master 2 with an emphasis in bio-statistics

◾ Knowledge required: statistics, programming and data analysis with R

◾ Skills sought: animal science

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| 🡮 Reception modalities  ◾ Unit: GenPhySE  ◾ Postal code + city: 31326, Castanet-Tolosan  ◾ Web site: https://genphyse.toulouse.inra.fr/  ◾ Type of contract: internship  ◾ Duration of the contract: 6 months  ◾ Starting date: february 2023 (depending on the applicant avaibility)  ◾ Compensation: 3.90€/hour (35h per week) | 🡮 How to apply  Send a cover letter and a CV to:    Christel Marie-Etancelin (co-superviser)  Ingrid David (co-superviser)  **@** By e-mail :  [christel.marie-etancelin@inrae.fr](mailto:christel.marie-etancelin@inrae.fr)  [ingrid.david@inrae.fr](mailto:quentin.le-graverand@inrae.fr)    **🞭** Deadline for applications: 30th November 2022 |