Appel à projets doctoral 2025 - Alliance Sorbonne Université - Initiative Sciences aux Interfaces du Vivant InLife

Axe 2 : développement et application d'approches théoriques des systèmes biologiques

PhD title: Cultural transmission of non-random mating behaviours during genetic admixture processes in human evolution

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Role : Supervise cultural anthropology and historical models to be explored, co-supervise MetHis v2.0 production, benchmarking and real-data analysis. Interpret results and help writing articles, PhD thesis, and conference presentations.

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Role : Supervise machine and deep-learning approaches to be explored, co-supervise MetHis v2.0 production and benchmarking. Interpret results and help writing articles, PhD thesis and conference presentations.

SUMMARY

This project will develop new bio-statistics methods aimed at exploring sex-specific non-random mating behaviours and their cultural transmission in admixed human populations. These complex processes are known to have shaped human evolutionary history, but it remains extremely hard to infer them from observed genetic data.

A software, allowing the simulation of scenarios of admixture with complex sex-specific socio-demographic histories, will be developed with SLIM. This highly parametrizable simulation tool will be combined with Approximate Bayesian Computation model-choice and posterior-parameter estimation frameworks based on machine learning architectures, including Random Forest and Multilayer Perceptron. The aim of this approach is to infer, from extant genomic data, the models and parameters of the historical dynamics of cultural transmission of non-random mating behaviours that fit best observed data. This framework will be benchmarked and released as an open-source software.

In the context of this thesis, the anthropological genetics applications of this framework will target several admixed populations, in particular those descending from human forced and voluntary migrations during the Trans-Atlantic Slave Trade (TAST) on both side of the Atlantic such as Afro-Americans, Puerto-Ricans, Barbadians, Cabo Verdeans, and São Toméans.

We will address both methodological questions about the technical possibilities of inferring past dynamics of non-random mating behaviours from extant genomic data, and anthropological questions about the history of sex-specific mating behaviours in populations related to the TAST and how they relate to the socio-historical shift from Societies with Slaves to Slave Societies, the abolition of the TAST, and the abolition of slavery.

Beyond these questions of interest, our open-source software will provide a general framework to investigate complex admixture processes in general. It could be applied to other human admixed populations and historical contexts, as well as to other social-species where socially driven non-random mating processes are at play.