

## DEEP LEARNING MEETS BIODIVERSITY: UNVEILING THE MICROBIOME OF A MEGA-RIVER

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The Paraná River is one of the mega-rivers of the world traveling 3,800 km through South America. It is considered a hotspot of biodiversity modelled by the complexity that emerges from the combination of spatio-temporal heterogeneity, climate and hydrology. Biodiversity loss is a severe threat to ecosystem health and the functions of fluvial systems. In this project, we aim at developing novel machine learning models to disclose the unknown diversity and functions of the Paraná River and build an environmental profile of the region. We will analyze hydroclimatological scenarios and quantify how changes in land use due to human activity decrease biodiversity and ecosystem functions, and relate with climatic forcing. In that sense, land use changes represent one the most severe threats for biodiversity and river dynamics. We plan to leverage the latest advances in deep learning to construct classification models to quantify land use changes from remote sensing images. Microorganisms are sentinels that serve to diagnose the state of the ecosystems they inhabit. Metagenomic shotgun sequencing appears as a cutting-edge technique that enables exploring the genetic information of the entire river community: the freshwater microbiome. Here we plan to develop machine learning based-based metagenomic analysis models to uncover the dynamic interplay between the microbiome and the environment.