discovery will be applied to the data knowledge discovery for the sustainability of the Seas started in 1965 and currently containing 9 million entries, 1612 species (i.e., 50 variables and traits per species), around 20 countries and 11 sampling methods (Figure 2). Our approach will explore broad classes of evolving functions from evolutionary biology-AI-inspired algorithms combining them to automated Bayesian machines ensuring the search, the evaluation of models, trading-off complexity, fitting to the data and quantify resource usage [21, 30].

Discovery in federated networks (WP3)

Evolutionary neural biology-inspired discovery in federated networks: Technologies in digital ecosystems around federated networks are scarce and mostly focus on decentralization, scalability and security fronts [9, 10, 14, 15, 20, 25]. Yet, the discovery of novel algorithms in biology-inspired federated networks for co-operative forecasting of global sustainability problems when heterogeneous groups learn and share from each other is currently not in place. Recent studies have shown the importance of evolutionary search of mathematical and symbolic operations as building blocks to discover ML algorithms ([21, 27]). Evolutionary biology-inspired search for algorithmic discovery can help to decipher how interactions among heterogeneous groups evolve and learn to solve complex sustainability problems. For example, evolutionary dynamics can explore open-ended language of models with varying trait evolution functions to discover biologically inspired solutions in multidimensional systems ([27],+++). ROBHOOT v.3.0 deploys biology-inspired federated networks accounting for heterogeneous agents to discover novel biology-inspired solutions for the sustainability of the Seas federated network

Going beyond: Our understanding of the outcomes from evolved information processing systems formed by highly heterogeneous groups, a kind of large-scale meta-learning in the federated setting [14], is currently quite limited. Therefore, new science-enabled approaches accounting for information processing with diversification of heterogeneous and highly dimensional systems in federated networks are required to develop science-enabled technologies where heterogeneous agents with different interests find (non optimal) solutions that allow sustainable exploitation of ecosystems. In this regard, federated objects can be seen as “neural networks” containing many types of heterogeneous nodes with varying degrees of learning, connectivity and firing probabilities [23, 24].

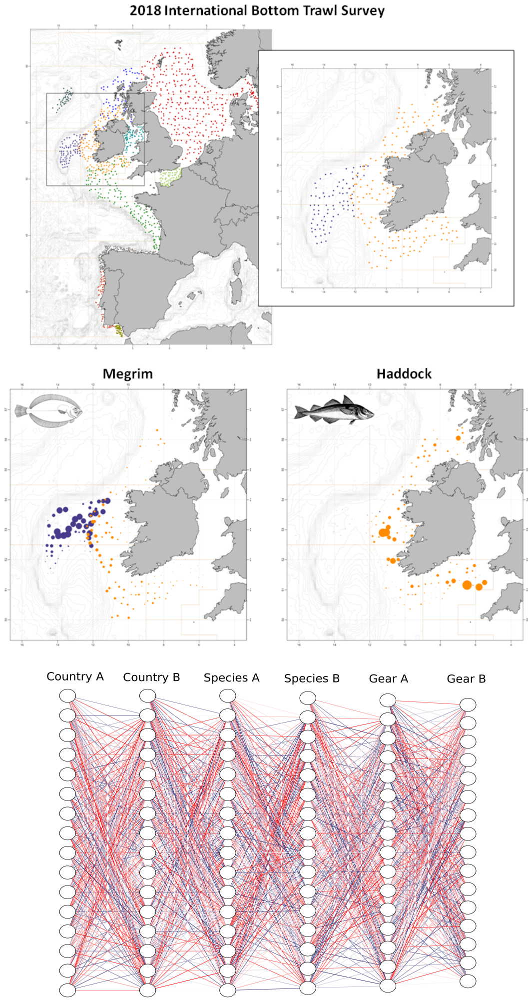

Figure 2: **Discovery for Sustainable Ecosystems**. ROBHOOT target discovery computation for new sustainability paths in complex ecosystems. The sustainability of the Seas case study [8] will be enriched to validate the technology when many species, human groups and technologies exploit resources (**Top left**, data-color points represent sampling from different countries. Zoomed in is the Irish ground Fish (IE-IGFS, Orange) and the Spanish survey on the Porcupine Bank (SP-PORC, Blue). Countries produce strong bias in the distributions maps because they use different Gears according to their commercial interest (Megrim, *Lepidorhombus whiffiagonis*, consumed largely in Spain and France, **Center left**) and Haddock, *Melanogrammus aeglefinus*, highly priced in northern Europe, **Center right**). This generates strong bias for sustainability in natural resources. ROBHOOT integrates evolutionary biology-AI-inspired solutions represented as networks with many layers to discover sustainability paths with many coexisting species, human groups and technologies **Bottom**. Each country, species and gear is composed by many nodes: country contains fishery, environmental agency, stakeholders, etc. Species contains size-classes, habitat preference, species interactions, etc. Red and blue links mean competition and cooperation links connecting each pair of nodes.