ARTIFICIAL INTELLIGENCE AND BAYESIAN STATISTICS FOR A SUSTAINABLE APPROACH TO MARINE RESOURCES FISHING AND FOR THE SIMULATION OF FUTURE SCENARIOS LINKED TO CLIMATE CHANGE

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The main goal of this PhD project is to develop a mid-range multispecies model to predict the abundance of marine resources on a medium-large time scale in a given area taking into account the interaction between anthropic impact (represented by catches data) and environmental factors (temperature, primary production etc) and their effects on marine population.

Data collection, the first phase of the current project, will avail of the collaboration with European Commission's Joint Research Center (JRC) and FAO's General Fisheries Commission for the Mediterranean (GFCM) for ecological and bio-economic datasets, and with ECHO research group (a subgroup of the OGS, Istituto Nazionale di Oceanografia e Geofisica Sperimentale, based in Trieste) for the extrapolation and management of spatial and environmental data from Copernicus, the EU Earth's observation project.

The second phase of this project is the data analysis and model development, which will be performed using two main approaches, neural networks and Bayesian statistics. The neural network approach will consist of two different recursive networks, Elman's network and Long-Short Term Memory (LSTM), both capable of catching time series' trends. The Bayesian approach will be carried out using the Approximate Bayesian Computation method, which can reduce the often-overwhelming computation times of classical Bayesian methods. Both these approaches are vastly adopted in ecological, evolutionary and bio-economic studies.

The models will be developed in R ambient and published via a Shiny interface, which can be easily shareable and will make the tool available to end user without requiring any modelling skill. The models will be widely tested with the cooperation of both JRC and GFCM.

The purpose of this work is to provide a tool which can be used to help protecting marine ecosystems from overfishing by instituting Marine Protected Area and to read in a clearer way the effects of climate changes on marine populations; moreover, the benefits of a healthy environment reflect on the whole community.