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Bird Migration and Climate Variables

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The scientific and industrial communities are being confronted with a strong increase of real time and long time series of environmental data: main data sources are numerical models, satellite sensors and ground measurements (see e.g. the Copernicus program of the European Commission http://www.copernicus.eu/). The challenge is not only to manage the large volume of data generated by each source, but to process and analyse the data streams. Creating synergies among different datasets will be key to exploit the full potential of all available information.
One of the fields that can greatly benefit from new data availability and new technologies to exploit them is the study of bird migration. There is a strong need to understand if and how environmental and climatic factors affect migratory movements and stop over at sites en route. In addition, few if any studies have investigated weather effects on bird migration at a broader scale, i.e. beyond the local conditions at the study site. The conditions encountered before arrival to, and expected after departure from a stopover site, might play an important role in the decision of the bird to stop at a given site and on the duration of the stopover. In order to correlate meteo-climatological information and stopover / migration data, we propose to implement a machine learning approach with predictive capabilities.
The main goals of this work are : i) the development of computational methods to interpret the movements and occurrence of birds, ii) the test of the above models with near-real time data, iii) the production of predictive models that can be used in the future to forecast bird movements and presence.
To adequately tackle the challenges a multidisciplinary approach is required: birds migration domain skills are needed to define requirements and validate results; data skills are needed to both understand the large variety of used data (bird migration data, meteo-climatological data, satellite data) and manage the large amount of geospatial data to be used; computational intelligence /machine learning skills are needed to identify the most adequate technique(s) to correlate and predict birds migration based on environmental information (either measured or simulated).
The results of the project will significantly advance our understanding of how environmental variables as recorded by satellites can be used to interpret and predict bird and animal movements in general, with relevance at international level; benefits will span from aviation (to avoid collisions between birds and planes), to health (monitoring and prediction of diseases spread through birds), to agriculture (to help mitigating damages caused by birds migration).