

Artificial Intelligence and Earth Observation data:

innovative methods for monitoring West Nile Disease spread in Italy

Funded by



AIDEO: Artificial Intelligence and Earth Observation Data

West Nile virus (WNV) infection is one of the most widespread mosquito-borne zoonosis in Italy and Europe. Its transmission cycle is well understood, whilst Identifying suitable environmental conditions across large areas containing multitude species of potential hosts and vectors can be difficult. To fill this gap ESA started a project with a consortium of research institutions and private sector entities. The goal is to connect the power of Artificial Intelligence (AI) to Earth Observation (EO) data to explore hidden patterns and to assess the potential of automated processes in making accurate predictions of the spatio-temporal re-emergence and spread of the disease in Italy. All in all, AIDEO aims to develop an innovative, scalable and accurate process to produce West Nile Disease (WND) risk maps, using EO data and specific Al algorithms.

SCIENTIFIC APPROACH

The study is conducted using historical ground truth data of West Nile cases reported in mosquitoes, birds and horses collected in the frame of several epidemics that have been impacting the Italian territory since 2008. The cases are extracted from the official repository of the Italian Ministry of Health (National Information System of Animal Disease Notification - SIMAN) while EO data are derived from different sources (Sentinel-2, Sentinel-3, PROBA-V, etc.), pre-processed and harmonised. WND and EO data are selected to guarantee a correct spatial and temporal representation of the last epidemics.

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In situ data of the WND cases and satellite data are studied and tested through a learning architecture based on Convolutional Neural Network (CNN) and Graph Theory. This process is able to produce AI based risk maps for evaluating the degree of improvement in forecasting the disease spread to be compared with classical statistical methods. Temporal deep models (e.g. RNN - Recurrent Neural Networks, LSTM - Long-short term memory) are then employed for an effective forecasting of the behavior based on EO data. The definition and development of such algorithms could be applied in early warning systems and integrated into the Information Systems of the Italian Ministry of Health and made available to other interested stakeholders including in particular the private sector and economic operators.

AI MODEL

THE CONSORTIUM

Synergise the expertise to predict the spread of the West Nile Disease (WND)

Istituto Zooprofilattico Sperimentale dell'Abruzzo e del Molise "G. Caporale" www.izs.it

Is a Veterinary Public Health Institute having a consolidated and recognised international experience in the surveillance, diagnosis, epidemiology and modelling of Vector Borne Diseases.

Its team leads the consortium and contributes with data, epidemiological analysis and deep knowledge of WND in Italy.

Progressive Systems

www.progressivesystems.it

Is a private company delivering solutions to simplify Earth Observation data exploitation and bringing significant expertise and experience to the consortium based on years of collaboration with ESA.

Its team contributes with selection, collection and release of EO data derived from multiple sources.

AlmageLab

aimagelab.ing.unimore.it/imagelab

Is a research laboratory of the Dipartimento di Ingegneria "Enzo Ferrari" at the University of Modena and Reggio Emilia with extensive experience in Computer Vision, Pattern Recognition, Machine Learning and Artificial Intelligence.

Its team contributes to the project implementation with the design and development of ad hoc learning architectures based on ground truth disease data and EO data.

REMEDIA Italia

www.remediagroup.it

Is a private company having an internationally recognised experience in the scientific communication domain, mostly in the Earth Observation field.

Its team designs communication tools in order to spread the project outcomes to the scientific community and citizens.













AIDEO

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