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AN EARTH OBSERVATION COGNITIVE SYSTEM IN RESPONSE TO SARS-COVID-19
EMERGENCY

Abstract

The pandemic emergency caused by the spread of COVID-19 has stressed the importance of promptly identifying new epidemic clusters and patterns, to ensure the implementation of local risk containment measures and provide the needed healthcare to the population. In this framework, artificial intelligence, GIS, geospatial analysis and space assets can play a crucial role. Social media analytics can be used to trigger Earth Observation (EO) satellite acquisitions over potential new areas of human aggregation. Similarly, EO satellites can be used jointly with social media analytics to systematically monitor well-known areas of aggregation (green urban areas, public markets, etc.). The information that can be obtained from the Earth Cognitive System 4 COVID-19 (ECO4CO) are both predictive, aiming to identify possible new clusters of outbreaks, and at the same time supervisorial, by monitoring infrastructures (i.e. traffic jams, parking lots) or specific categories (i.e. teenagers, doctors, teachers, etc.). In this perspective, the technologies described in this paper will allow us to reach individuals involved in risky aggregation clusters and to investigate their health status. The ECO4CO data lake will be integrated with ad hoc data

obtained by sanitary structures to understand trends and dynamics, to assess criticalities with respect to medical response and supplies, and to test possibilities useful to tackle potential future emergencies. The System will also provide geographical information on the spread of the infection which will allow an appropriate context-specific public health response to the epidemic. In the present study that is co-funded by ESA Space Solutions, the ECO4CO space asset-based system aims to reply to the emergency of the actual pandemic through the following pillars:

- **Cluster Area Identification:** a predictive data analytics service using social media and news to automatically identify possible new outbreaks;

- **Epidemiological study and public health intervention:** an applied and interdisciplinary approach which combines sanitary-epidemiological-clinical, geo-technological and geographical components and competences;

- **Intelligent Satellite Tasking:** an autonomous system able to task EO data acquisitions;

- **Object Detection:** a deep learning service able to identify objects and people gathering or movements from images and videos;

- **Tracking:** an intelligent service able to track devices detected in a specific location, identifying suspect patterns or anomalies;

- **Logistic Planning:** a predictive data analytics service to identify stock of medical centers and match them against future needs of medical supplies.