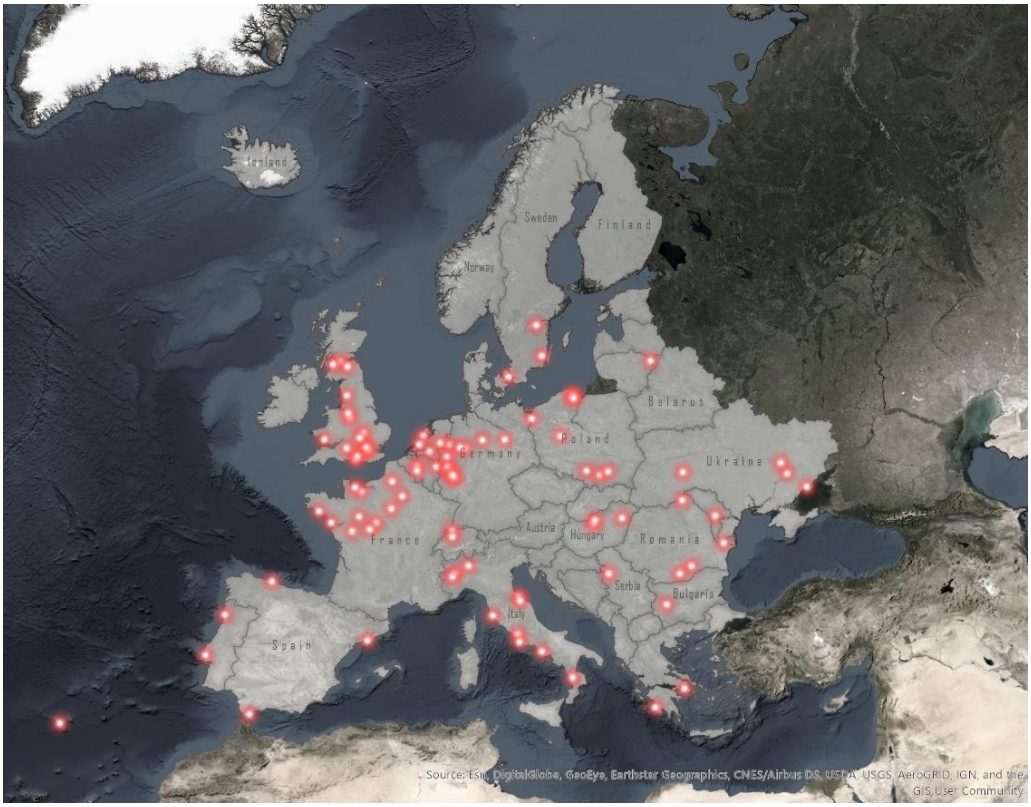
EO-FIN

Predicting Terrorism Hotspots



5-km grids represent grids the ML model has predicted at-risk in Europe based on previous terrorism attacks (1970-2018). (Source: Buffa, C.M., 2021. Predicting Terrorism in Europe with Remote Sensing, Machine Learning, and Spatial Statistics (Doctoral dissertation, Saint Louis University).).

Product Category

■ Land Use	☐ Natural Disaster	☐ Coast Management	☐ Earth's Surface Motion
☐ Land Cover	☐ Climate Change	☐ Marine	

Financial Domain(s)

■ Investment management ■ Risk analysis ☐ Insurance management ☐ Green finance

User requirements

UN12: Analysis of potential risks in specific regions
UN37: Projection of risk to portfolio assets into the future

Description

Terrorism poses significant risks to economies and financial systems. Identifying terrorist hotspots allows financial institutions to assess the potential impact of terrorism-related disruptions on their investments, portfolios, and operations. Using satellite imagery, socio-economic data and historical terroristic activity with machine learning models, we can predict terroristic hotspots from spatial and geographical perspectives. Remote sensing data such as DEM, land cover, and nighttime lights can be used as predictors with open-source socio-economic data including civil unrest data, socio-political interactions, and population features such as distance to major waterways, inland water, major road intersections, roadways, the population counts, population densities, built settlement growth, and demographics.

Spatial coverage target

Regional

Data throughput

Rapid tasking	☐ High	■ Low
Data availability	■ High	☐ Low

Product specifications

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Main processing steps	Remote sensing data needs to be sourced from suitable providers. DEMs can be acquired from various sources including Copernicus DEM, ASTER, ACE-2, and others. Land cover information can be obtained from diverse sources like Copernicus land cover datasets. Nighttime light data can be accessed from VIIRS DNB. Past instances of terrorist attacks in the vicinity can be retrieved from the Global Terrorism Database (GTD), while geospatial and population features can be gathered from Worldpop. Civil unrest data can be calculated using the Armed Conflict Location and Event Data set (ACLED), while sociopolitical interactions can be derived from the Integrated Crisis Early Warning System (ICEWS). All of this data should be interpolated to generate raster data in the form of grids. Employing a feature selection algorithm is essential to pinpoint the pertinent factors for predicting the locations of terrorist hotspots. Subsequently, the chosen features will be input into various machine learning models to evaluate their predictive capabilities. The model demonstrating the most optimal performance will be employed for forecasting regions prone to terrorist hotspots.
Input data sources	Optical: VIIRS DNB Radar: N.A Supporting data: DEM, land cover data, GTD, Worldpop, ACLED, ICEWS
Accessibility	VIIRS DNB: are publicly available from NASA.
Spatial resolution	VIIRS: 750 m DMSP OLS: 2700 m
Frequency (Temporal resolution)	VIIRS: Daily
Latency	1 day
Geographical scale coverage	Globally
Delivery/ output format	Data type: Raster File format: GeoTIFF
Accuracies	Thematic accuracy: N.A Spatial accuracy: N.A
Constraints and limitations	■ The complexity of terrorism which related to plenty and complex factors. ■ Some of the factors are not directly correlated with terroristic activity which may lead to false predictions. ■ Cloud presence for nighttime light data.
Level of skills required by users to use the EO service	Skills: Essential Knowledge: Essential