European Commission

European Big Data Hackathon 2025

Earth Observation: from Space to European Statistics

Brussels, 6–11 March 2025

eurostat

Interactive Hazard Prediction Dashboard: Area vulnerability to hazards with Adjustable Area Characteristic using the example of fire

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Our product bridges the gap between fire forecasting and actionable fire prevention

Aim: assess specific ACTIONS that could be taken in areas to prevent or minimize the risks of fire effectively by determining the environmental variables with the most impact for an area

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European Commission Targets:

"650 billion Euro: the cost of natural hazards in the EU from 1980 to 2022 (of which around 16% in 2021-22)" [1]

- European Commission aims to:
  - "Adapt and prepare for changing climate" in order to "sustain EU citizens' quality of life" [1]
  - "develop European Civil Defence Mechanism", "work on climate resilience and preparedness" and "develop European Climate Adaption Plan" [1]

[1] Quality of life - European Commission

Policies addressed:

Increasing risk of environmental hazards due to climate change:

- early warning and risk management including resource allocation
- civil protection including land management and urban planning
- public health and safety policy including resource allocation

Overview:

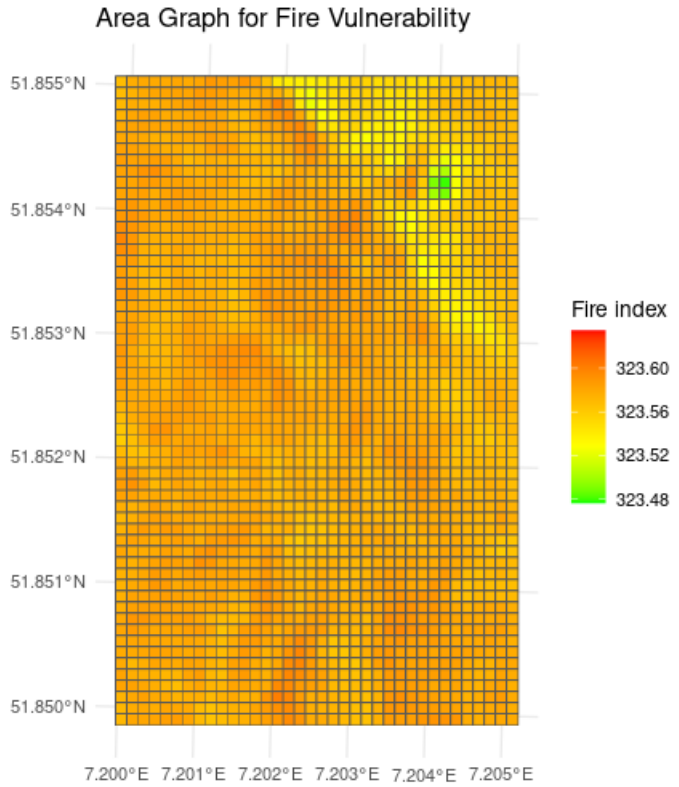
Model:

- Based on data from different areas and time of year
  - Due to computing power on virtual machine only trained on specific areas at specific points in time where we know fire was present, but could be trained and predicted for any area in Europe and aggregated to country and EU level
- Data
  - Target variable: **fire** (combination of bands S7 and F1 from Sentinel3_SLSTR) collected on the day of fire occurrence
  - Covariates: **topography** (combination of bands B04 and B08 – Sentinel2_L2A), **moisture** (combination of bands B8A and B11 – Sentinel2_L2A), **chlorophyl** (band 03– Sentinel3_OLCI_L1B), **temperature** (band LST from Sentinel3_SLSTR_L2_LST) and **scene classification** (band SCL – Sentinel2_L2A) all collected on the day the area was last visited before fire outbreak
- Model selection
  - Inclusion of polynomials and interactions
  - Stepwise selection based on AIC

Overview:

Predictions in Dashboard:

- Predict fire vulnerability for an area of interest: how an area's characteristics influence the fire vulnerability
- Change predictors while holding topography constant
- -> "What if" scenario for an area
  - What if temperature increases/decreases?
  - What if more of a specific vegetation is planted?
  - What if a specific crop is harvested?
  - What if specific fields get watered?
- -> impact on an area's vulnerability to fire
- -> implies what actions are the most sensible in order to prevent fire in an area



Outlook:

- Include cloud masking and correct invalid data
  - E.g. multiple imputation
- Include more predictors in the model and try different models
  - E.g. urbanisation, wind, humidity or land usage
  - E.g. Random forest
- Train model on an ongoing basis with real time data for all of Europe
- Extend model to predict costs of hazard
  - E.g. including resource availability (e.g. fire brigade, water, communication), urbanisation, potential spread of hazard
- Extend model to predict vulnerability of population in area to specific hazards
  - Link spatial data with population data: e.g. census and survey data, perform small area estimation
- Extend model for more hazards like flood, heavy rain, droughts, tornados etc