Computing Wildfire Susceptibility Maps at the National level in Italy: A Machine Learning Approach

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Wildfire susceptibility

Definition

- Static spatial probability of **wildfire** occurrence based on the intrinsic characteristic of the territory and past burned areas.

Role of the mapping

- Identification of most fire prone areas
- Help the wildfire **management** → **prevention** and **preparedness** phases
- First step for computing the wildfire **hazard** and **risk**

How it is evaluated

- **Machine learning** model → Random Forest Classifier → Association of topographic, climatic and antropic variables to historical burned areas
- **Seasonal** analysis due to different wildfire regimes

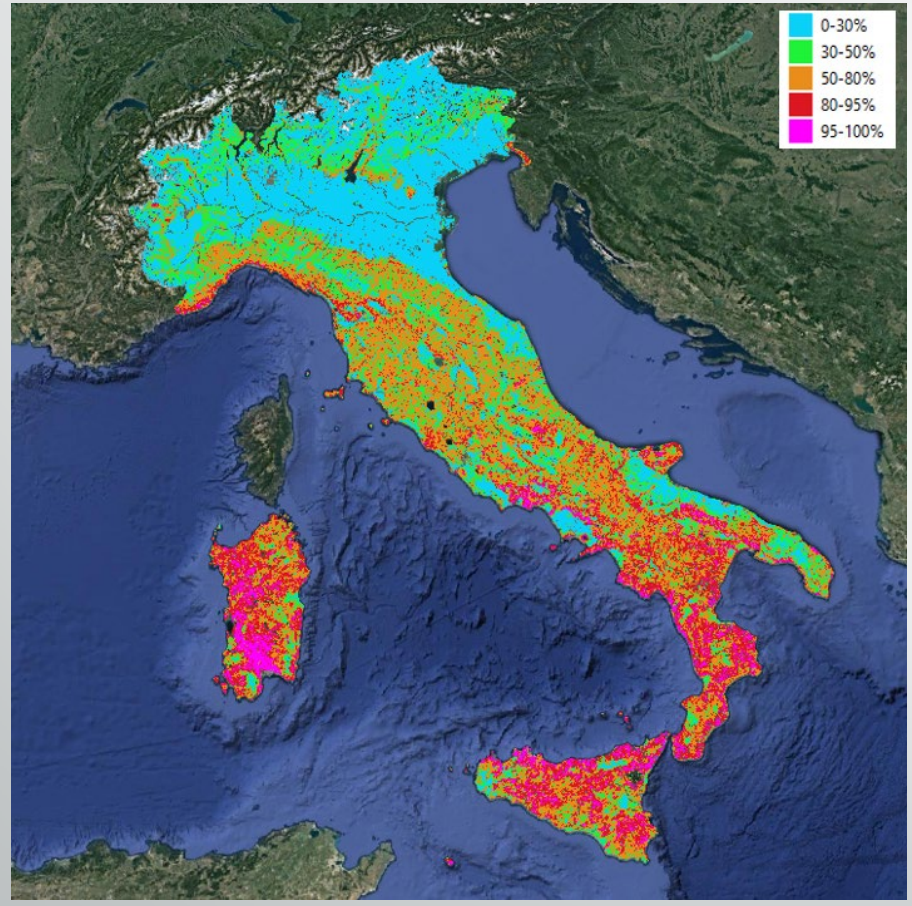
Predisposing factors

Selection of input variables that are related to a wildfire event

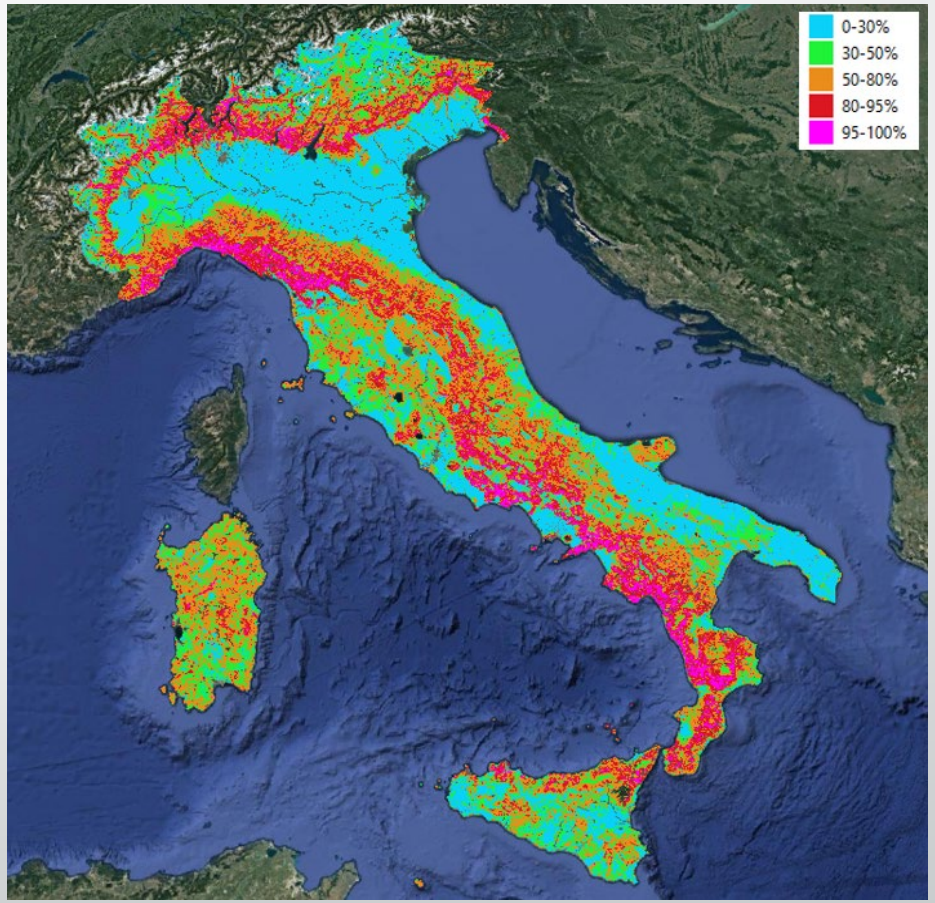
Geo-topographical variables	Climatic variables	Anthropic variables
Corine Land cover 2018 at third level	Total averaged monthly precipitation [mm] (1951-2019)	Distance from settlements [m]
Neighboring vegetation	Seasonal mean temperature [°C] (1951-2019)	Distance from crops [m]
DEM, slope, exposition		Distance from roads [m]
		Presence of Natura 2000 protected areas

Results

Static mapping of the wildfire susceptibility at 500 m resolution



Summer seasonal regime

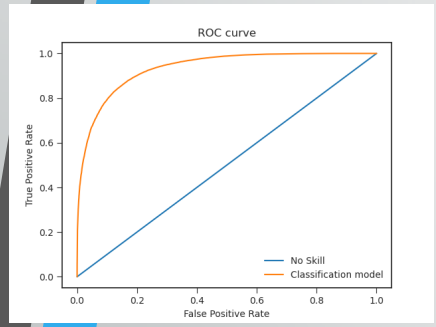


Winter seasonal regime

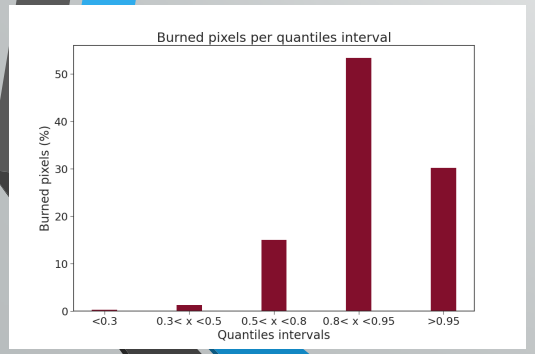
The model performances

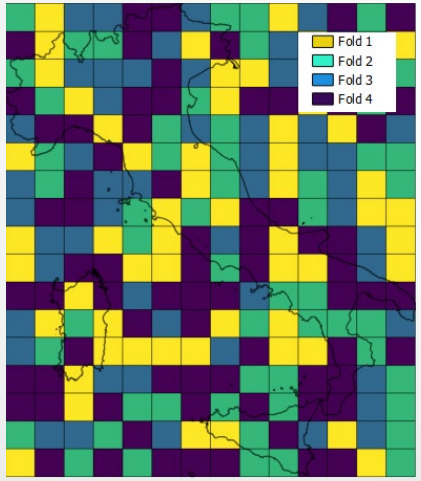
Seasonal models

Summer regime



AUC: 0.93
MSE: 0.10

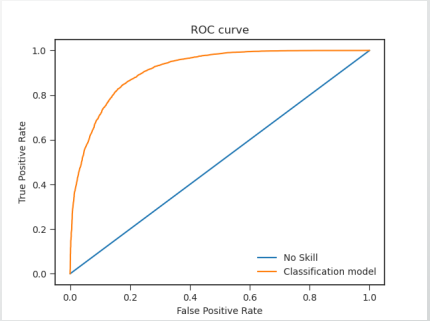




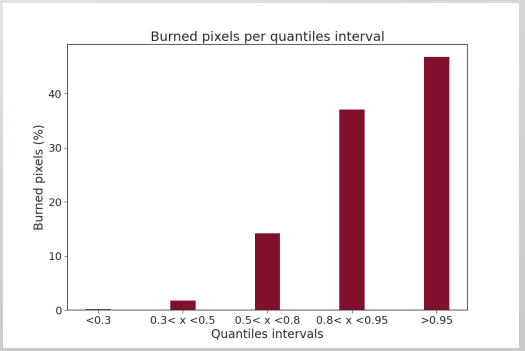
AUC spatial cross validation

fold 1	fold 2	fold 3	fold 4
0.84	0.81	0.89	0.87

Winter regime

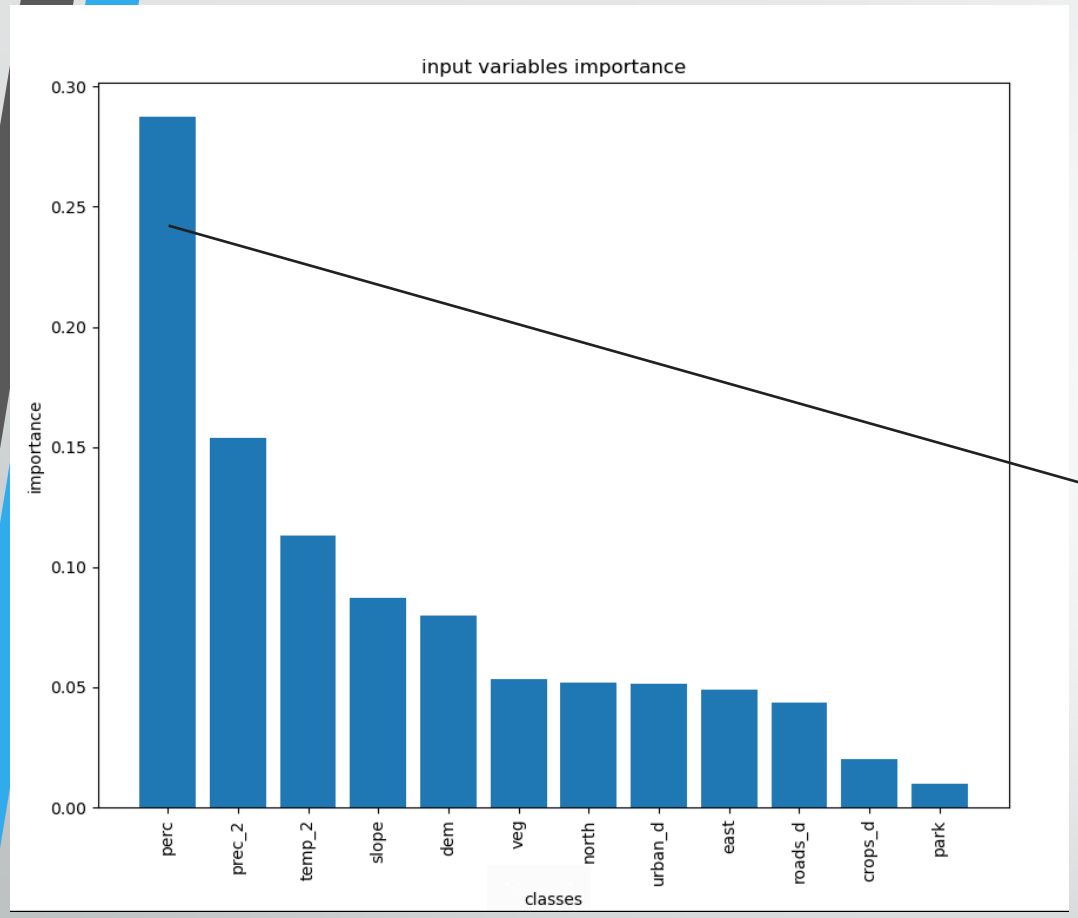


AUC: 0.91
MSE: 0.12

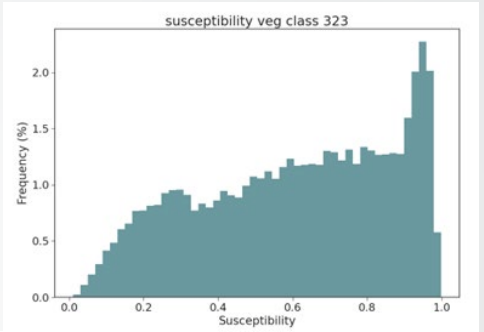


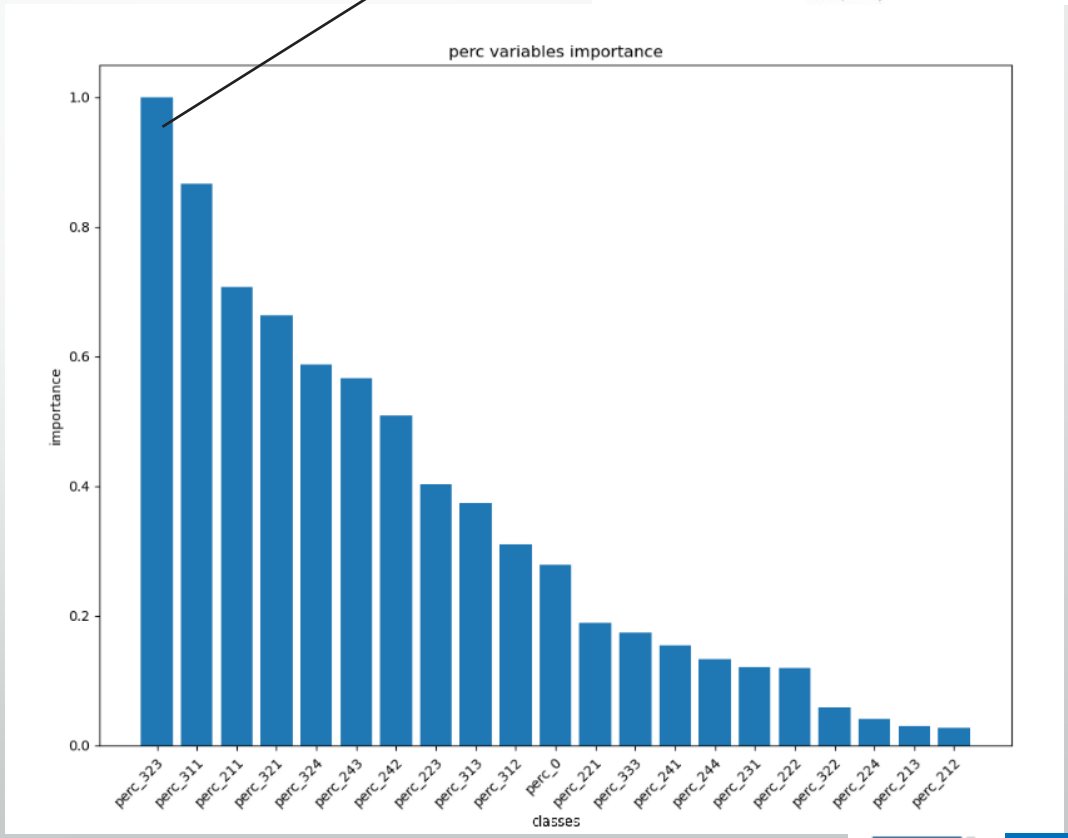
fold 1	fold 2	fold 3	fold 4
0.85	0.80	0.84	0.83

The model performances - variables importance



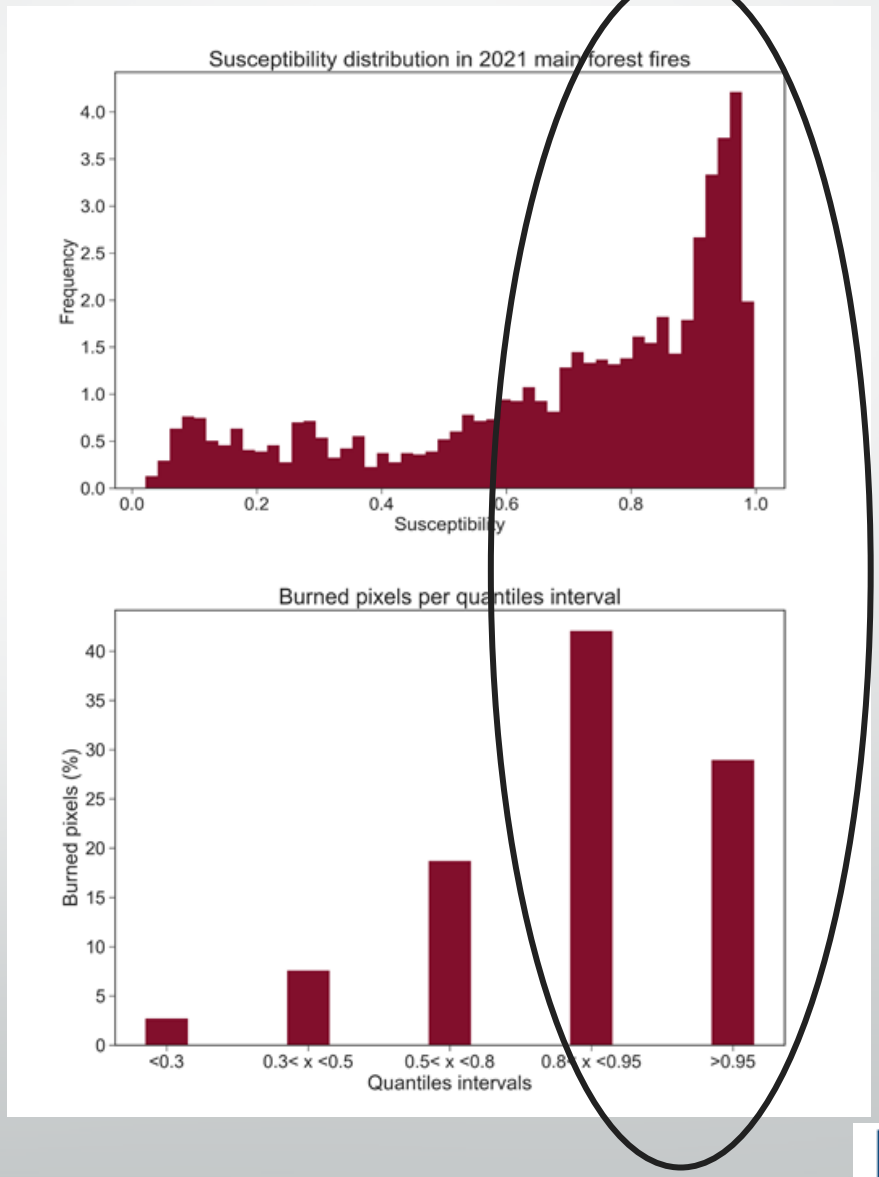
Sclerophyllous vegetation





The validation

Main **2021** burned areas: data unseen by the ML model



High performance: High susceptibility values inside the burned areas

Thanks for the attention

Reference
Trucchia, A.; Meschi, G.; Fiorucci, P.; Gollini, A.; Negro, D. Defining Wildfire Susceptibility Maps in Italy for Understanding Seasonal Wildfire Regimes at the National Level. *Fire* **2022**, *5*, 30