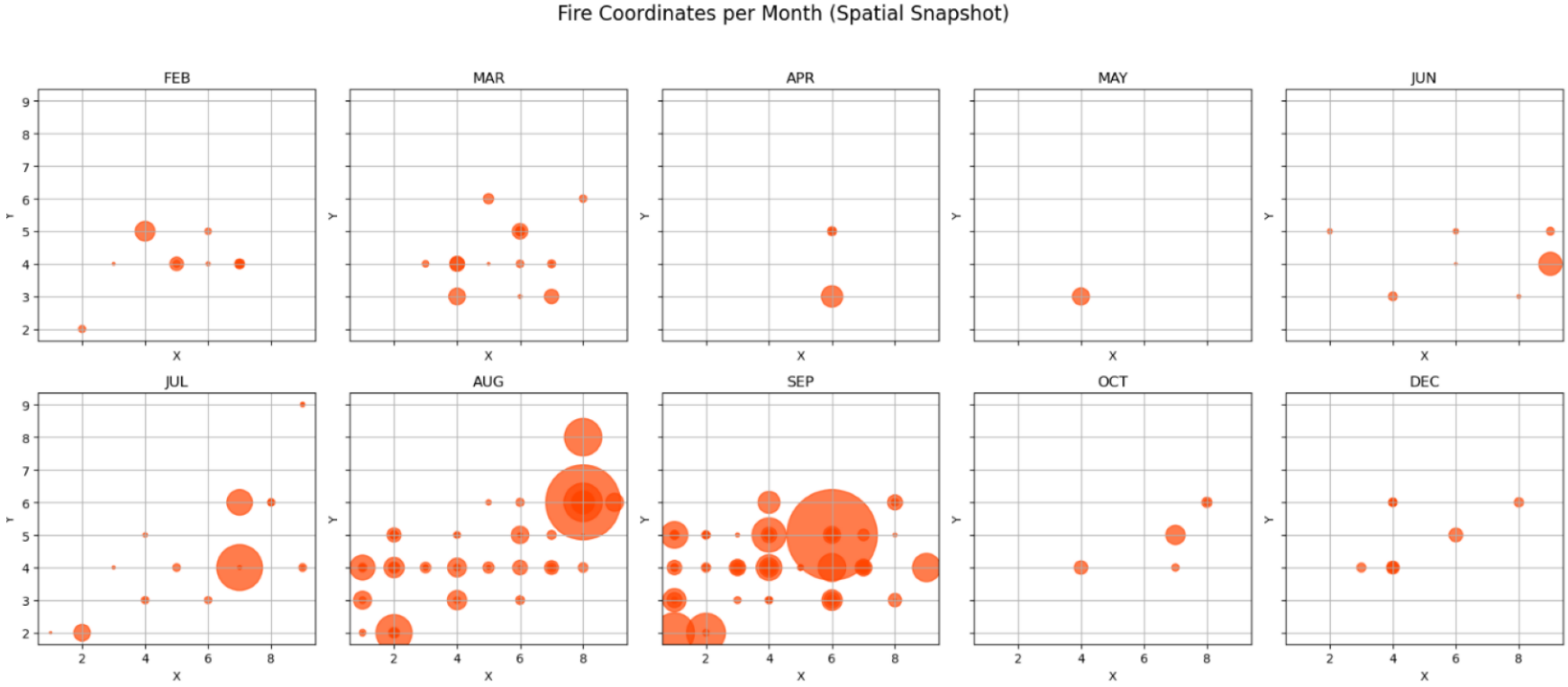
Fire Coordinates per Month (Spatial Snapshot)
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
DEC
X
Y

On the Limitations of Predictive Modeling for Forest Fire Area in the Absence of Fuel Information

This note investigates the predictive modeling of burned forest area using meteorological and fire-weather variables. While traditional approaches treat the problem as a regression or probabilistic task, a spatial-temporal analysis reveals that fire propagation at a given coordinate follows a one-time stochastic transition likely governed by fuel exhaustion. Without explicit observability of fuel conditions, both deterministic and stochastic predictive models are fundamentally constrained. We propose a reframing of the task as a partially observable, state-transition process.

The fire process is stochastic, but not fully observable. Key latent variables such as fuel load, vegetation type, and moisture retention are missing from the dataset. As a result, the process exhibits irreversible transitions and absorbing states after significant burns. Any modeling of fire area without accounting for these underlying dynamics is physically and statistically ill-posed.

This insight highlights the importance of state-based modeling and spatial diagnostics when evaluating natural phenomena. Environmental conditions enable ignition, but the quantity of burnable material determines fire magnitude—information which is unavailable in the current dataset. Therefore, what superficially appears as a regression task is, in fact, a complex, underdetermined stochastic process.