

A photograph of a small propeller-driven aircraft flying from right to left, leaving a thick, red smoke or fire retardant trail across a hazy sky. The aircraft has 'ZB' written on its vertical stabilizer and 'N662DB' on its fuselage. Below the aircraft, a hillside is visible with dark smoke rising from its base, suggesting an active wildfire.

ClassiFire

Predicting Fire Complexity Levels

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Background

- Data scientist
- Environmental Studies
- Summer in Boulder



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Aug 7 2021



Agenda

- Business Problem
- Data Understanding
- Models
- Evaluation and Next steps

Business Problem

03

- Risks and Dangers
- Why fire complexity levels
- Our Solution

CRITERIA

1. SIZE
2. THREAT TO
LIFE & PROPERTY
3. POLITICS
4. ORGANIZATIONAL
COMPLEXITY
5. JURISDICTIONS
6. VALUES AT RISK
7. FIRE BEHAVIOR
8. STRATEGY & TACTICS
9. AGENCY POLICY



DATA UNDERSTANDING

04

Timeline:

2014-2023

Location:

Contiguous USA

Cleaned Size:

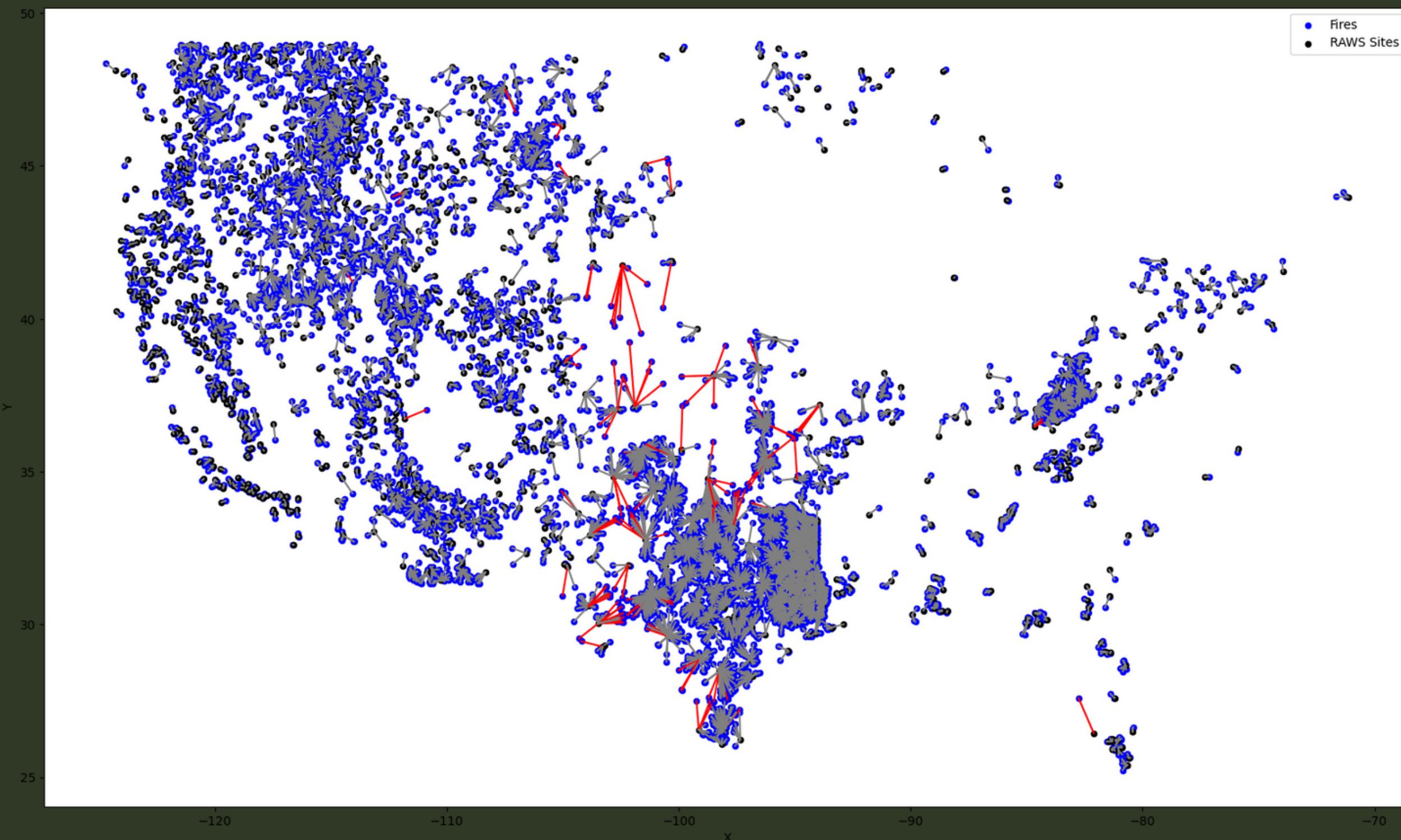
7731 fires

RAWS:

Meteorological features

NIFC:

Wildfire occurrences



Sources:

<https://data-nifc.opendata.arcgis.com/datasets/nifc::wildland-fire-incident-locations/about>

<https://data-nifc.opendata.arcgis.com/datasets/nifc::public-view-interagency-remote-automatic-weather-stations-raws/about>

<https://raws.dri.edu/>

TARGETS

05

Type 5 Incident:

- lowest class
- local resources
- 2-6 firefighters
- quickly contained
- low impact risk

Type 4 Incident:

- Local resources
- low impact risk
- slight increase in scale compared to Type 5

Type 3 Incident:

- Mix of local and regional resources used
- increased scale and risk
- action plan created

Type 2 Incident:

- large scale 200+ firefighters
- Many units required
- regular planning and briefing

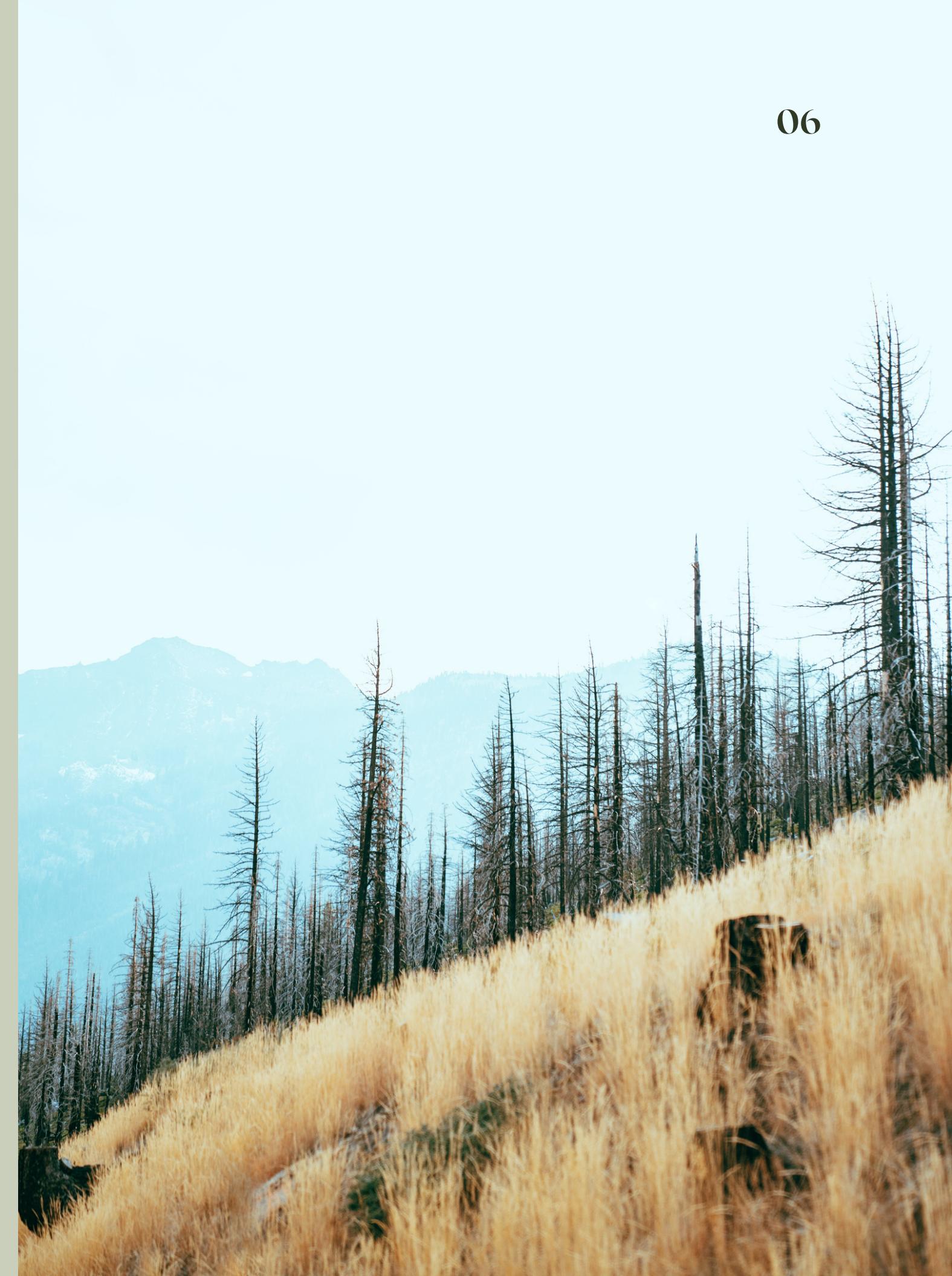
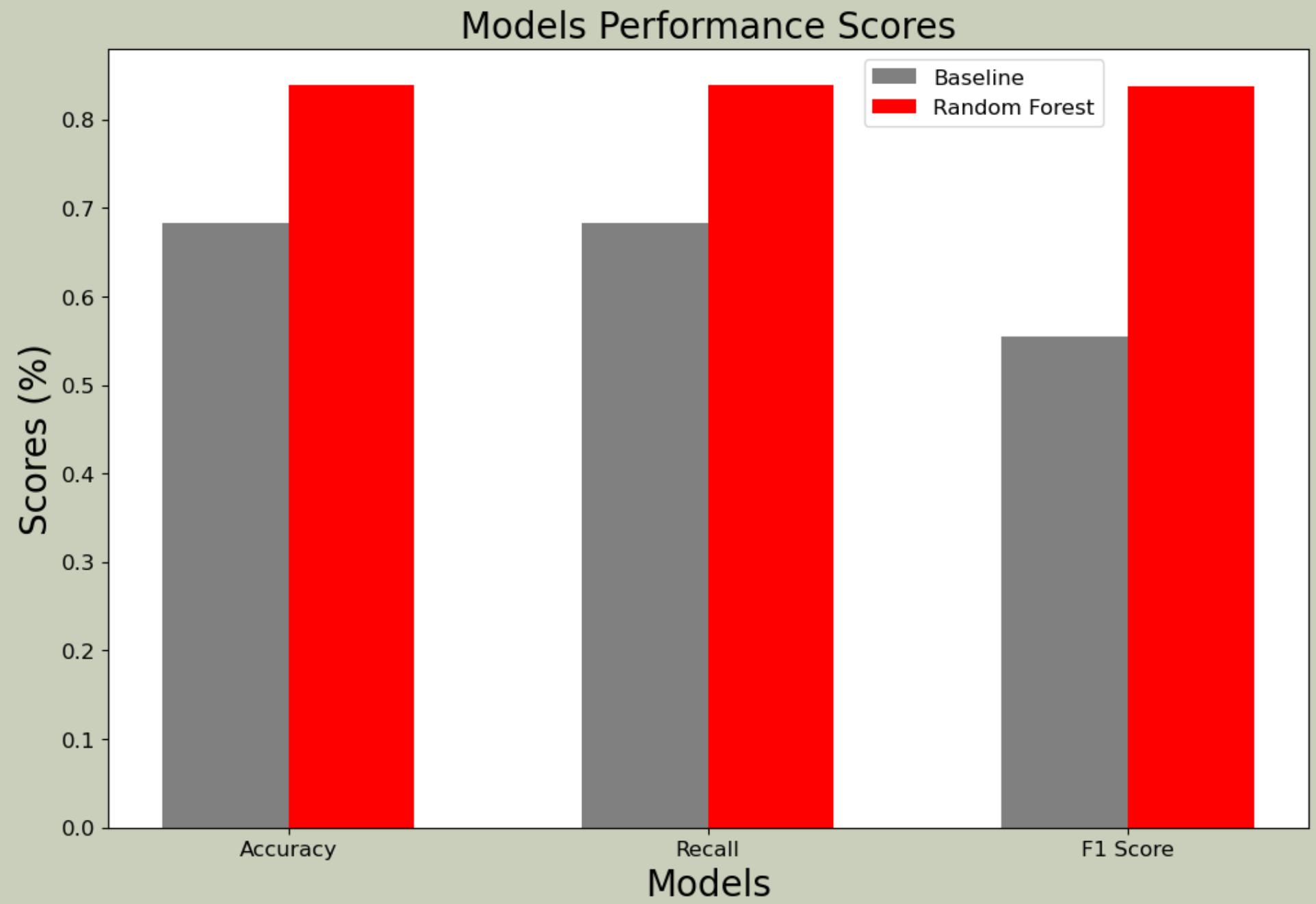
Type 1 Incident:

- highest class
- Same characteristics of type 2 incident
- 500+ firefighters
- aircraft and aviation is used
- Greater access to resources
- larger scale and impact

— Models

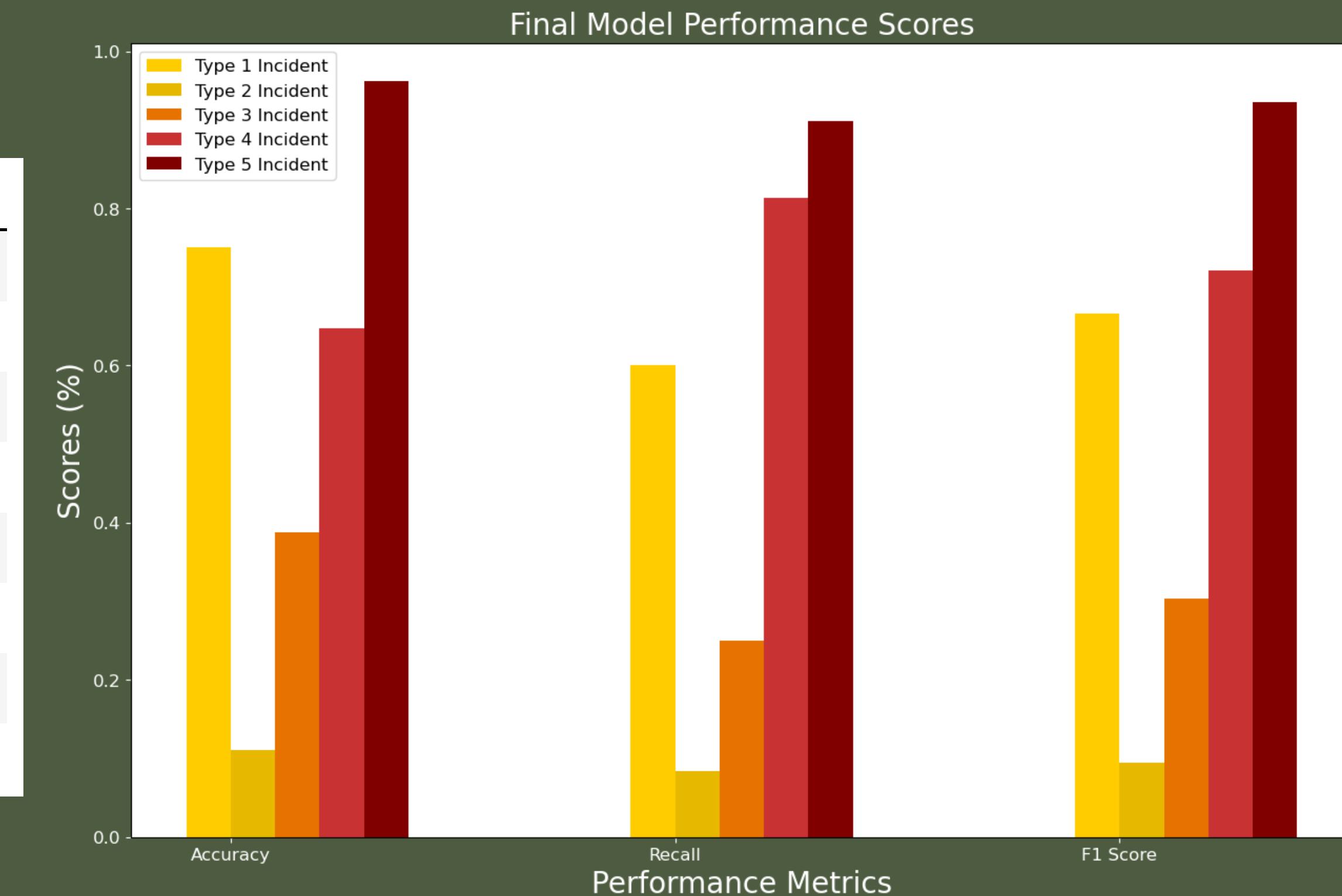
06

- Dummy Classifier
- Decision Tree
- Random Forest

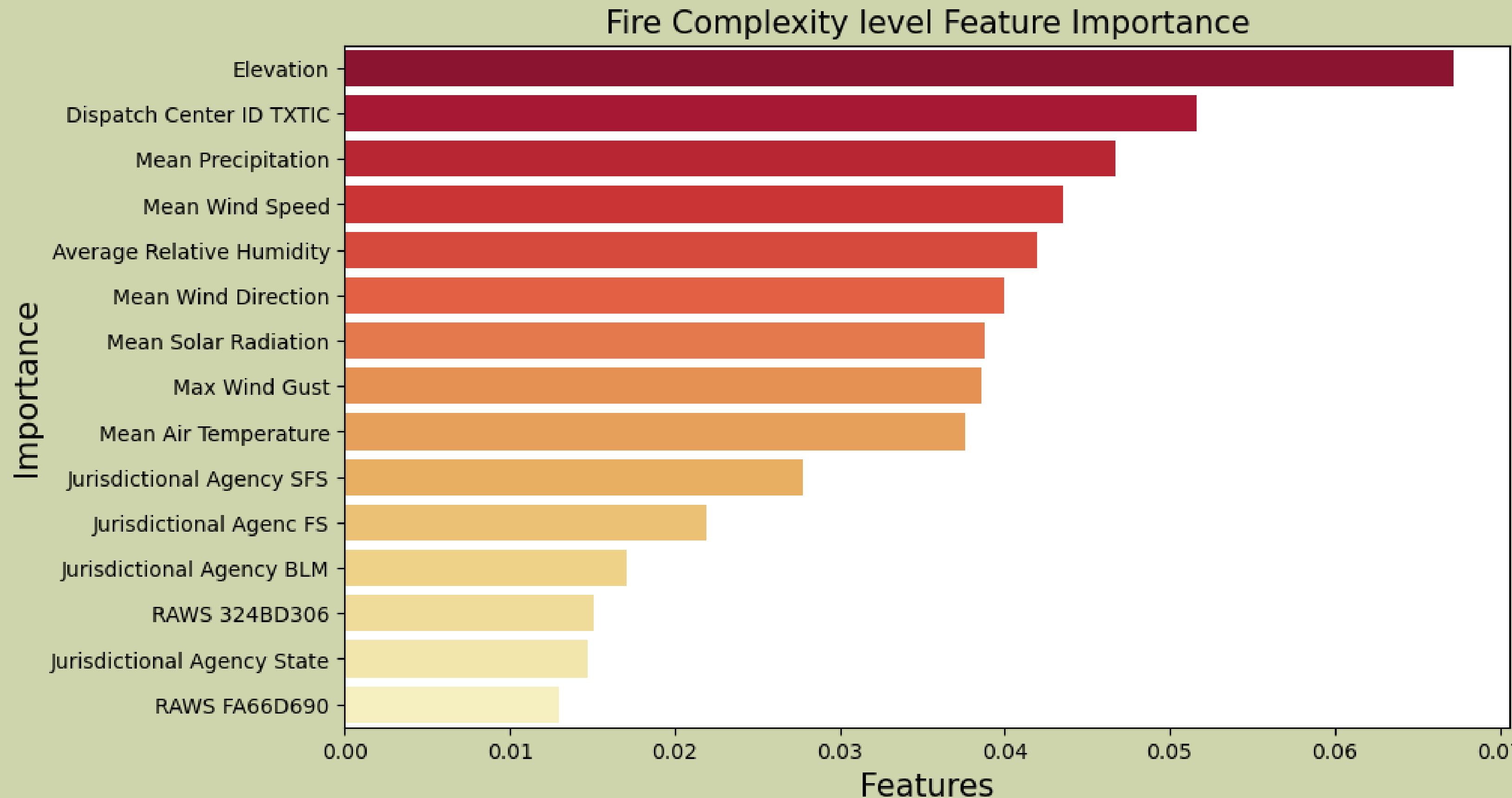


Model - ClassiFire

Complexity level	precision	recall	f1-score	support
Type 1 Incident	0.75	0.60	0.67	10
Type 2 Incident	0.11	0.08	0.10	12
Type 3 Incident	0.39	0.25	0.30	124
Type 4 Incident	0.65	0.81	0.72	467
Type 5 Incident	0.96	0.91	0.94	1320
accuracy			0.84	1933
macro avg	0.57	0.53	0.54	1933
weighted avg	0.84	0.84	0.84	1933

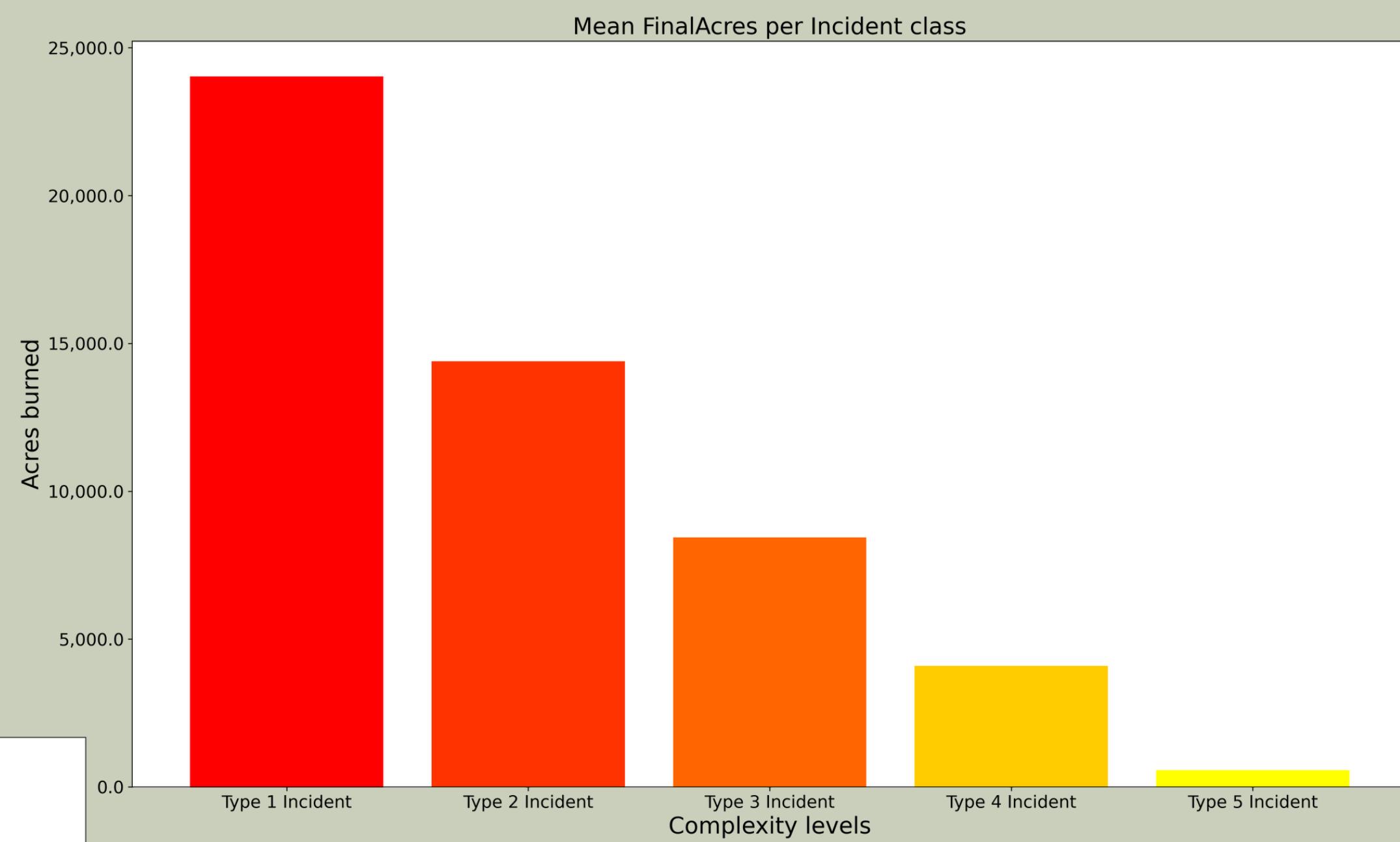
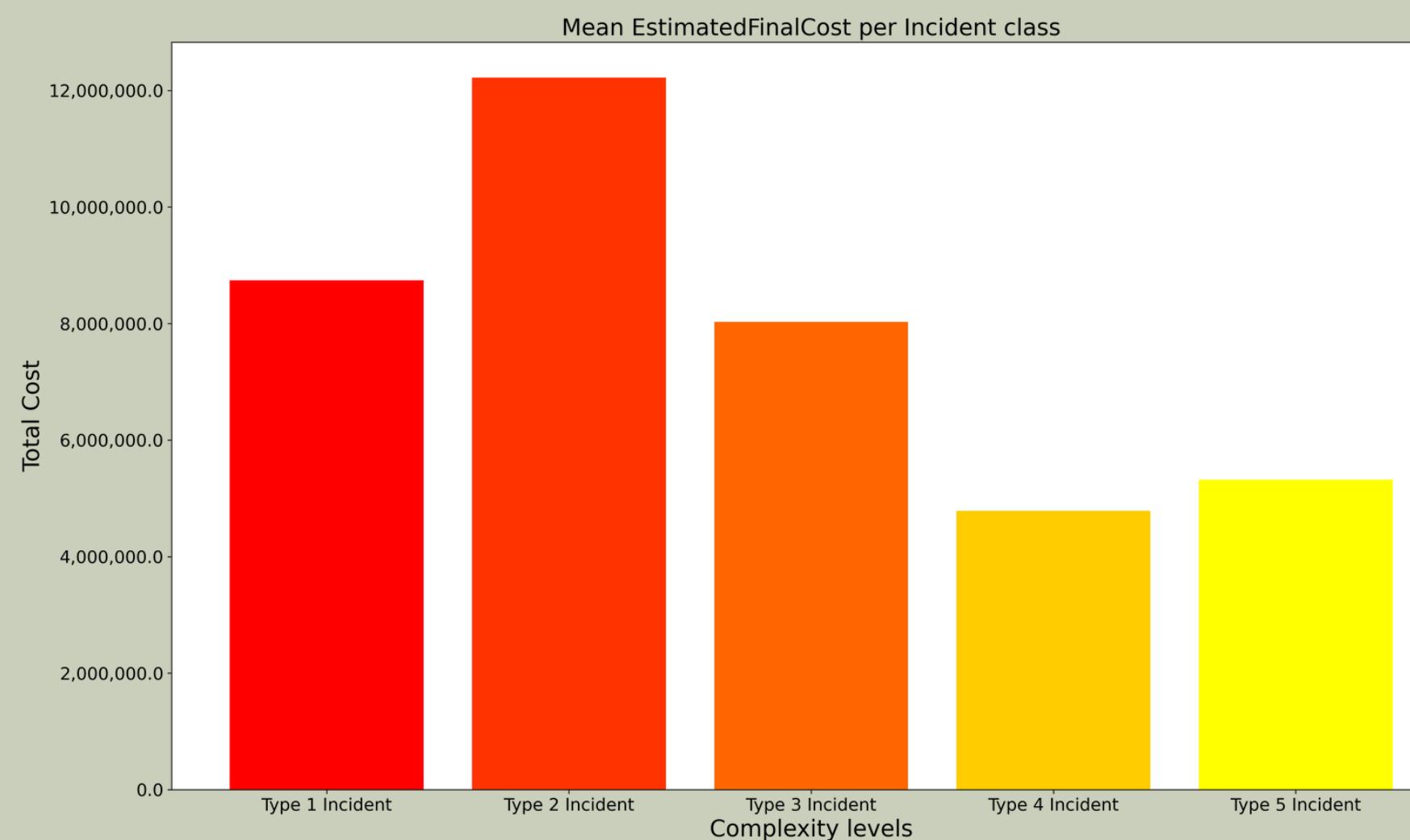


Feature Importance

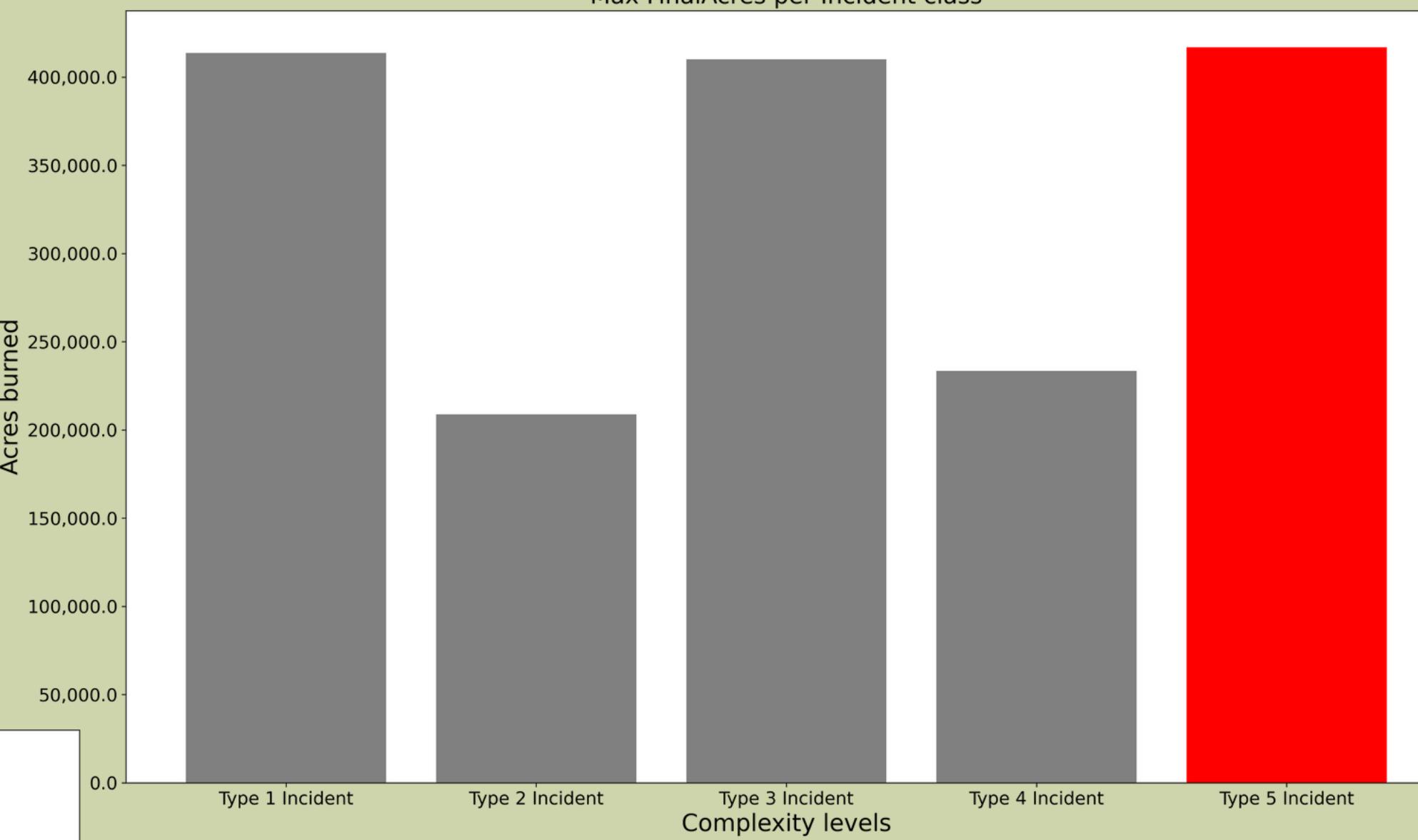
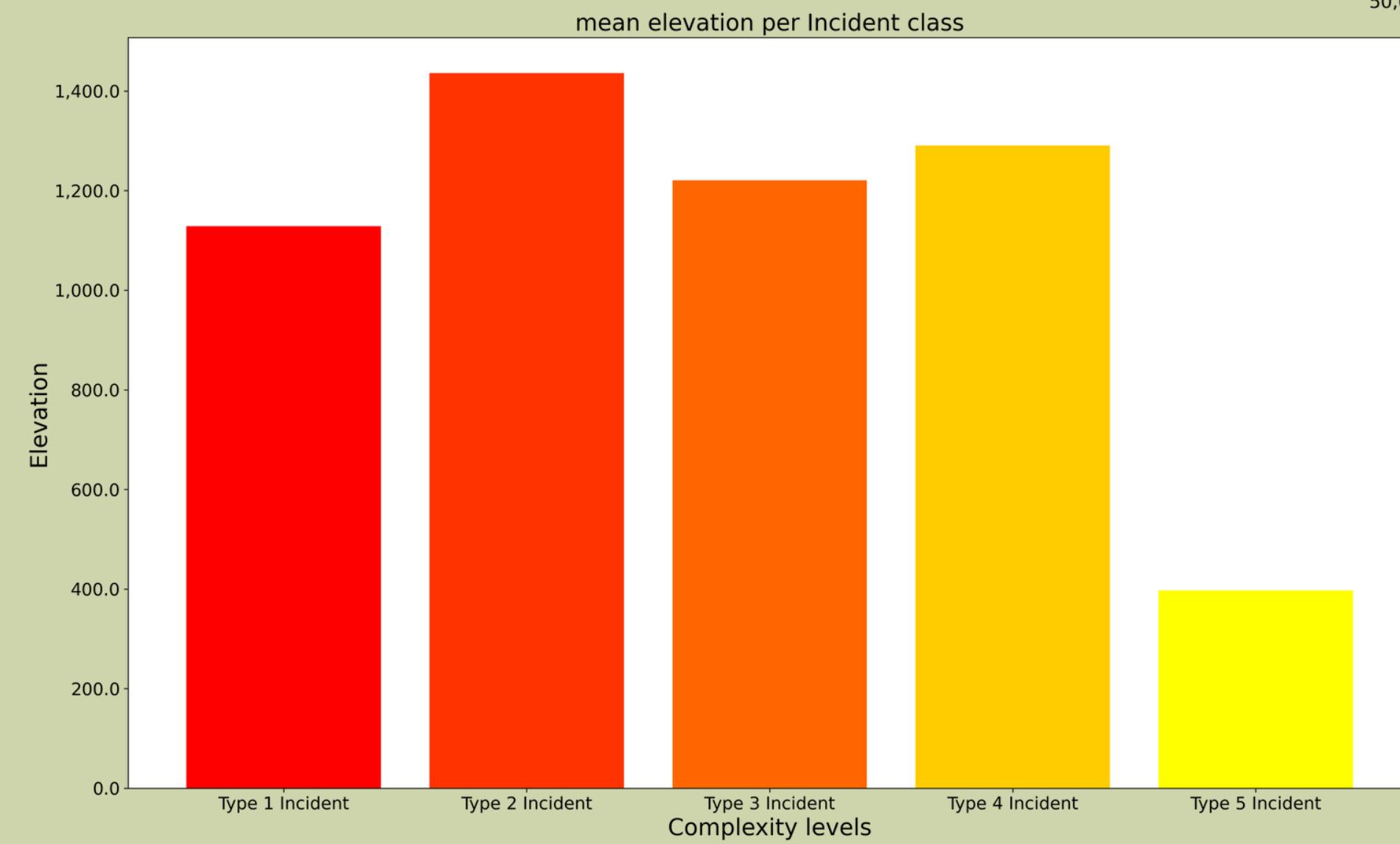


Conclusion

- Effective at levels 1, 2, and 5
- Risks associated with the target



Conclusion



NEXT STEPS

- Deployment
 - Improving RAWS selection
 - Collect more data
 - Model implementation
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A wide-angle photograph of a landscape at sunset. The foreground is a lush green grassy field. In the middle ground, there is a cluster of dark evergreen trees. Beyond them, a range of mountains is visible against a sky filled with dramatic, colorful clouds. The clouds are illuminated from below by the setting sun, showing shades of orange, yellow, and pink. The overall atmosphere is peaceful and scenic.

THANK YOU