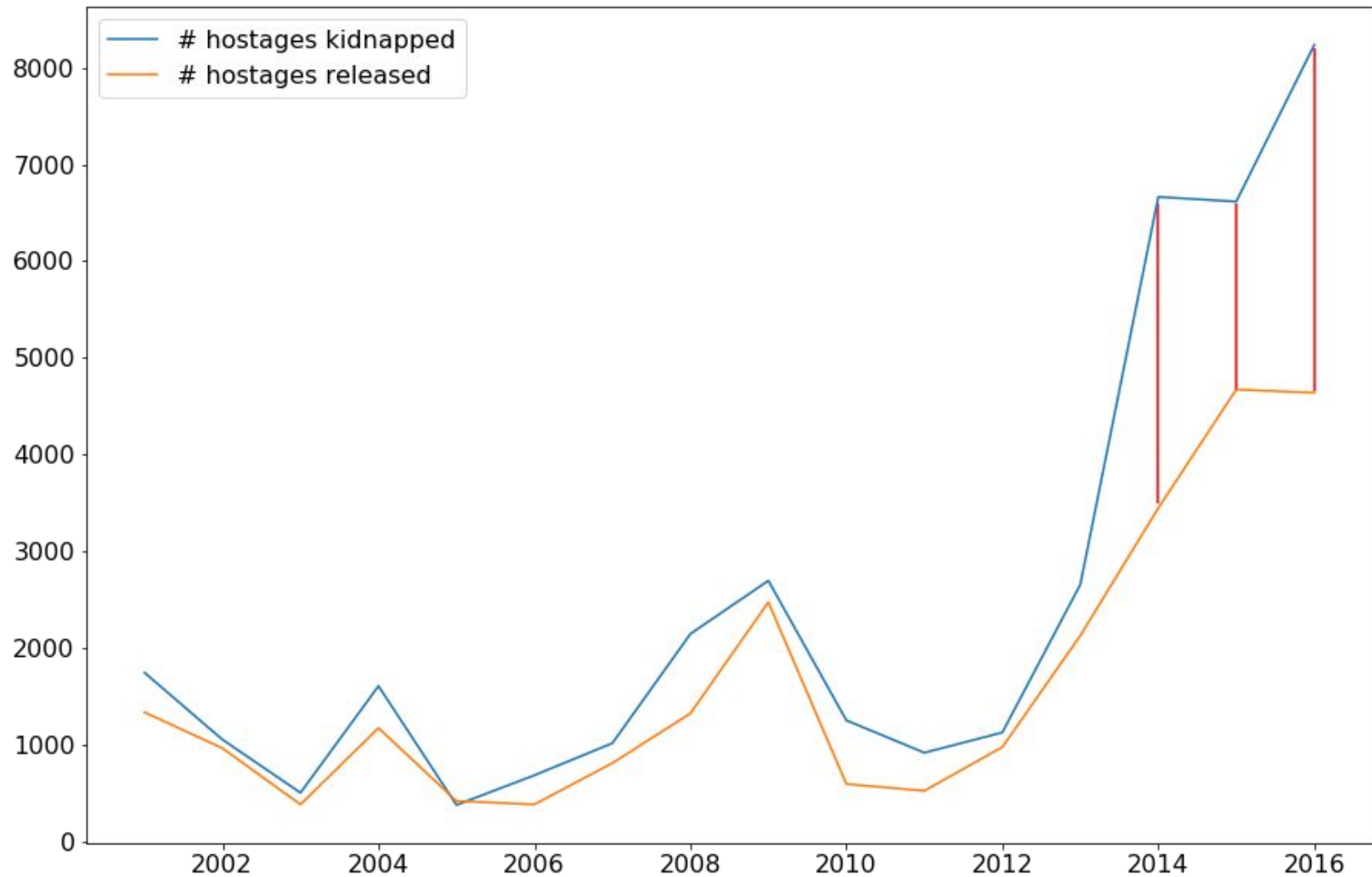


# Will they survive?

Another cheery presentation,  
Brought to you by Terror Inc.

jon kislin  
nyc18\_ds14  
project  
mcnulty

The rise of ISIS and Boko Haram?



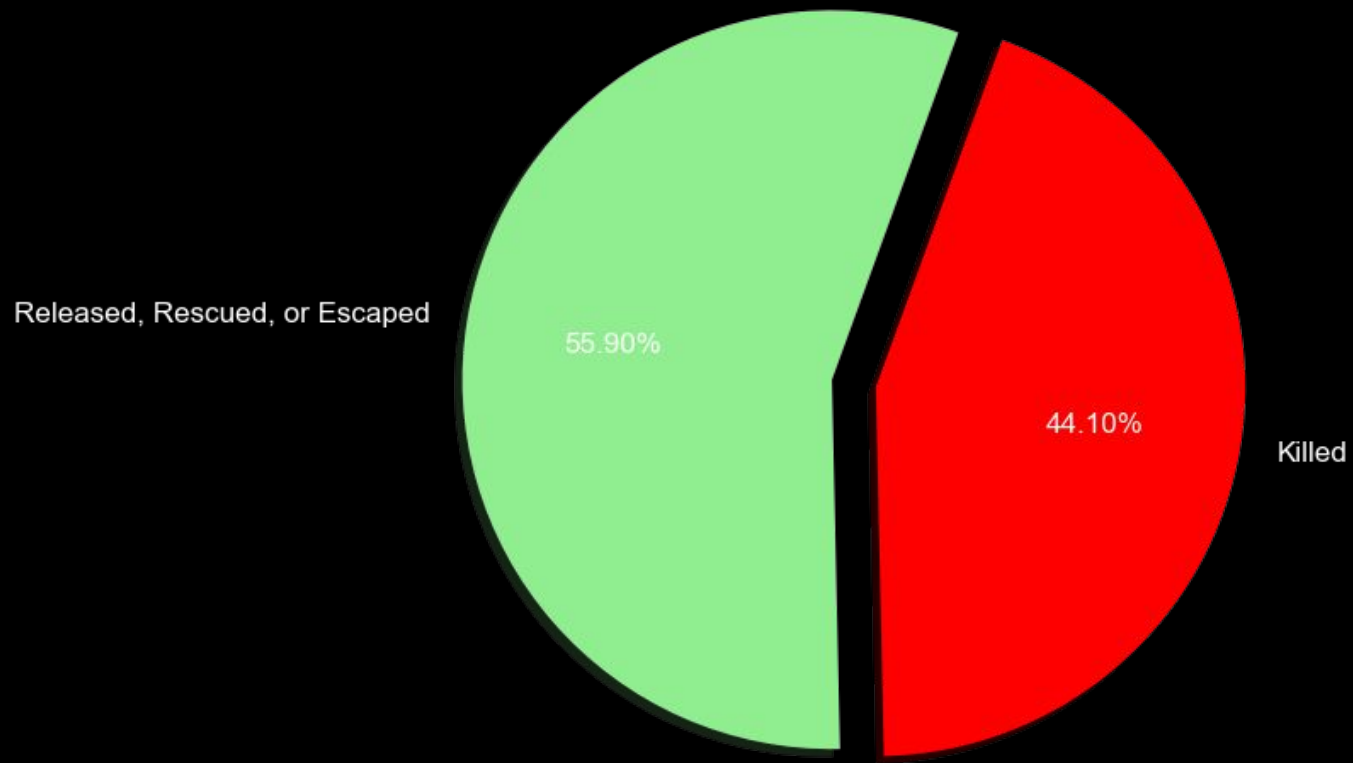
## **Machine learning question:**

Can we correctly classify the  
outcomes of hostage situations?

## **Practical problem:**

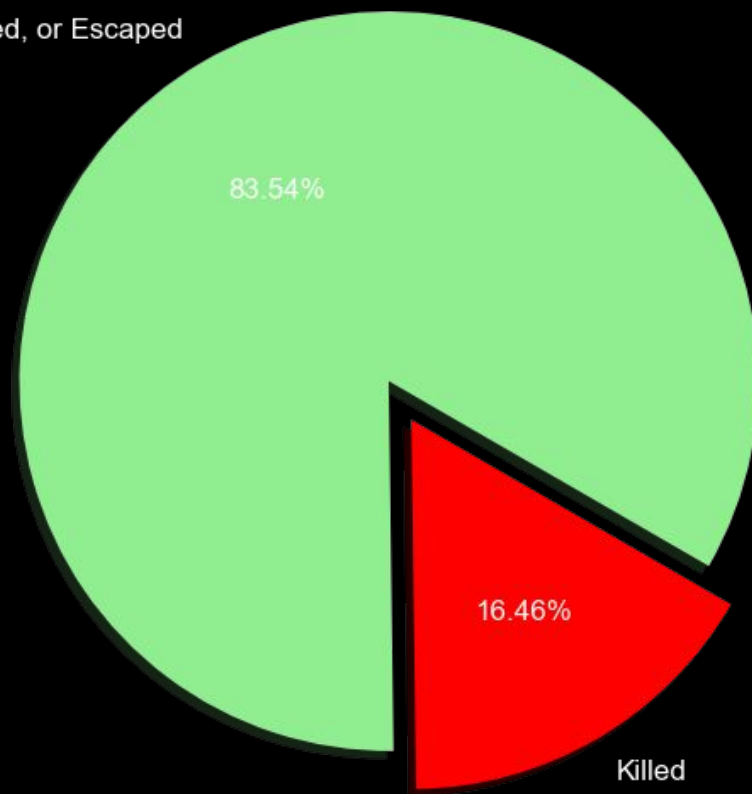
Can we predict the outcomes  
*during the event?*

### Outcomes when ransom NOT demanded



## Outcomes when ransom demanded

Released, Rescued, or Escaped



Killed

## “Kitchen Sink” Model

General prediction made on  
all information in dataset

(attempt to answer  
**Machine learning  
question**)

## Hypothesis Model

What would be available to  
negotiators / law  
enforcement?

(attempt to answer  
**Practical problem**)

# Features in Hypothesis Model

Country?

Type of target?

Month of attack

Year of attack

*Ransom demanded?*

Extended incident?

Number of hostages

# Features in “Kitchen Sink” model

All in hypothesis model, plus:

Victim nationalities,

Hostage-takers’ group affiliation

Number of h-t’s killed

Day of the month

Part of larger attack?

Terrorist criteria

# Hypothesis Decision Tree Model

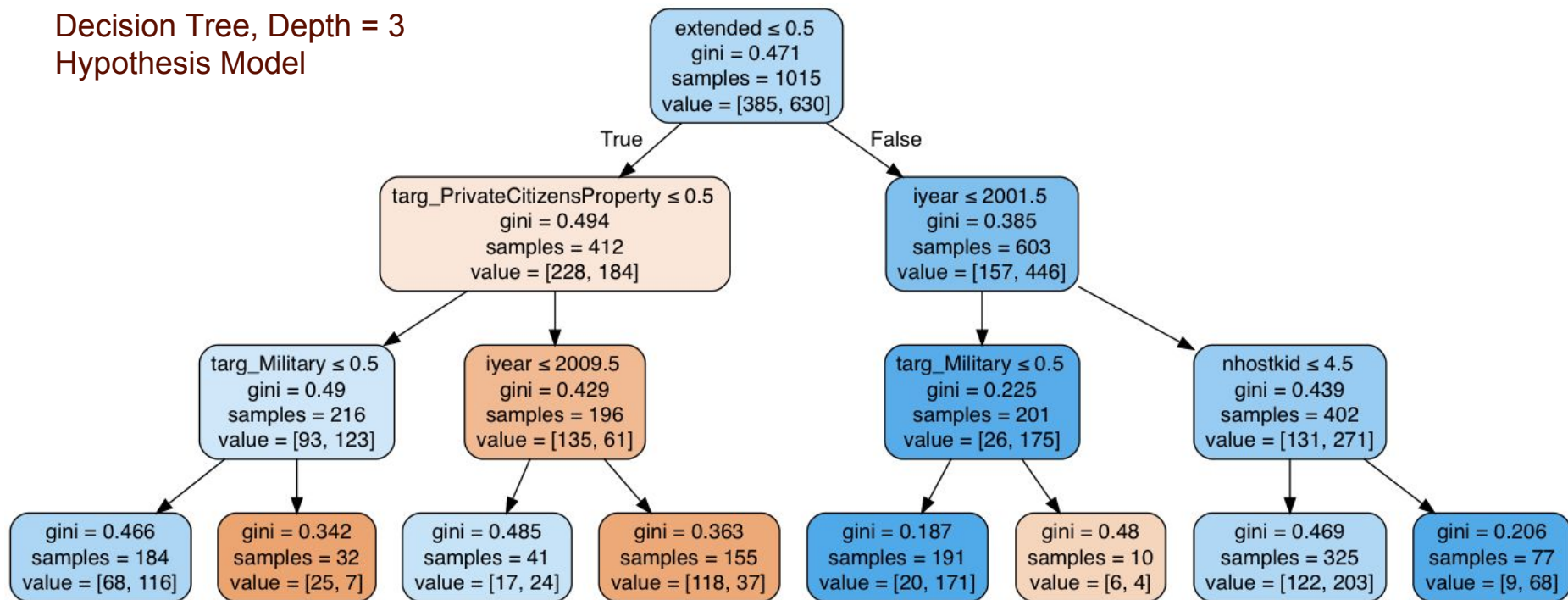
## Relative Feature Importances

Depth 3	
Extended event?	.366
Year of situation	.232
Business target?	.141
Private Property	.127
Police target?	.058
<b><i>Ransom demanded?</i></b>	<b>.055</b>
Num hostages	.021

Depth 5	
Extended event?	.242
Year of situation	.168
Num hostages	.120
In Iraq?	.096
Business target?	.093
Private target?	.084
Police target?	.039

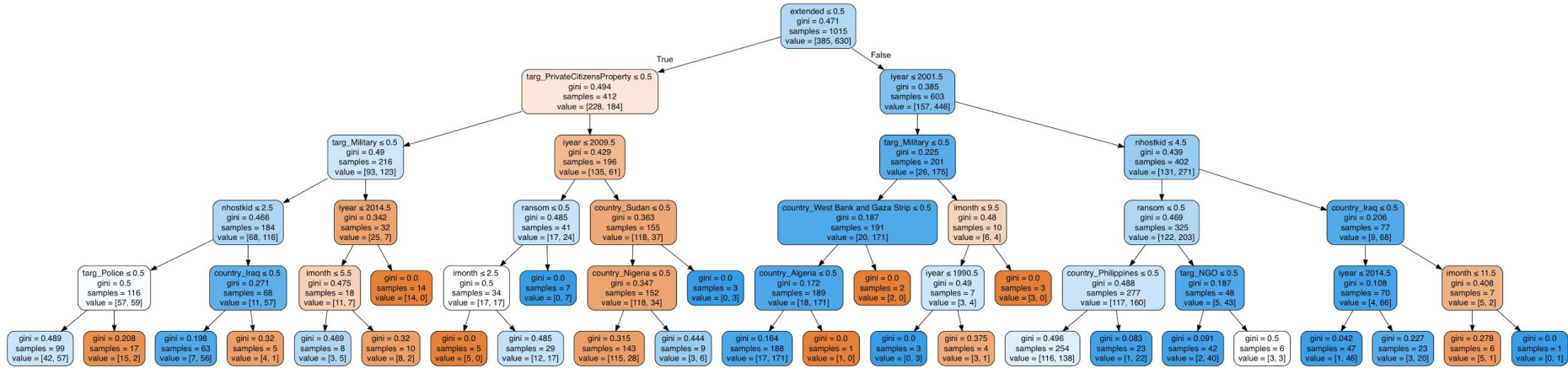


## Decision Tree, Depth = 3 Hypothesis Model



	Precision	Recall	F1 Score
Killed	57%	66%	61%
Released/Rescued	77%	70%	73%

# Decision Tree, Depth = 5 Hypothesis Model



<b>Classification Report</b>	Precision	Recall	F1 Score
Killed	65%	63%	64%
Released/Rescued	78%	80%	79%

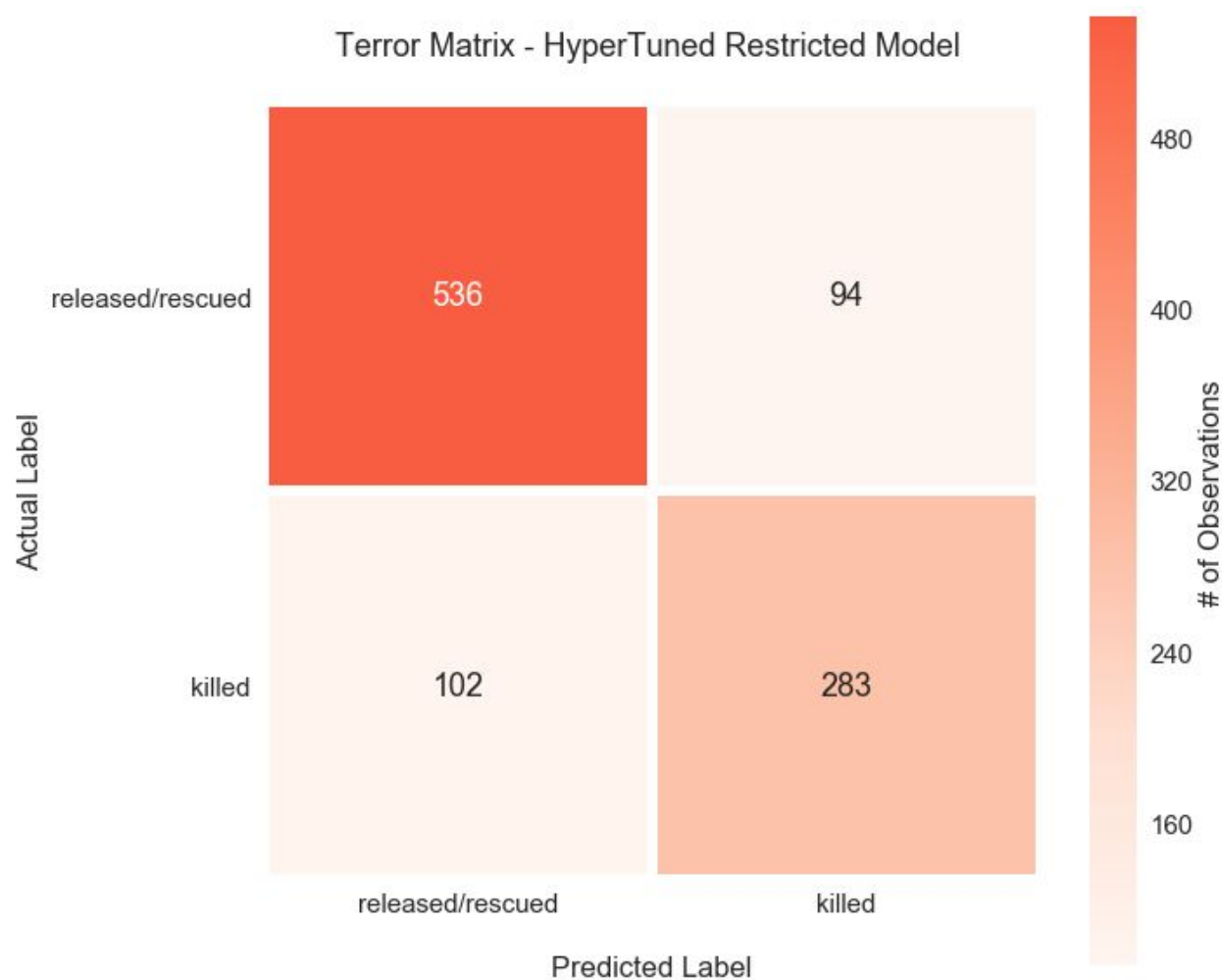
# Tuned Random Forest Models

Hypothesis Model	
year	.144
Num hostages	.096
Extended?	.091
Private target?	.077
Iraq?	.070

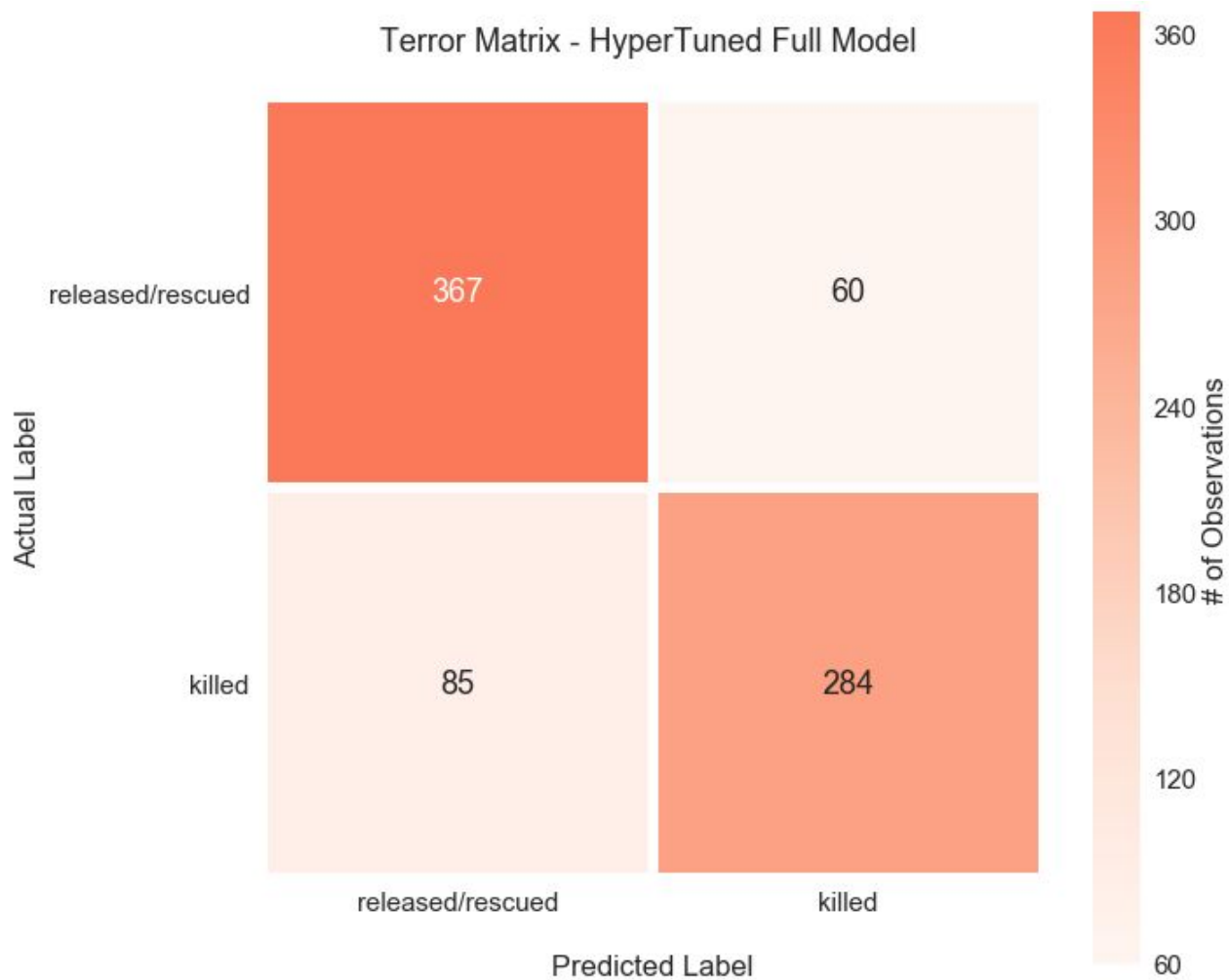
Full Model	
Num hostages?	.073
year?	.052
Day of month?	.047
Private target?	.045
Extended?	.044

<b><i>Classification Report</i></b>	Precision	Recall	F1 Score
Killed	75% to 84%	73% to 77%	74% to 80%
Released/Rescued	84% to 82%	85% to 87%	84% to 84%

Terror Matrix - HyperTuned Restricted Model



Terror Matrix - HyperTuned Full Model



# Assumptions and Limitations

## Assumptions

1. Use of Model won't adversely affect results / causal inferences for humanly modifiable feature levels.
2. Rescued vs Released vs Escaped outcomes aren't meaningfully different

## Limitations

1. Detailed ransom information almost entirely missing
2. "Released", "killed" only available at event level, not hostage level
3. Not all hostage situations available - only those that meet "terrorism" criteria.
4. Hard to tell what factors should be isolated by negotiators and law enforcement as meaningful for different classes of outcomes (RF)

Thank you!