The Global Terrorism Preparedness Model

An interactive tool to enhance threat preparedness

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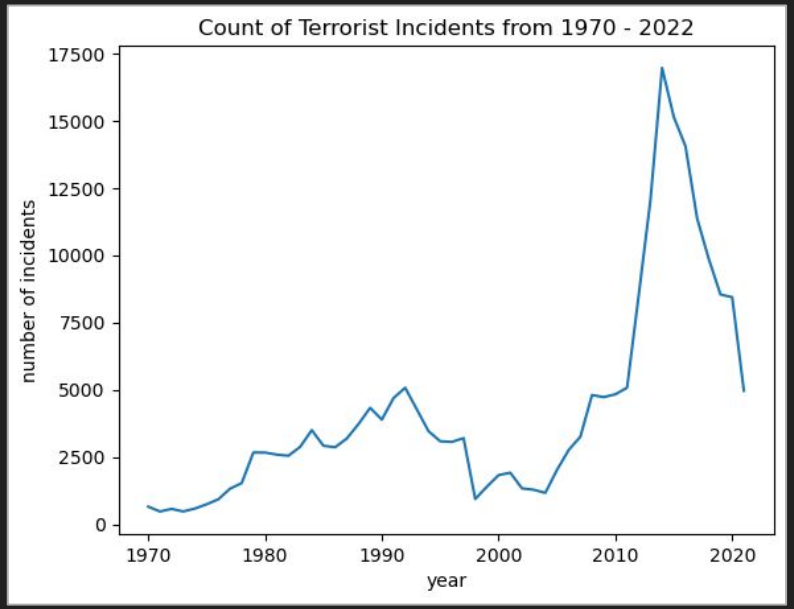
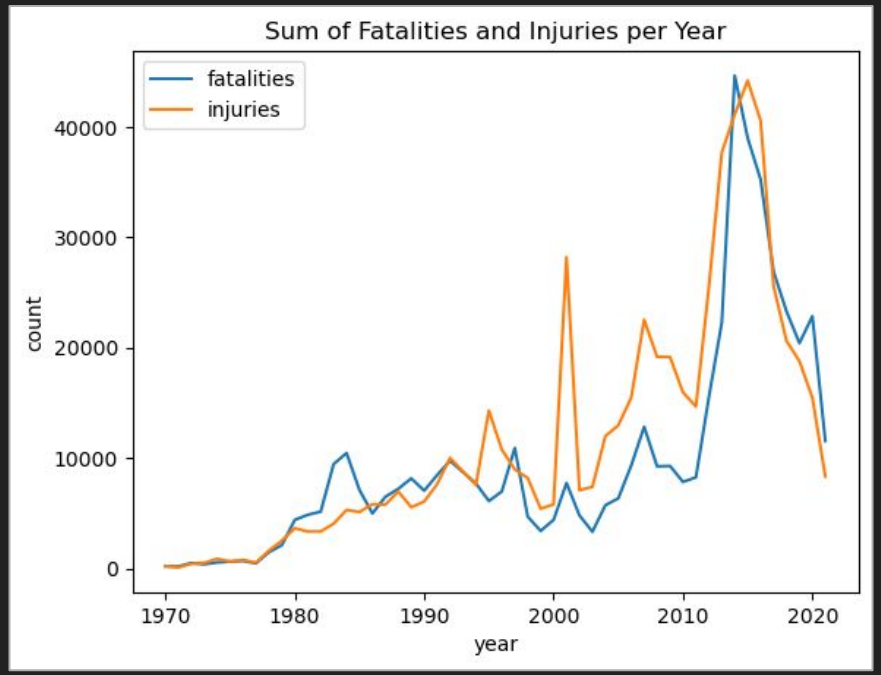
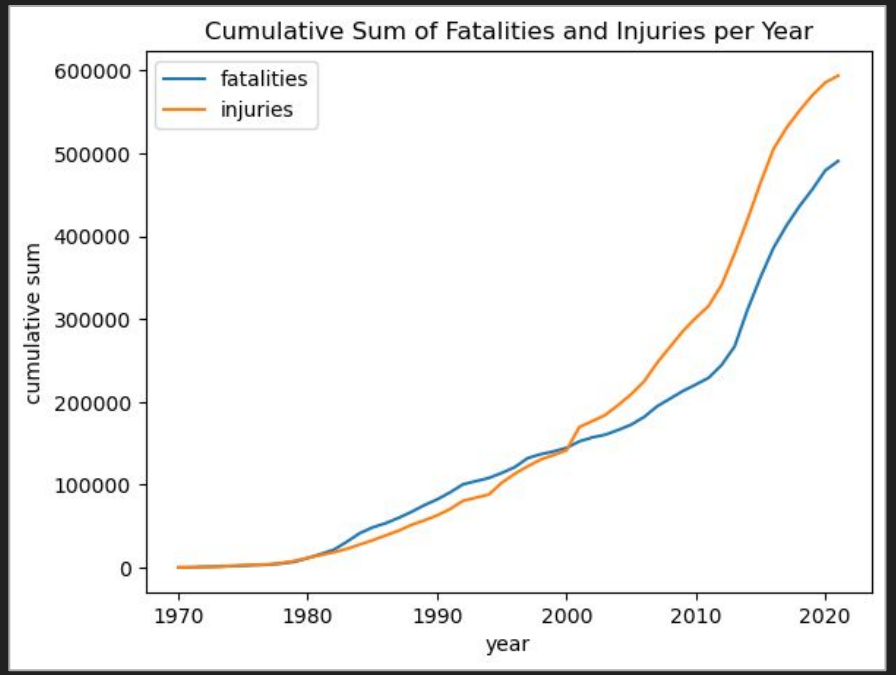
What Are We Dealing With?

***Terrorism**: the threatened or actual use of illegal force and violence by a nonstate actor to attain a political, economic, religious, or social goal through fear, coercion, or intimidation.*

- The incident must be intentional.
- The incident must entail some level of violence or immediate threat of violence.
- Perpetrators must be sub-national actors.




Sum of Fatalities and Injuries per Year
fatalities
injuries
count
year
0
10000
20000
30000
40000
1970
1980
1990
2000
2010
2020


Cumulative Sum of Fatalities and Injuries per Year
fatalities
injuries
cumulative sum
year
0
100000
200000
300000
400000
500000
600000
1970
1980
1990
2000
2010
2020

Can we extinguish terrorism once and for all?

No. This ideology doesn’t die.

But if we can predict it, we can prepare for it.

The **Global Terrorism Preparedness Model** can predict probabilities for over TWENTY THOUSAND types of potential terrorist events.

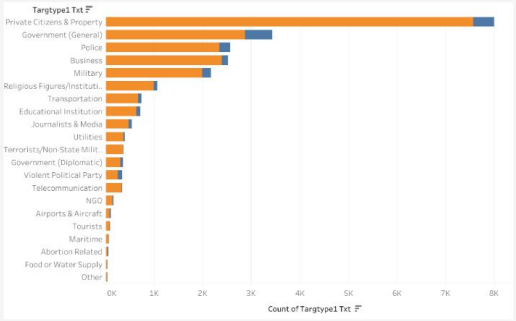
All it needs is an idea.

The Foundation

- Global Terrorism Database (214k)
  - Cleaning
  - Exploration
  - Processing
  - Modeling
  - Implementation

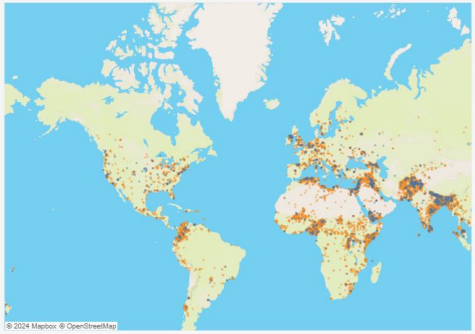
Global Terrorism Database Dashboard

Target Types

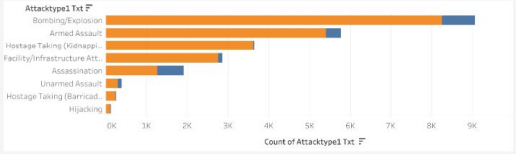


Success
0
1

Success Map



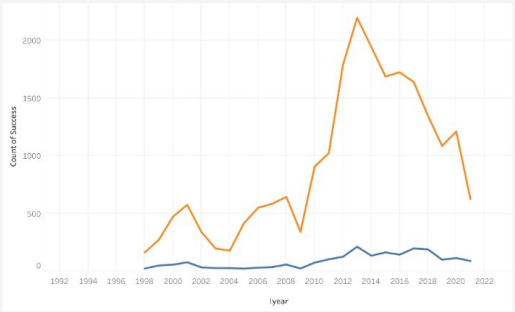
Attack Types



Fatalities
1-5
5-14
15+

Fatality Map

Success Timeline



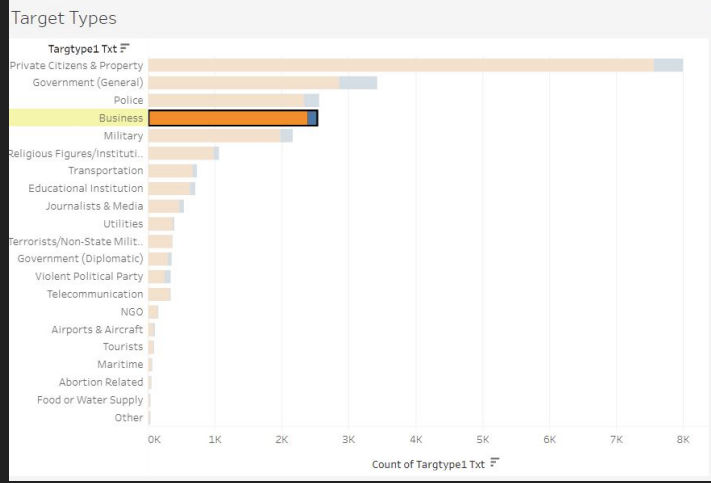
Injuries
1-5
5-14
15-29
30+

Injury Map

View on Tableau Public

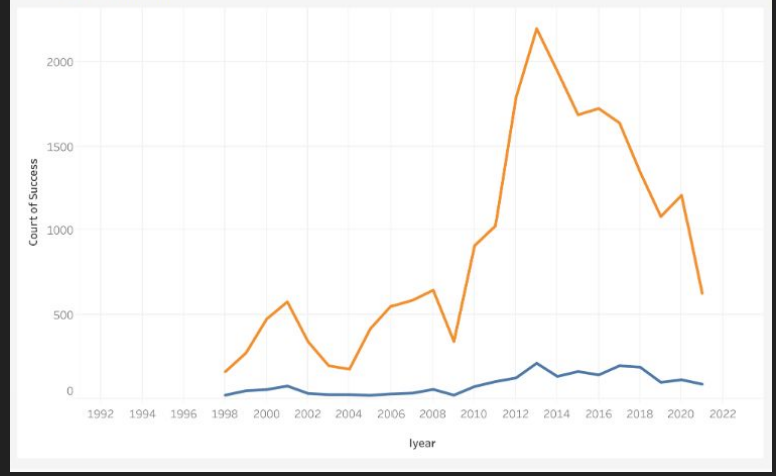
Share

Target Types



Success
0
1

Success Timeline



Motives: Predictive Ideas

“Bank of America was perceived to symbolize the ‘capitalist exploitation of the little man.’”

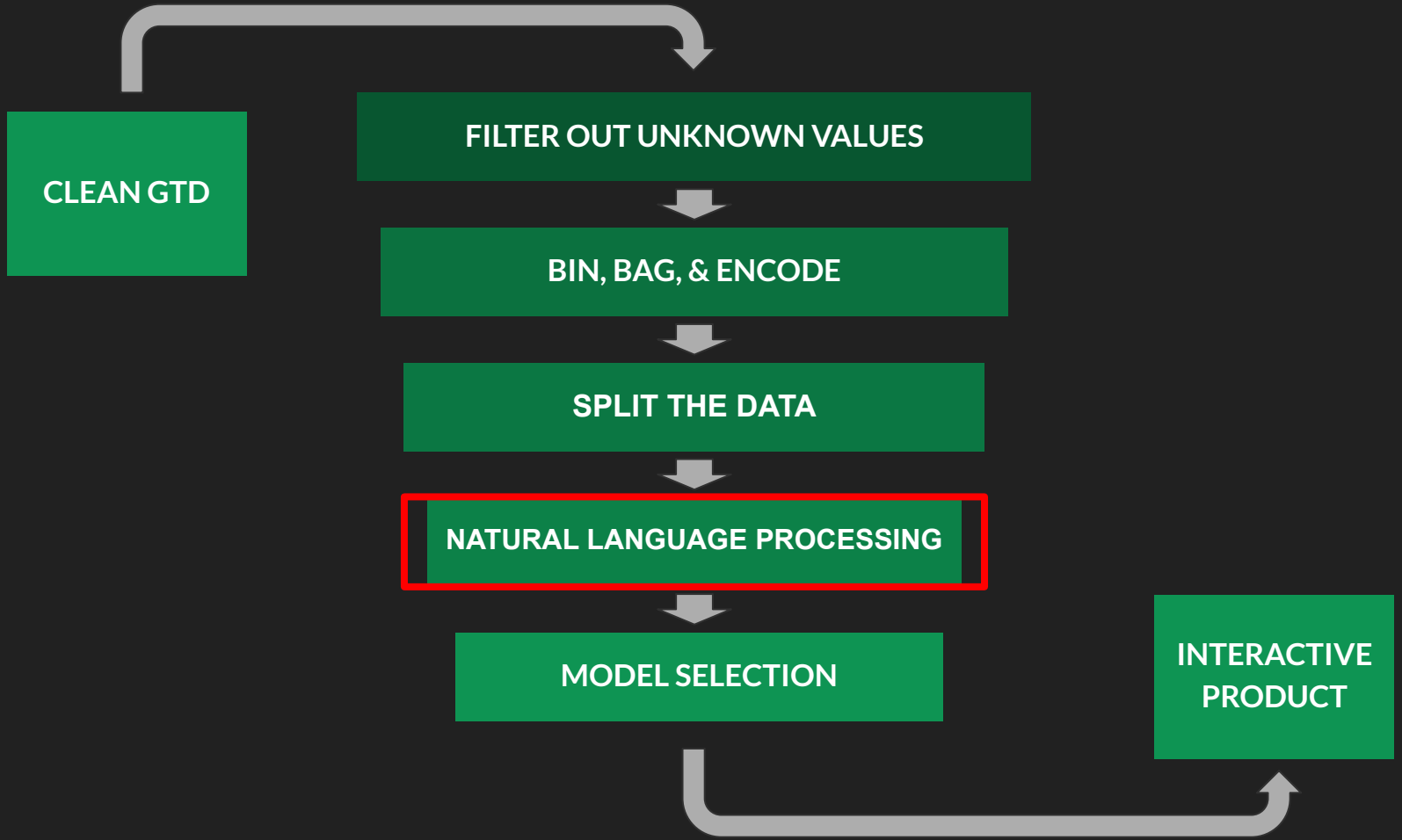
- *Series of bombings on BoA in LA, 1971.*

“To sabotage the upcoming referendum on the charter for peace and national reconciliation.”

- *Armed Assault on random Algerian citizens, 2005.*

“Croatian nationalists were seeking independence of Croatia from Yugoslavia, and wanted the U.S. and West Germany to stop providing economic aid and to break all political and economic ties with Yugoslavia.”

- *Bombing of travel agency in NY, 1979.*


CLEAN GTD
FILTER OUT UNKNOWN VALUES
BIN, BAG, & ENCODE
SPLIT THE DATA
NATURAL LANGUAGE PROCESSING
MODEL SELECTION
INTERACTIVE PRODUCT

Natural Language Processing

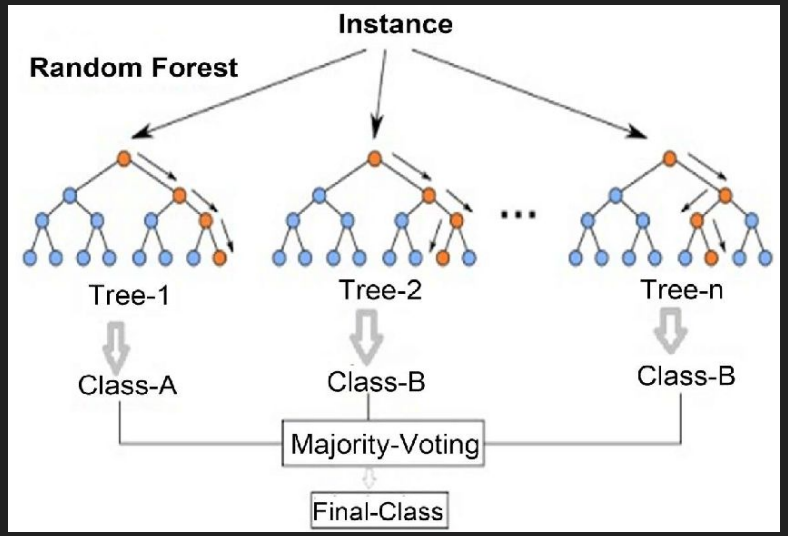
- Tokenizing…
  - [I, am, naturally, processing, this, entire, sentence]
- Lemmatizing…
  - [I, am, natur, proces, this, enti, senten]
- Vectorizing…
  - *Term Frequency - Inverse Document Frequency*
  - natur - 1, proces - 1, enti - 1, senten - 1
  - natur - 0.94, proces - 0.0, enti - 0.21, senten - 0.69

Creating a Model

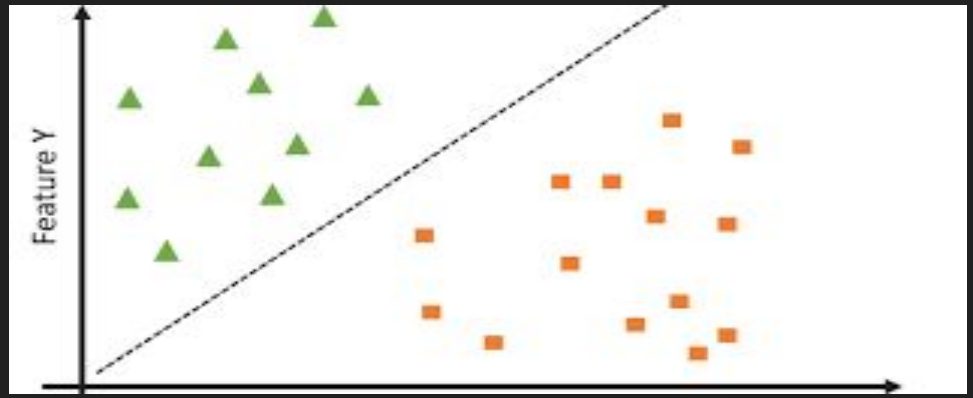
Feature	Data Type
Is Weekend	Boolean
Target Type	Category
Attack Type	Category
Weapon Type	Category
Number of Fatalities	Category (ordinal)
Number of Injuries	Category (ordinal)
NLP Vectorized Motive	Float
Success	Boolean

The Contestants

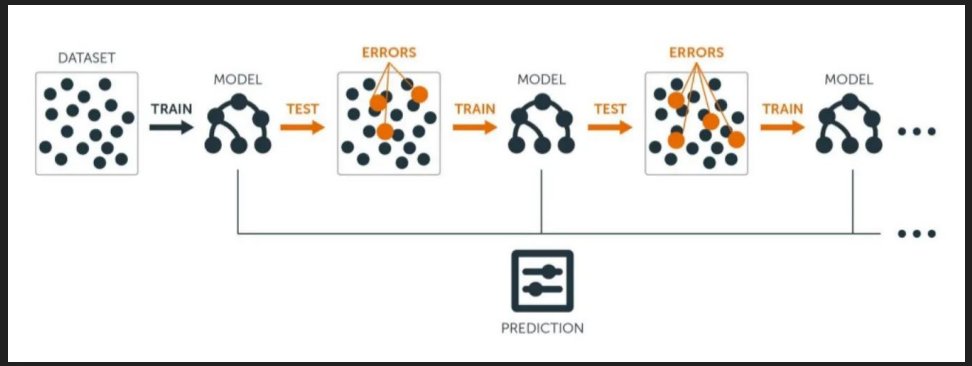
Random Forest



Linear Support Vector Machine

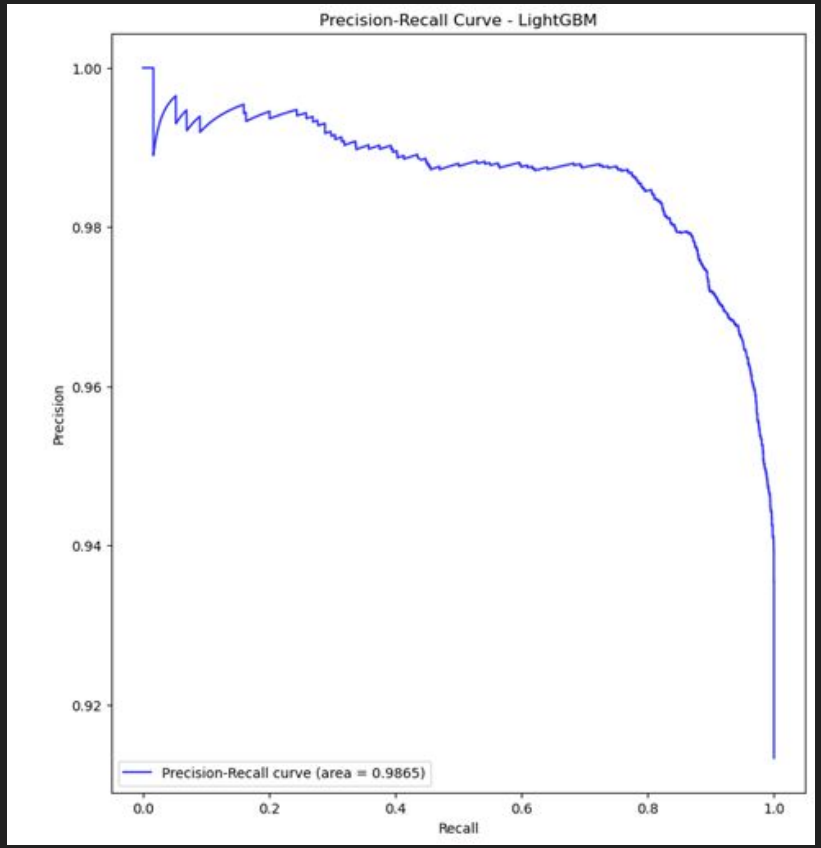


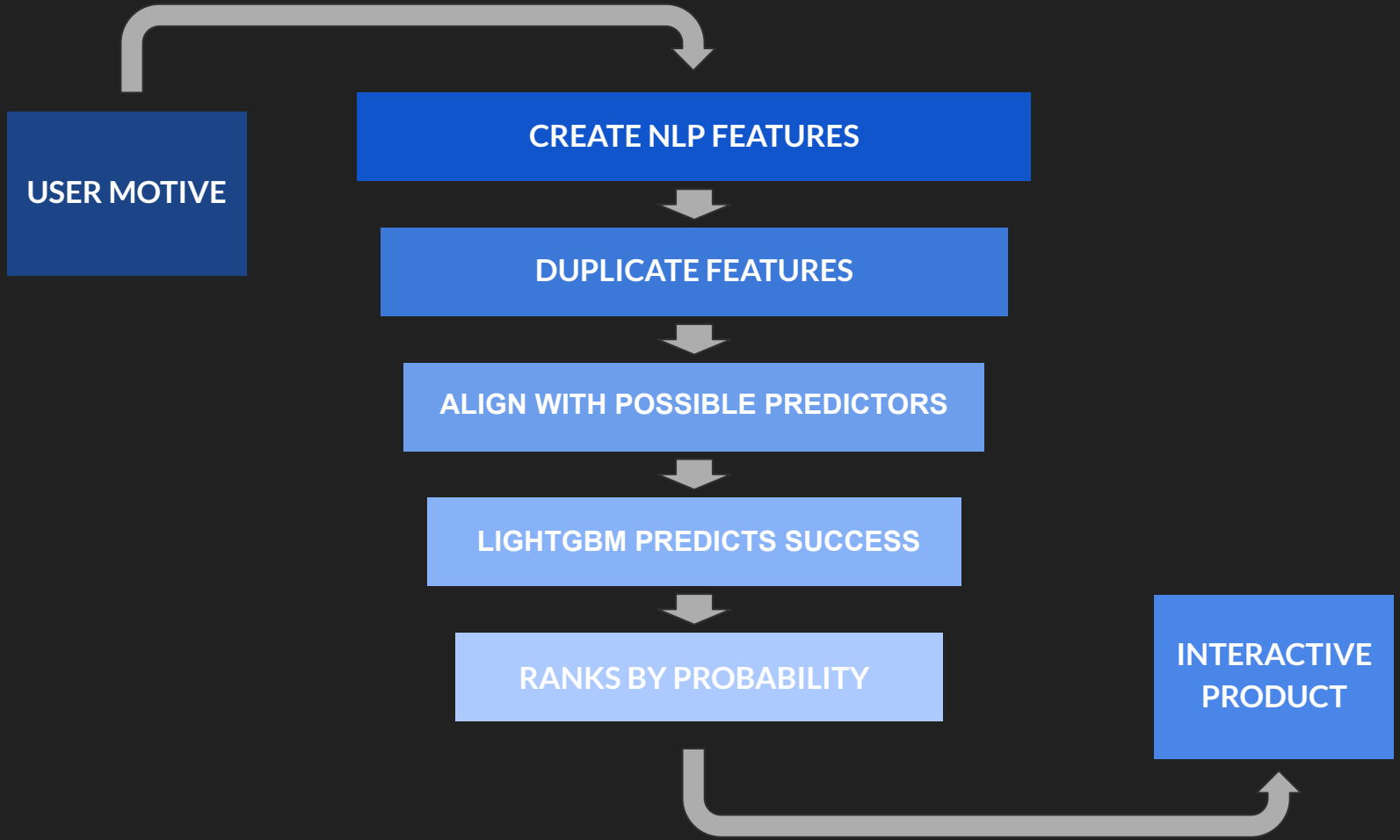
Light Gradient Boosting Machine



Evaluating a Classifier

- Accuracy
- Precision
- Recall
- F1 Score



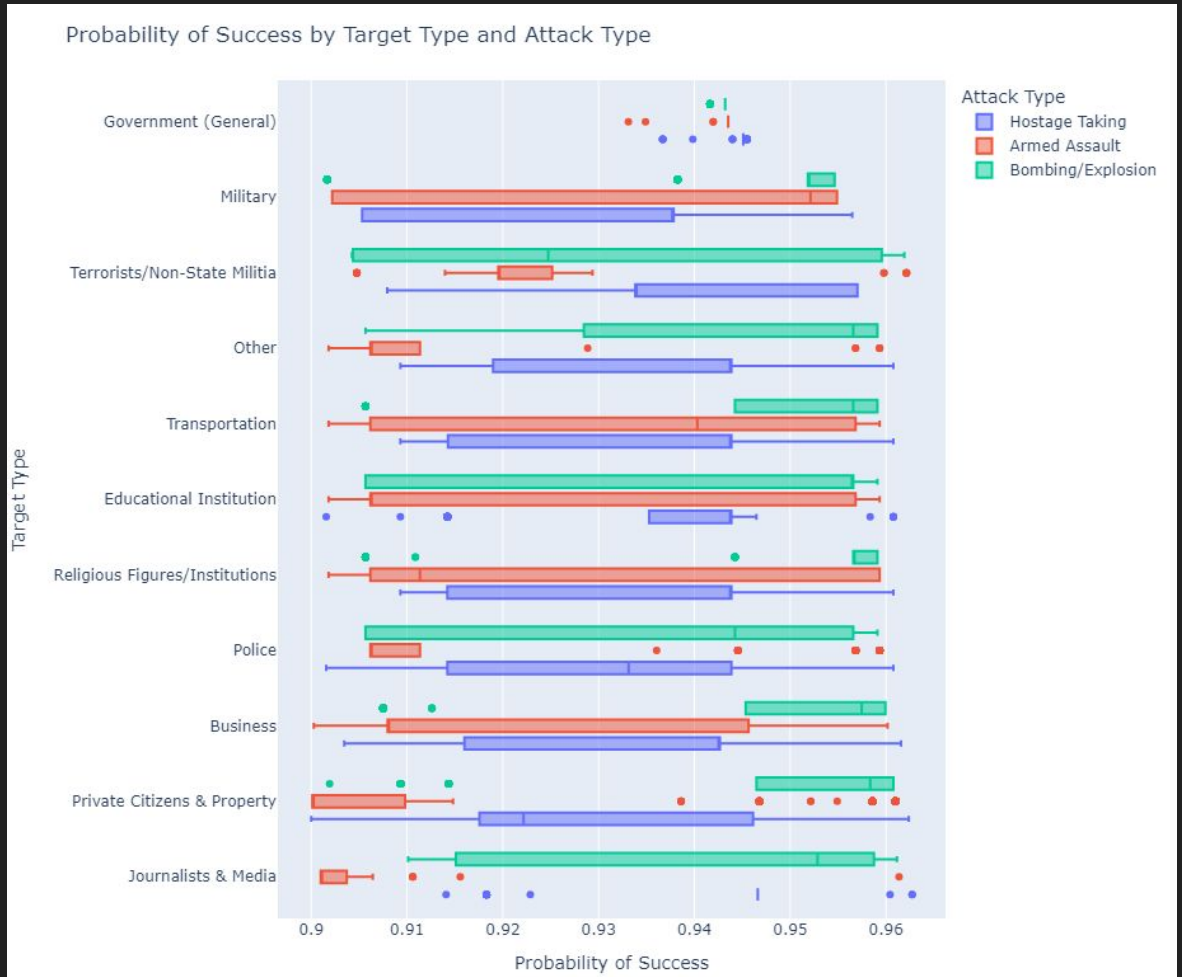

USER MOTIVE
CREATE NLP FEATURES
DUPLICATE FEATURES
ALIGN WITH POSSIBLE PREDICTORS
LIGHTGBM PREDICTS SUCCESS
RANKS BY PROBABILITY
INTERACTIVE PRODUCT

User Interaction

```
model()

Enter a potential suspect or affiliation and motive in your own words: Political Extremist student organization at Universit
y of Tennessee is protesting recent educational bill that hinders the development of government-funded charter schools
Tokenizing...
Lemmatizing...
Vectorizing...
Converting to sparse matrix...
Initializing LGBM...
Fitting LGBM...
[LightGBM] [Info] Number of positive: 21705, number of negative: 2059
[LightGBM] [Info] Auto-choosing row-wise multi-threading, the overhead of testing was 1.014943 seconds.
You can set `force_row_wise=true` to remove the overhead.
And if memory is not enough, you can set `force_col_wise=true`.
[LightGBM] [Info] Total Bins 83407
[LightGBM] [Info] Number of data points in the train set: 23764, number of used features: 3134
[LightGBM] [Info] [binary:BoostFromScore]: pavg=0.913356 -> initscore=2.355322
[LightGBM] [Info] Start training from score 2.355322


Making Predictions...
Creating interactive dashboard...
Results ready for analysis!
```


Probability of Success by Target Type and Attack Type
Government (General)
Military
Terrorists/Non-State Militia
Other
Transportation
Educational Institution
Religious Figures/Institutions
Police
Business
Private Citizens & Property
Journalists & Media
Target Type
0.9
0.91
0.92
0.93
0.94
0.95
0.96
Probability of Success
Attack Type
Hostage Taking
Armed Assault
Bombing/Explosion

Target Type Value Counts Threshold

Attack Type Value Counts Threshold

Probability of Success Threshold

How Does It Help?

- User defined creativity
- Evaluate vulnerable targets
- Compare historical likelihoods

*If we can **predict** it, we can **prepare** for it.*

Future Direction

- Include more predictive features
- Bayesian Optimization
- Neural Networks
- Explore the GTD…

Thank You!

Questions?