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Title: Modeling Political Instability in Pakistan

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Modeling Political Instability in Pakistan

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Summer Fun (Meow Wolf)

Oscar Goodloe (A-1)

- Educational Background
 - B.S. Applied Mathematics. ASU, 2019
- A (Analytics, Intelligence, and Technology)
 - A-1 (Information Systems and Modeling)
 - Mentor: Geoffrey Fairchild
- Research
 - At LANL: Political instability modeling.
 - Elsewhere: Mathematical biology, network science, machine learning.

The PakMAN Project

Goal: develop regional political instability proof-of-principle approach that can...

1. Assimilate heterogeneous data streams.
2. Quantify the contribution of different instability drivers.
3. Provide near real-time political instability forecasts with quantified uncertainty.

Research Approach

1) Identify, gather, and assimilate *heterogeneous data streams*.

2) Develop and apply *statistical, computational, and mathematical models*.

3) Produce *real-time forecasts with quantified uncertainty*.

Notable Challenges:

- Process has an incredibly complex state space (lurking included/excluded variable bias, strong correlations between predictors).
- Good candidates for outcome/response variables are hard to identify.
- Developing robust, largely automated pipelines for data collection and aggregation (continuity).
- Variation in spatial/temporal resolution between data sets.

Summary of Results (Preliminary Random Forest)

- Outcome:** sign of average event intensity at the district-month level (-1, 0, 1)
- Predictors:** terrorism, violence history, leadership changes, forest coverage, climate
- Training:** ~25,000 observations, 70/30 train/test split, 5-fold CV.

Confusion Matrix for Random Forest Model

overall statistics

Accuracy	: 0.8558
95% CI	: (0.8476, 0.8638)
No Information Rate	: 0.6529
P-Value [Acc > NIR]	: < 2.2e-16
Kappa	: 0.6683
McNemar's Test P-Value	: < 2.2e-16
Class: -1 Class: 0 Class: 1	
Precision	0.9282 0.8371 0.704545
Recall	0.7629 0.9994 0.048666
F1	0.8375 0.9111 0.091043
Prevalence	0.2610 0.6529 0.086058
Detection Rate	0.1991 0.6525 0.004188
Detection Prevalence	0.2145 0.7795 0.005944
Balanced Accuracy	0.8710 0.8167 0.523372

Variable importance

	overall
Months.Since.Violent.Event	100.000000
Drought.Severity.Index	12.467402
wind.Speed	12.244747
Max.Temperature	12.052946
Water.Deficit	12.026732
Min.Temperature	11.915248
Taliban.Events	11.251656
Percent.Forest.Coverage	7.166835
Charged.Events	5.298586
Leader.Change	0.000000