

Predicting violence in Mali

Janek Bruker (Methods IV, MACIS)

1 Introduction

The successful prevention of one-sided violence (OSV) requires good forecasting. A model capturing conflict and violence dynamics provides a forecasting tool. The application is demonstrated for Mali between 2016 and 2018.

2 Data Overview

- Datasets: PRIO-GRID, ACLED, SPEI, EPR
- 426 grid cells over 36 months (15,336 observations)
- Temporal and spatial lags for events and SPEI (drought proxy)
- Static geographic and ethnic group variables
- Month dummies
- Total: 118 predictors

3 Method Overview

- Baseline model: logistic regression
- Model 1: Lasso
- Model 2: Elastic Net
- Model 3: XG Boosting

4.1 Training Process

- *Forward Chaining* with initial window of 8 months, horizon of 3 months and moving forward by 3 months for each resampling iteration
- Tuning using area under ROC curve (AUC)

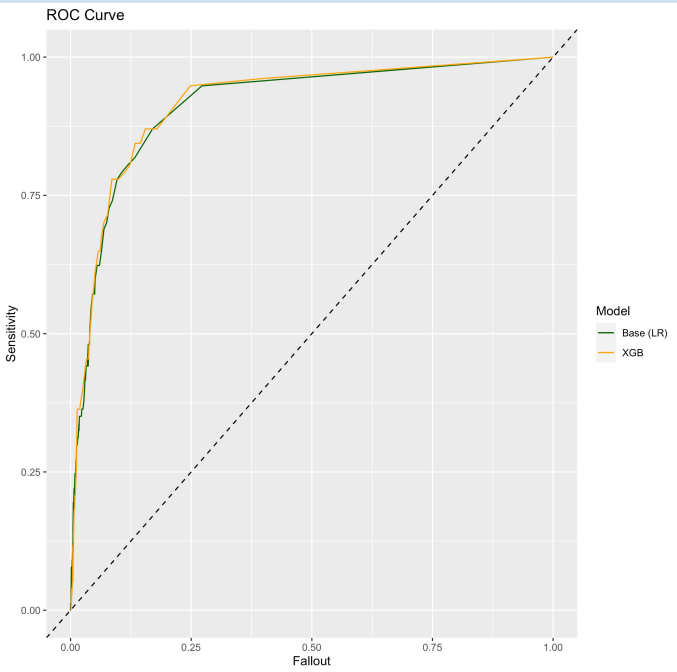
4.2 Training Results

Model	ROC	Improvement
Base (LR)	0.7939	-
Lasso	0.8945	12.7%
Elastic Net	0.9051	14%
XG Boost	0.9229	16.2%

XG Boost Best Tune: max_depth = 3, gamma = 0, colsample_bytree = 0.7, min_child_weight = 5, subsample = 0.8, nrounds = 50

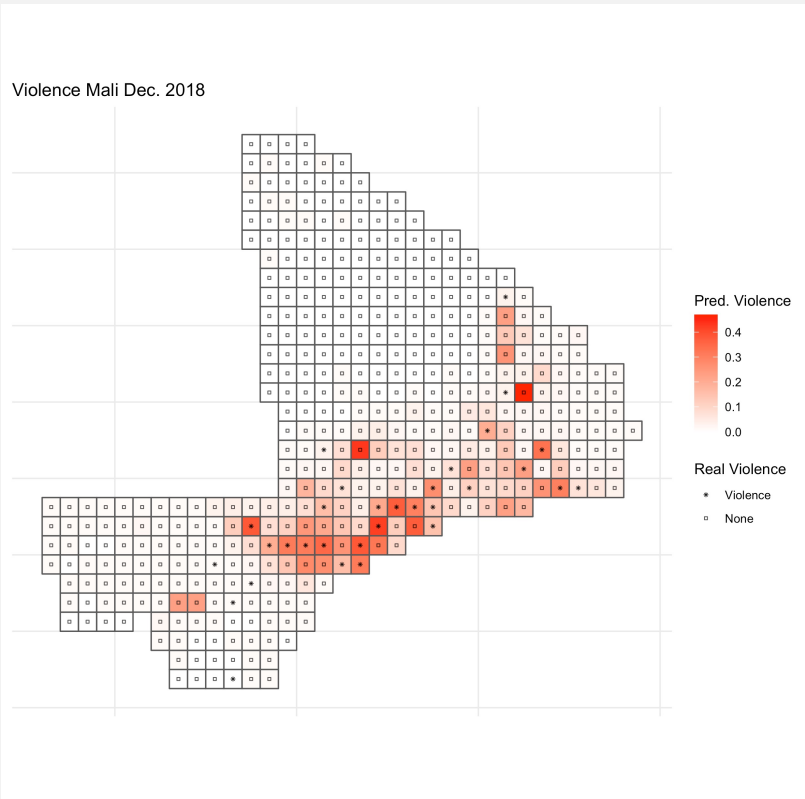
5.1 Predictive Performance

The ROC Curve is calculated using predictions on the holdout sample.



5.2 Mapping Predictions

The test set includes three last months of 2018. December was chosen as the latest months, but mainly for illustrative purposes.



References

1. Beguería, S., Vicente-Serrano, S. M., Reig, F., & Latorre, B. (2014). Standardized precipitation evapotranspiration index (SPEI) revisited: Parameter fitting, evapotranspiration models, tools, datasets and drought monitoring. *International Journal of Climatology*, 34(10), 3001–3023. <https://doi.org/10.1002/joc.3887>
2. Raleigh, C., Linke, A., Hegre, H., & Karlsen, J. (2010). Introducing ACLED: An Armed Conflict Location and Event Dataset: Special Data Feature. *Journal of Peace Research*, 47(5), 651–660. <https://doi.org/10.1177/0022343310378914>
3. Tollefsen, A. F., Strand, H., & Buhaug, H. (2012). PRIO-GRID: A unified spatial data structure. *Journal of Peace Research*, 49(2), 363–374. <https://doi.org/10.1177/0022343311431287>
4. Wucherpfennig, J., Weidmann, N. B., Girardin, L., Cederman, L.-E., & Wimmer, A. (2011). Politically Relevant Ethnic Groups across Space and Time: Introducing the GeoEPR Dataset. *Conflict Management and Peace Science*, 28(5), 423–437. <https://doi.org/10.1177/0738894210393217>