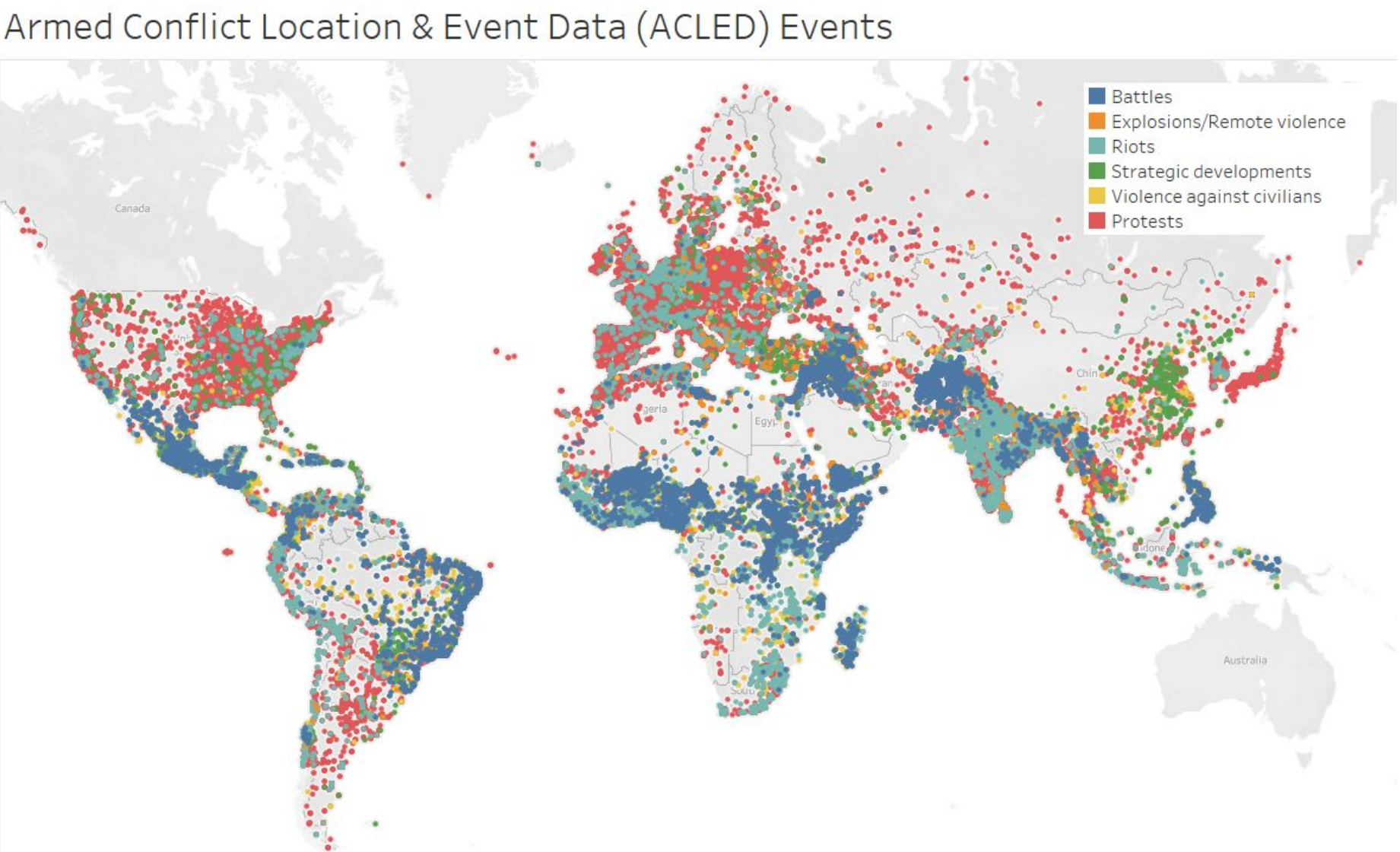


Conflict, Displacement, and Food Insecurity

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Problem Statement

Hunger and food insecurity are still major problems in the world. It is estimated that 9.2% of the world's population face severe food insecurity. This project attempts to identify the interactions between conflict, displacement, and food insecurity. In doing so, the project aims to provide insights that can serve as an early warning system.



Conflict - Displacement

We modeled the relationship between displacement and different conflict metrics for the whole world at a country-level on a yearly basis.

- > The percentage of the population displaced, based on UN metrics, is predicted using the different conflict variables (ACLED)
- > The models identified that some conflict types were better predictors than others, for example, the normalized number of fatalities in battles proved to be the most significant
- > The analyses showed that the data has enough structure to be explained by statistical methods

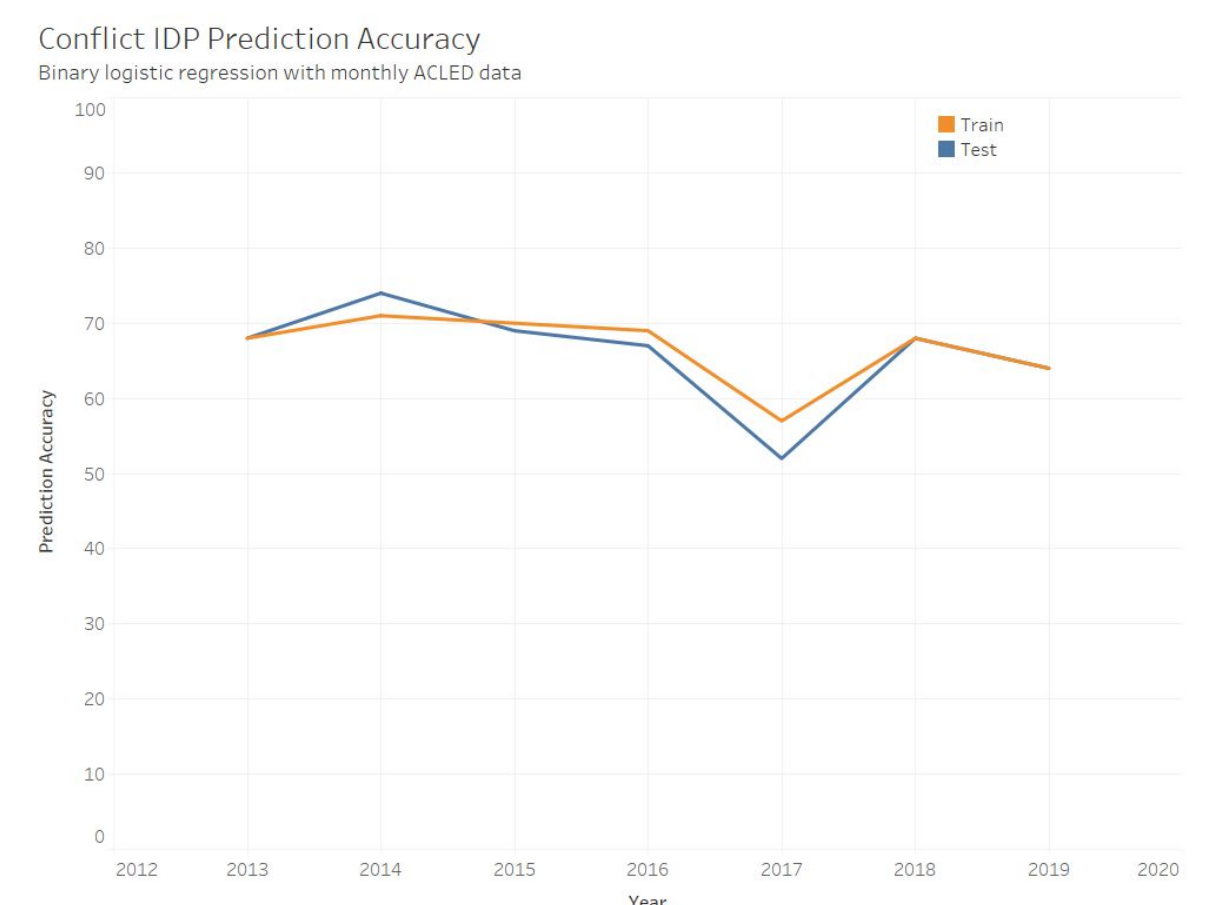
Model Comparison

Model	RMSE	
	Train	Test
Linear Regression	2.6×10^{-5}	1.7×10^{-4}
Lasso *	6.2×10^{-5}	1.0×10^{-4}
Ridge	2.6×10^{-5}	1.5×10^{-4}
GLM (Binomial)	6.1×10^{-5}	2.2×10^{-2}
Random Forest	5.8×10^{-5}	9.4×10^{-4}
XGBoost	1.6×10^{-5}	5.2×10^{-4}

Table. Comparison of various models using cross validated rmse

The relationship between conflict and displacement was also explored by training a logistic regression model with monthly ACLED data to predict if a country would see a non-zero number of internally displaced persons due to conflict in a given year.

- > The model performed slightly better than random guessing and would likely benefit from a more granular target variable



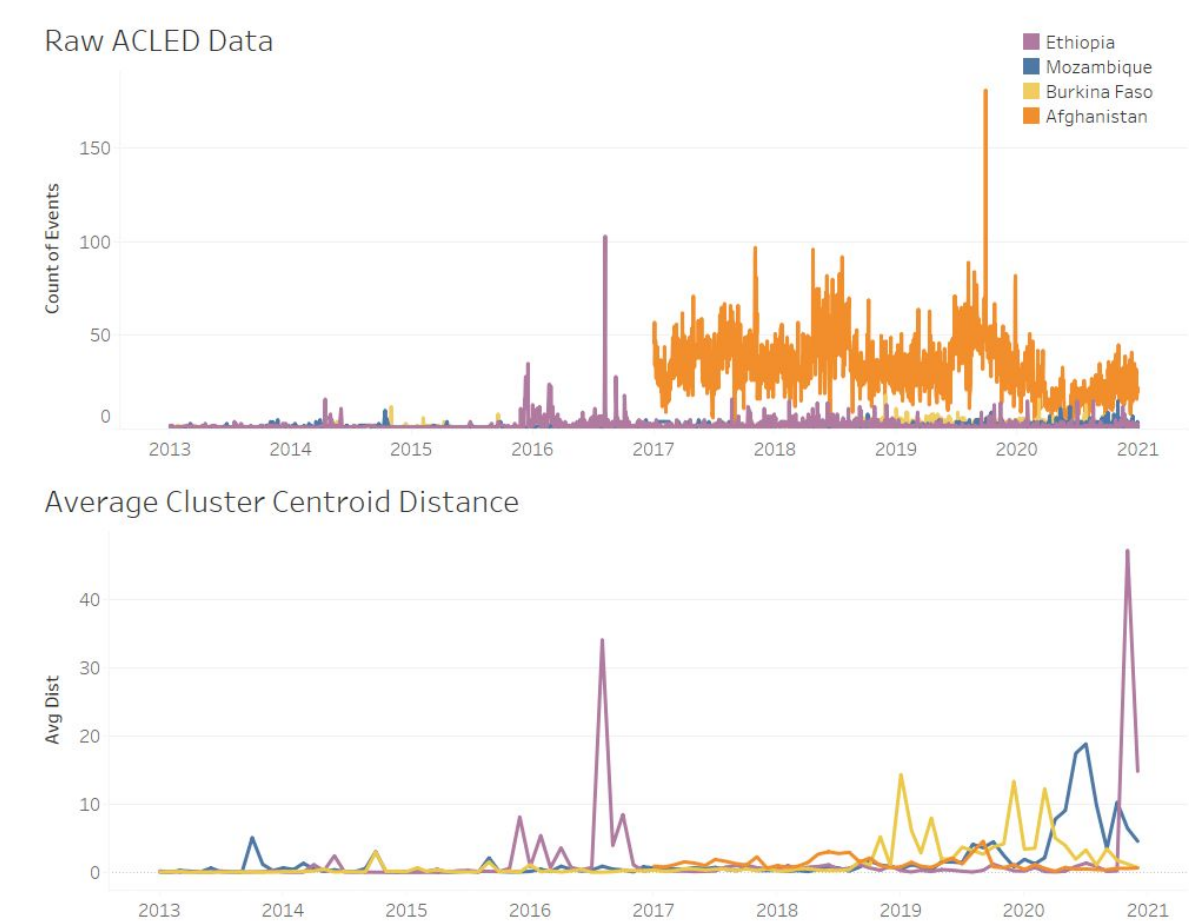
SUMMARY

- > Data shows enough structure to suggest predictability in food insecurity and displacement using conflict data
- > Certain types of conflict have a larger impact on food insecurity and displacement
- > Existing target variables are limited in availability and granularity (time and geography)

An Early Warning for Conflict

The Armed Conflict Location and Event Data (ACLED) dataset is a log of all reported political violence and protest events around the world. Manual detection of changes within such a granular dataset can be difficult if not impossible.

A system was developed to monitor incoming ACLED data in real time and detect significant changes in the conflict trend for each country. The daily count of events and fatalities for each country were treated as points in a k-means cluster and the average centroid distance was plotted over time. Control limits can then be set to alert when the average cluster distance increases.



An attempt was made to determine the predictive power of these alarms but none of the target variables had sufficient granularity to obtain meaningful results.

Conflict - Food Insecurity

Conflict and food insecurity interactions were probed in Afghanistan, Burkina Faso, Colombia, El Salvador, Ethiopia, Haiti, Mozambique, Nigeria, & South Sudan.

- > The food consumption score (FCG), a proxy measure of food insecurity, is modeled as function of conflict variables
- > The models identified conflict variables like percentage of battles and explosions as significant indicators in predicting food insecurity
- > Global, national, and administrative level 1 trends revealed that food insecurity in countries like Afghanistan and western Nigeria were more sensitive to conflicts compared to other countries

Model Comparison

Model	RMSE	
	Train	Test
Linear Regression	141	322
Lasso	143	303
Support Vector Regression	0.2	334
Random Forest Regression *	8.8	219

Table. Comparison of various models using cross validated rmse

Future Work

- > Extend the analysis to more granular displacement data (monthly, administrative zone 1) when data is available
- > Apply vector autoregressive models once longer time series data is available for the food security indicators through the continuous monitoring surveys - Investigate yearly trends and seasonality
- > Identify interactions between displacement and food insecurity in order to bridge the gap between predicting food insecurity from conflict event data