PREDICTING THE FALL OF A REGION: A SPATIO-TEMPORAL ANALYSIS OF RUSSIA-BACKED SEPARATISTS IN THE DONBASS

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GEOG 596A
Spring 1 2023
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AGENDA

- Background
- Models
- Goals and Objectives
- Methodology
- Project Timeline
- Anticipated Results

BACKGROUND – UKRAINE

- Second largest European country and covers approximately 600,000 square kilometers
- Population of 43 million

BACKGROUND – EVENTS

- Russia annexed Crimea in 2014 and annexed Donetsk and Luhansk in 2022
- Russia's proxy forces of the Donetsk and Luhansk Peoples Republic continue to pose a threat to the security of Ukraine and Europe
- The conflict has caused thousands of deaths and approximately one-and-a-half million people to flee the region
- The military actions caused a sharp decline in the industrial output of the region between 2014-2016
- The composition of the DPR military consists of mercenaries from Russia as well as locals from the region of Donbass
- Tactics of conducting operation for the seizure of administrative buildings showed the excellent combat training of the people's militia of Donbass

BACKGROUND – CURRENT STATUS

- There is an ongoing war in the Donbass
- Russia currently controls the most Eastern part of Ukraine
- Since the area was already controlled prior to the invasion, does it offer any strategic significance?

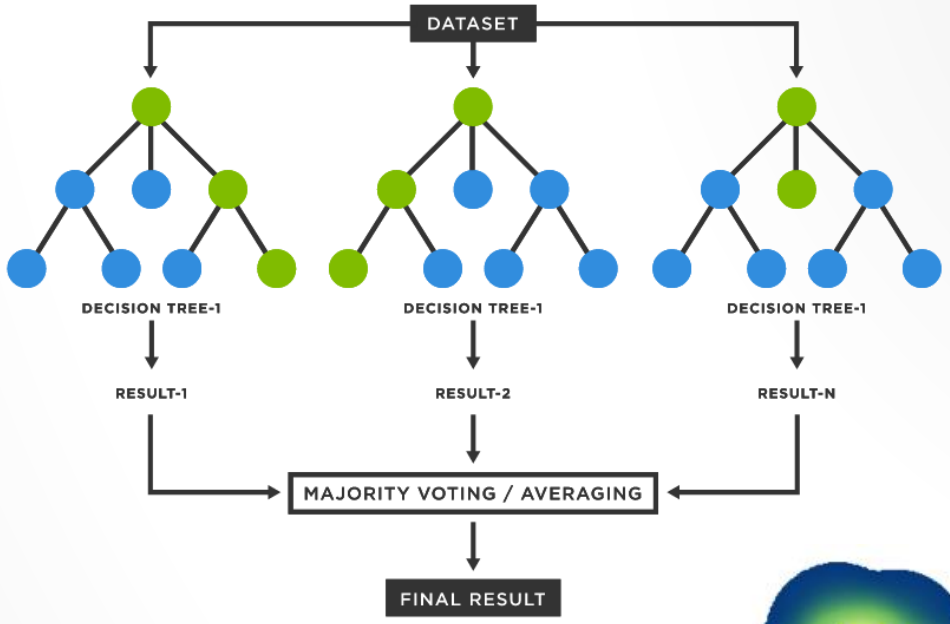
BACKGROUND – WHY THIS CASE

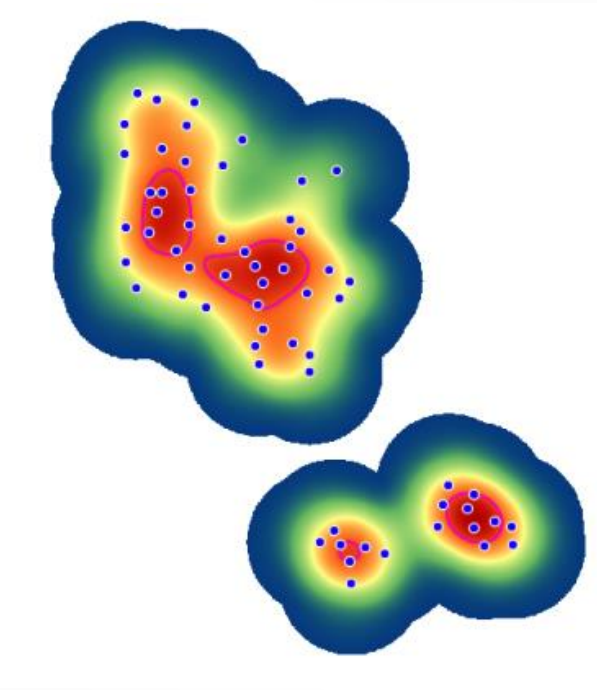
- Predictive analysis for future conflicts
- Questions to be answered by research through a geospatial story:
  - What strategic significance does the Donbass area of Ukraine provide to Russia?
  - How does the occupation of the Donbass assist with Russia's military?
  - Does the geography of the Donbass provide more than the bordering region of Russia?
  - What short- and long-term implications does occupying the Donbass give to Russia?
  - What is the political objective by partially occupying a country prior to a war? (May be beyond the scope)

MODELS

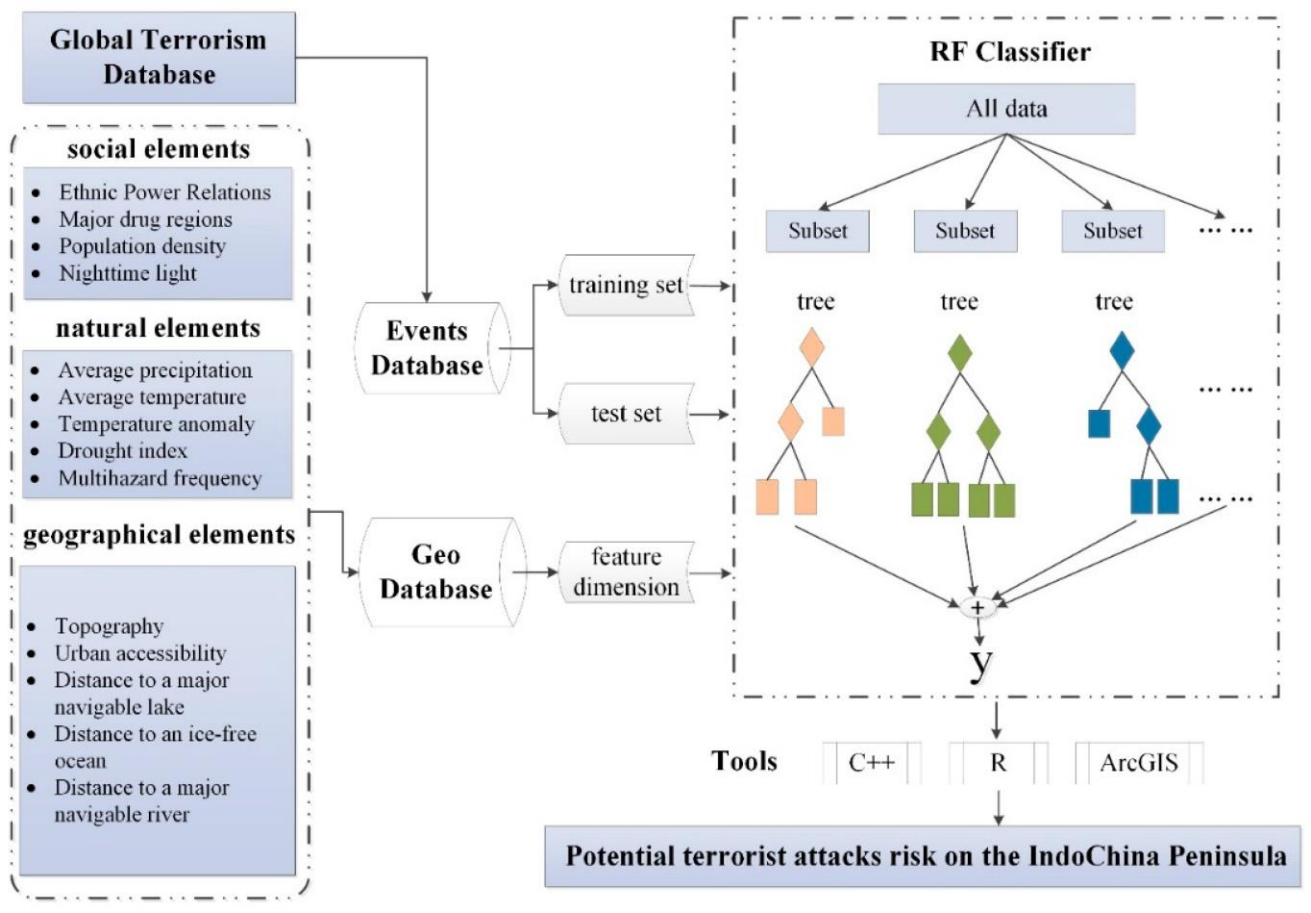
Random Forest Method – combines the output of multiple decision trees to reach a single result

Kernal Density – used to analyze the spatio-temporal variation of attacks in the Donbass





MODELS


Global Terrorism Database
social elements
Ethnic Power Relations
Major drug regions
Population density
Nighttime light
natural elements
Average precipitation
Average temperature
Temperature anomaly
Drought index
Multihazard frequency
geographical elements
Topography
Urban accessibility
Distance to a major navigable lake
Distance to an ice-free ocean
Distance to a major navigable river
Events Database
Geo Database
training set
test set
feature dimension
RF Classifier
All data
Subset
Subset
Subset
tree
tree
tree
y
Tools
C++
R
ArcGIS
Potential terrorist attacks risk on the IndoChina Peninsula

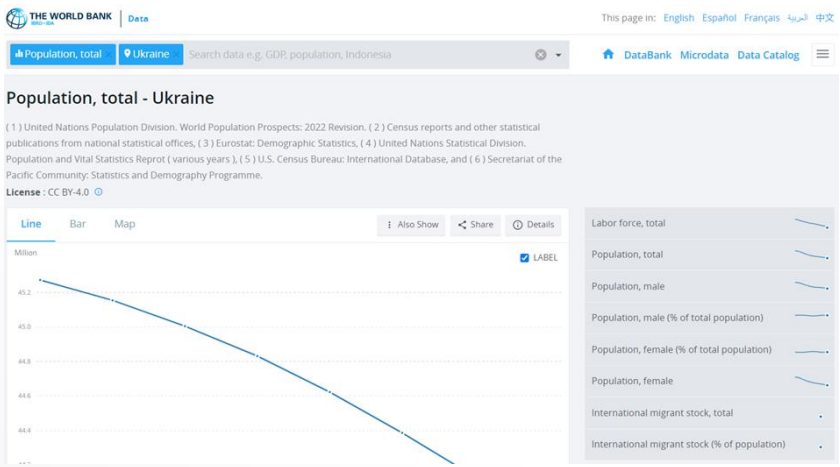
DATA

ACLED provides historical context of:

- Battles
- Violence against civilians
- Explosions/Remote Violence
- Riots
- Protests
- Strategic Developments

The World Bank provides historical context of:

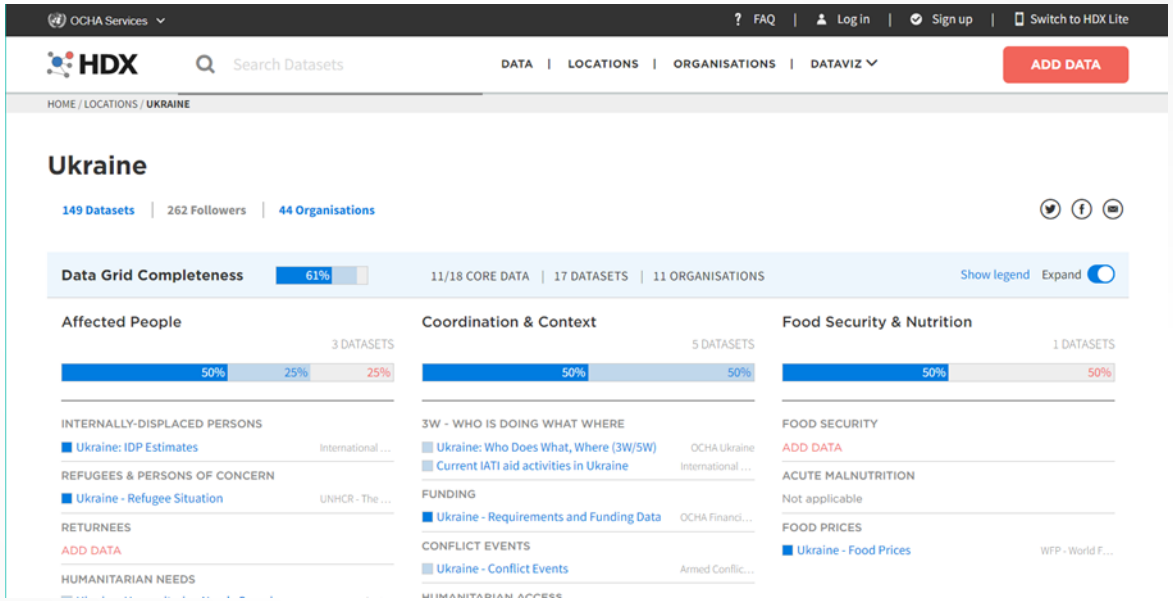
- Labor force
- Population – gender
- Migrant stock



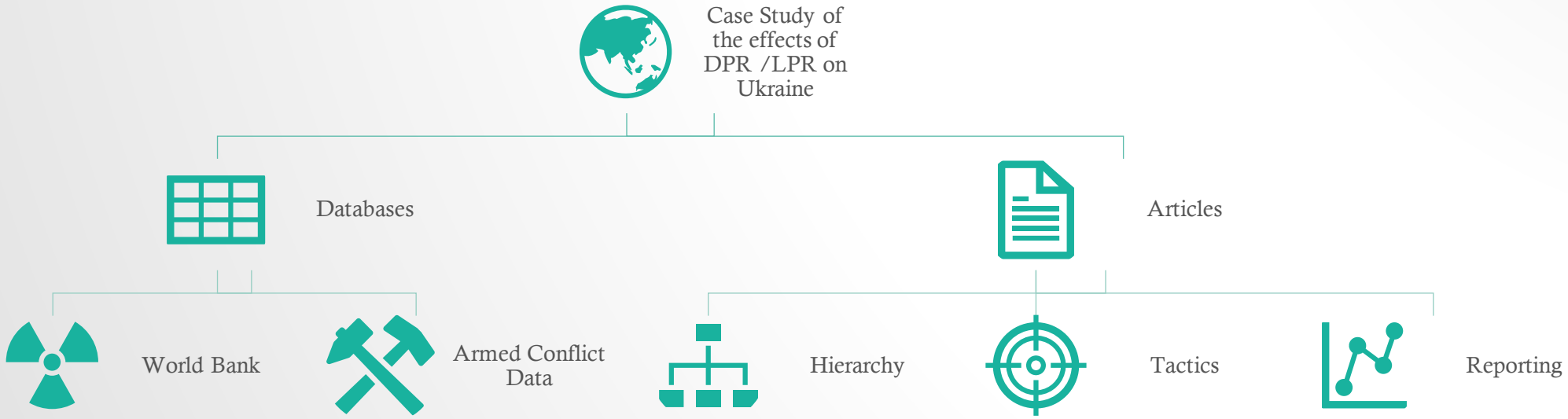
DATA

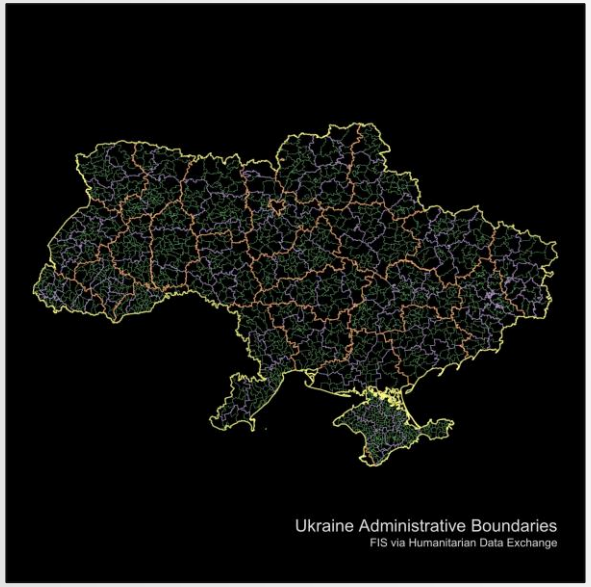
The Humanitarian Data Exchange provides historical context of:

- IDPs
- Refugees
- Food security
- Acute malnutrition
- Poverty Rate
- GIS data (administrative boundaries)



WORKFLOW


Case Study of the effects of DPR /LPR on Ukraine
Databases
Articles
World Bank
Armed Conflict Data
Hierarchy
Tactics
Reporting



Administrative boundaries

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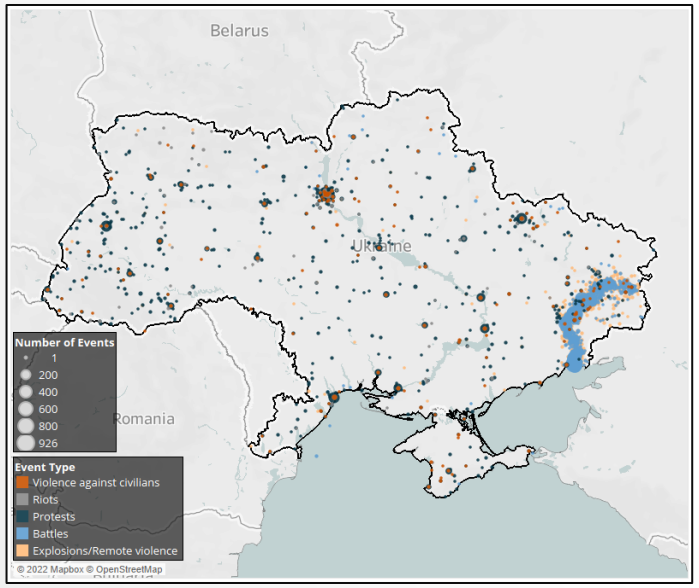

Attack Data

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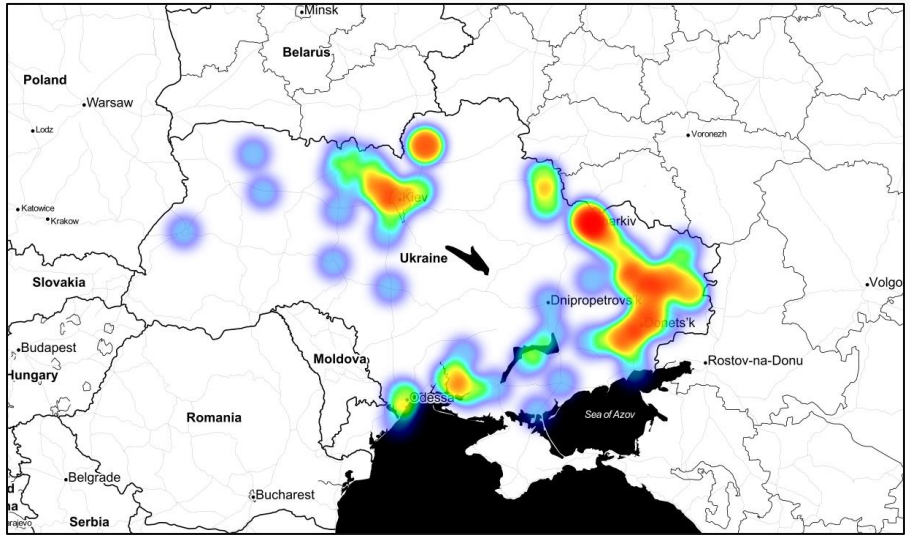

Predictive Analysis

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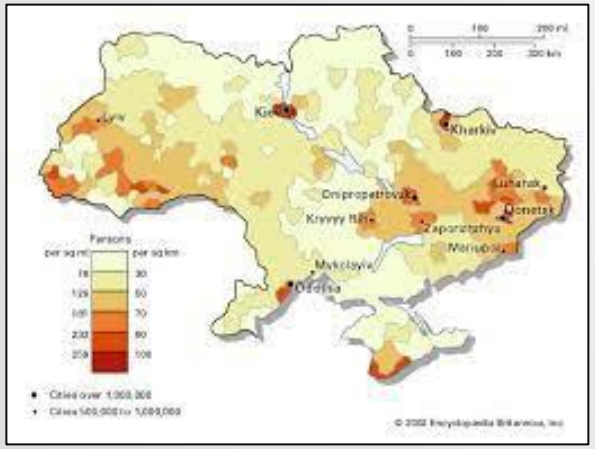


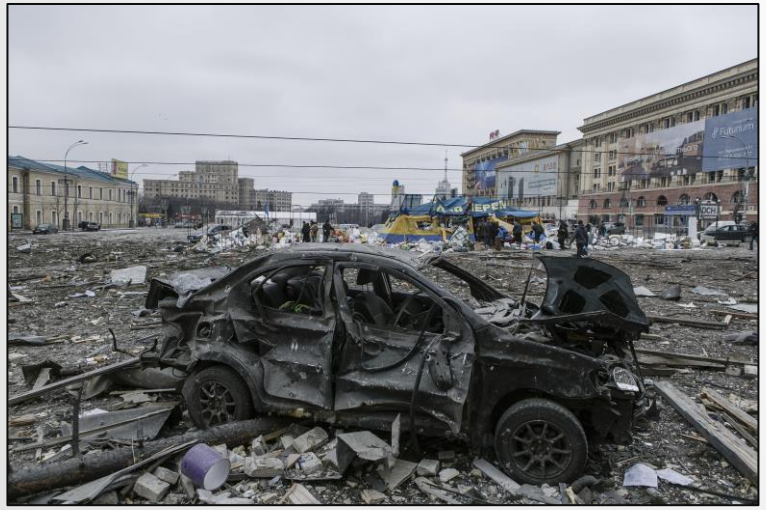
GIS demographic layers

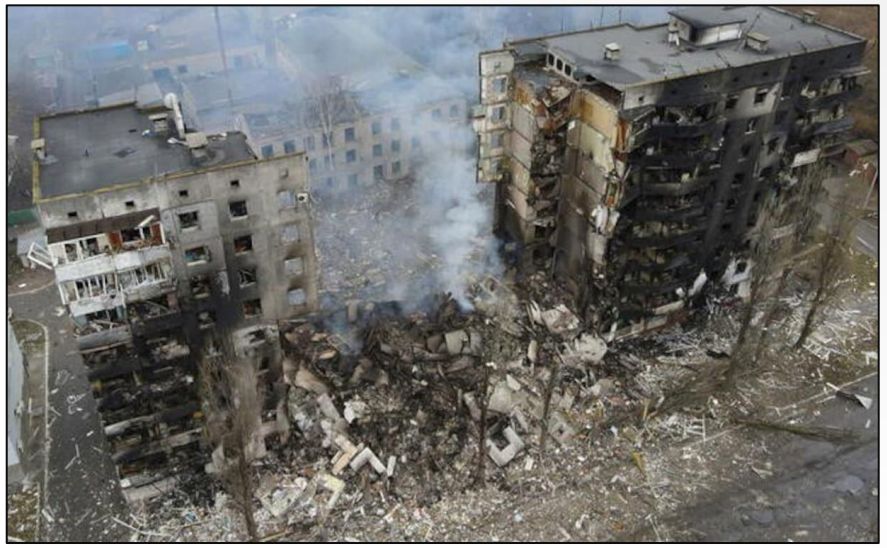
GOALS AND OBJECTIVES

- Can this be used to predict future conflicts and evacuate areas prior to a conflict
- Can policymakers use this when assisting another nation
- ArcGIS outputs of predictive analysis using spatial statistic tools

ANTICIPATED RESULTS

Hypothesis 1: The area's immediately surrounding the Donbass with similar socio-economic variables, and robust infrastructure will be high risk for possible conflict





- Hypothesis 2: Ukraine's large cities such as Kiev and Lviv will be the hotspots for possible predictive conflict

POSSIBLE VENUES/TIMELINE

- March- April 2023
  - Data analysis
  - Compile results
- May 2023
  - Present Results
- Geospatial World Forum
  - 2-5 May, The Netherlands
- FOSS4G 2023
  - 26 June – 2 July, 2023

REFERENCES

Caplan JM, Kennedy LW, Miller J. Risk Terrain Modeling: Brokering Criminological Theory and GIS Methods for Crime Forecasting. Justice quarterly. 2011;28:360-381.

Hao, Mengmeng, Dong Jiang, Fangyu Ding, Jingying Fu, and Shuai Chen. 2019. "Simulating Spatio-Temporal Patterns of Terrorism Incidents on the Indochina Peninsula with GIS and the Random Forest Method" ISPRS International Journal of Geo-Information 8, no. 3: 133. https://doi.org/10.3390/ijgi8030133

“World Bank Document.” Cities in Europe and Central Asia, https://documents1.worldbank.org/curated/en/563161623257944434/pdf/Overcoming-Economic-Challenges-Natural-Disasters-and-the-Pandemic-Social-and-Economic-Impacts.pdf.

Matsuzato K. The Donbass War: Outbreak and Deadlock. *Demokratizatsiya (Washington, D.C.)*. 2017;25:175-201.

Matveeva A. No Moscow stooges: identity polarization and guerrilla movements in Donbass. Journal of southeast European and Black Sea studies. 2016;16:25-50.

Robinson P. Russia's role in the war in Donbass, and the threat to European security. European politics and society (Abingdon, England). 2016;17:506-521.