

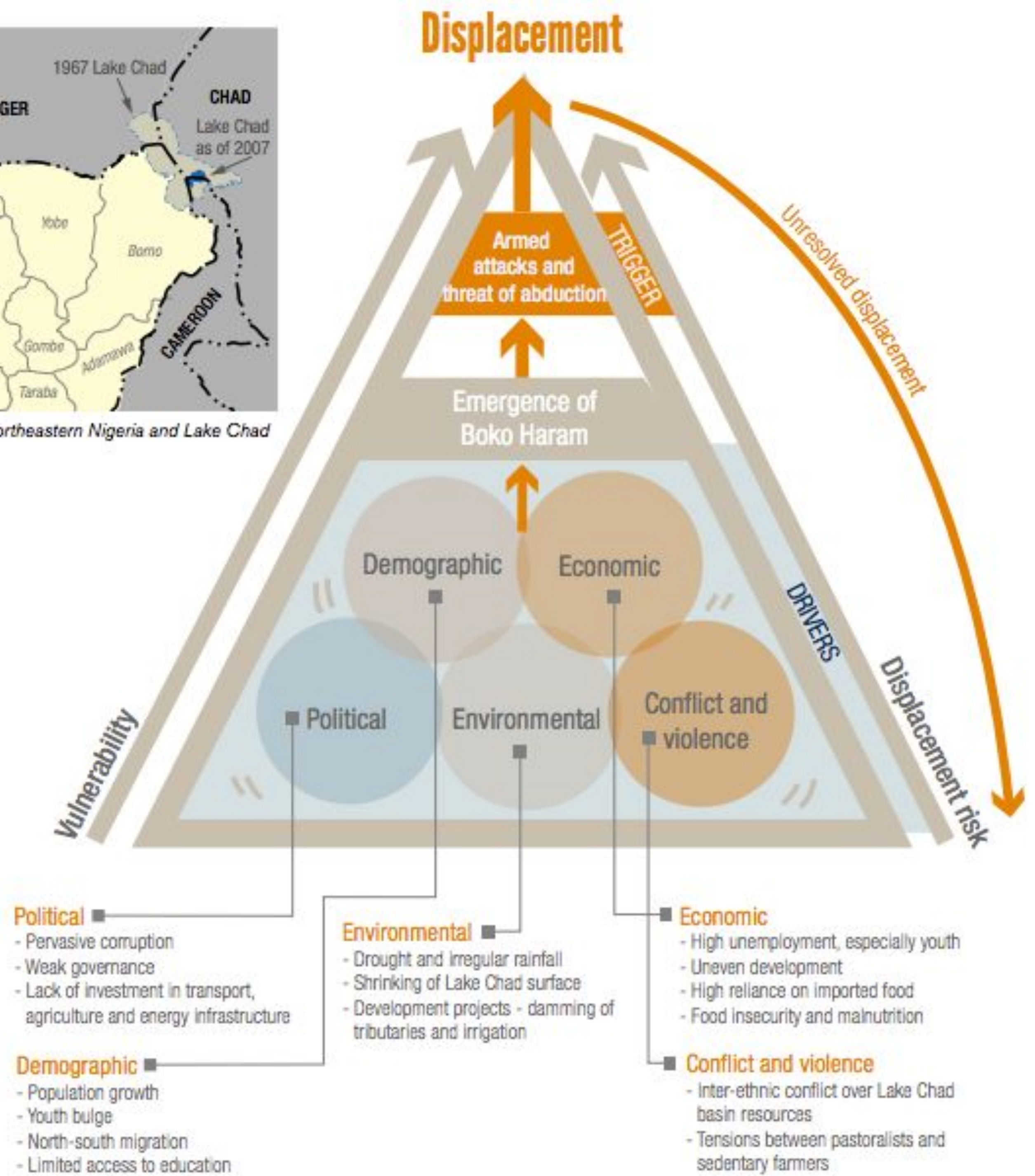
PROJECT MCNULTY:

MODELING REFUGEE CRISES

REFUGEE FACTORS



Map of northeastern Nigeria and Lake Chad



Ken M - Politics and General Demographics

POLITICAL AND GENERAL DEMOGRAPHIC FEATURES

Corruption Perception Index¹

Civil Liberties²

Political Rights²

Freedom Status²

Ratio of Female Legislators³

Gender Ratio³

Population Growth³

Age<5 Mortality³

Life Expectancy³

Population age 0-14³

Population age 15-64³

Population Age 65+³

1. Transparency International

2. Freedom House

3. The World Bank

POLITICAL AND GENERAL DEMOGRAPHIC FEATURES

~~Corruption Perception Index¹~~

Civil Liberties²

Political Rights²

~~Freedom Status²~~

Ratio of Female Legislators³

Gender Ratio³

Population Growth³

~~Age<5 Mortality³~~

Life Expectancy³

~~Population age 0-14³~~

Population age 15-64³

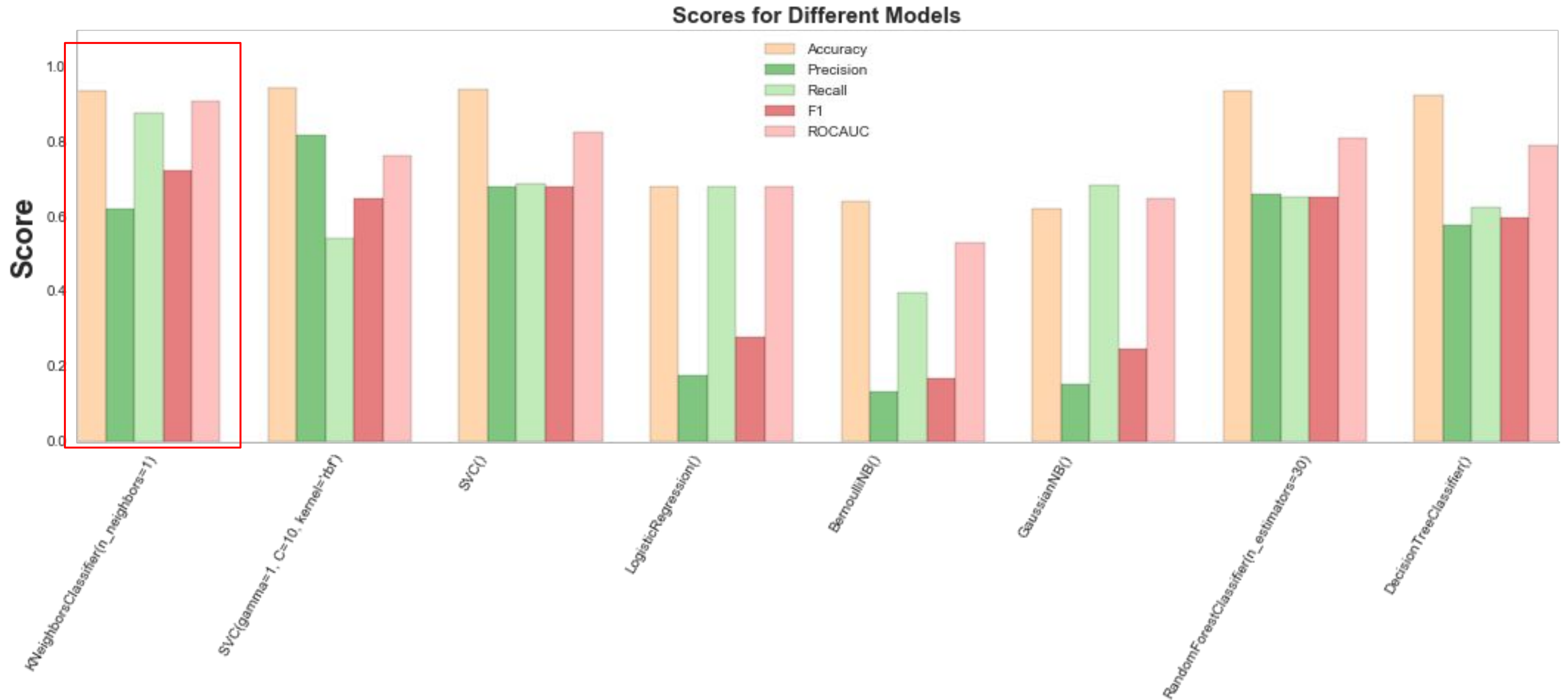
~~Population Age 65+³~~

1. Transparency International

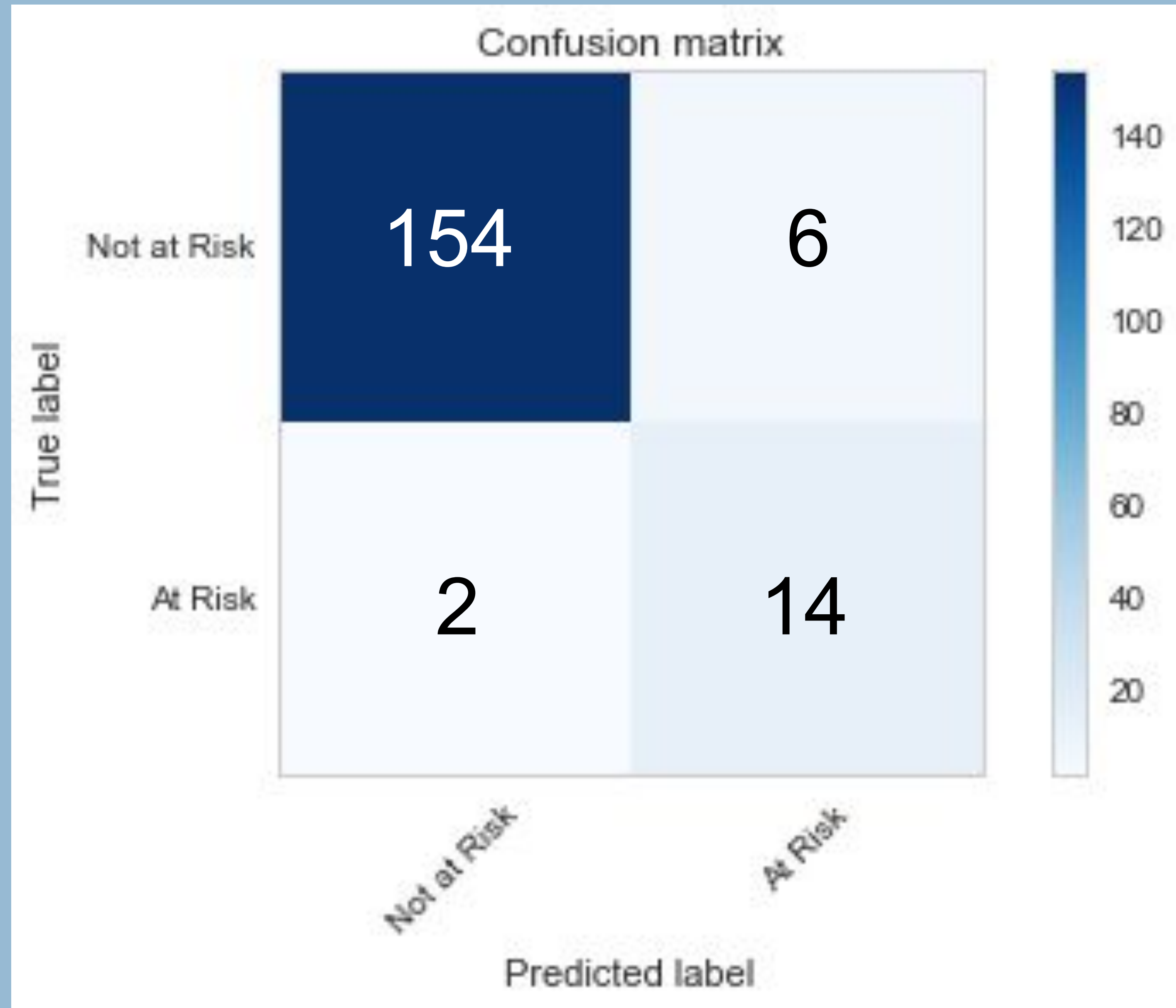
2. Freedom House

3. The World Bank

2013 Predictions



2013 Predictions



Dan - Social

SOCIAL AND DEMOGRAPHIC FEATURES

PREDICTING SOCIAL RESILIENCE

Binary classification:

Disasters that displaced
+5000 persons

Assumption:

Countries with lower social
resilience will see more
displaced persons after a
natural disaster

countrycode	year	disaster	totalaffected	homeless	binary	adolescent_fertility	have_good_sanitation	labor_force_participation
AFG	1994	Earthquake	100330	0	0	164.4464	20.6	48.599998
AFG	1996	Earthquake	3250	750	0	164.9768	21.1	48.400002
AFG	1998	Earthquake	149753	45000	1	161.4432	22.2	48.200001
AFG	1999	Earthquake	91960	31275	1	157.6444	22.8	48.099998
AFG	2001	Earthquake	270	250	0	150.0468	23.9	47.599998
AFG	2002	Earthquake	100891	10000	1	146.2480	24.5	47.700001
AFG	2003	Earthquake	1001	1000	0	140.4764	25.1	47.700001
AFG	2004	Earthquake	1040	1000	0	134.7048	25.7	47.799999
AFG	2005	Earthquake	501	0	0	128.9332	26.3	47.799999
AFG	2006	Earthquake	935	195	0	123.1616	26.9	47.900002
AFG	2009	Earthquake	3309	3250	0	105.5516	28.7	48.000000
AFG	2010	Earthquake	1070	1000	0	99.6324	29.3	48.099998
AFG	2012	Earthquake	237	235	0	87.7940	30.5	47.900002

SOCIAL AND DEMOGRAPHIC FEATURES

PREDICTING SOCIAL RESILIENCE

Research points to these features as potential predictors of social resilience following similar natural disasters:

Adolescent Fertility Rate

Access to Cell/Internet

Access to Electricity

Access to Good Sanitation

GDP per capita

Inflation

Unemployment

Vulnerable Employment

Population (total)

Population age 0-14

Population age 15-64

Population Age 65+

Labor Force Participation

SOCIAL AND DEMOGRAPHIC FEATURES

PREDICTING SOCIAL RESILIENCE

Running several decision trees narrows down the features that are most important:

Adolescent Fertility Rate

~~Access to Cell/Internet~~

Access to Electricity

Access to Good Sanitation

~~GDP per capita~~

Inflation

Unemployment

~~Vulnerable Employment~~

Population (total)

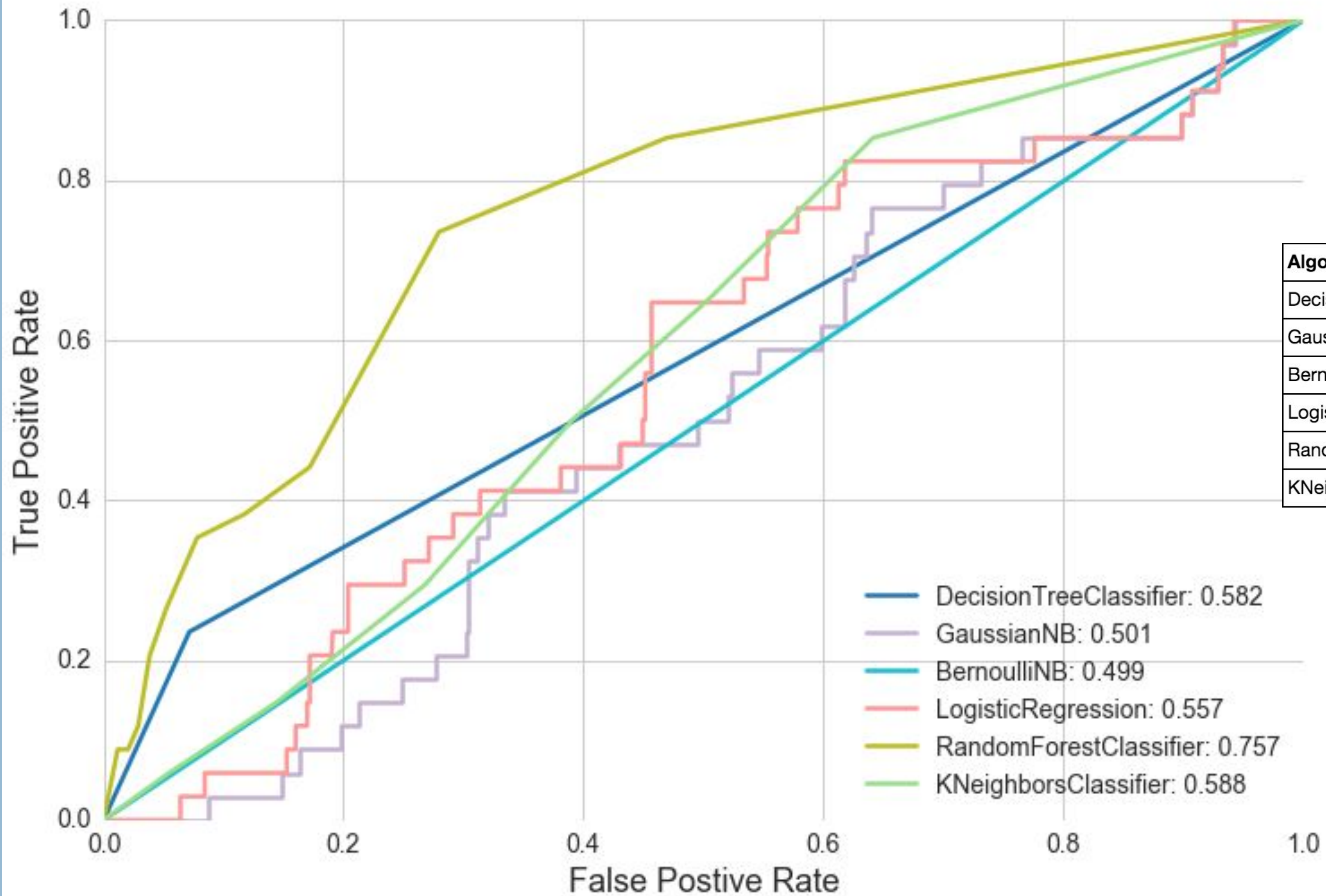
~~Population age 0-14~~

~~Population age 15-64~~

Population Age 65+

Labor Force Participation

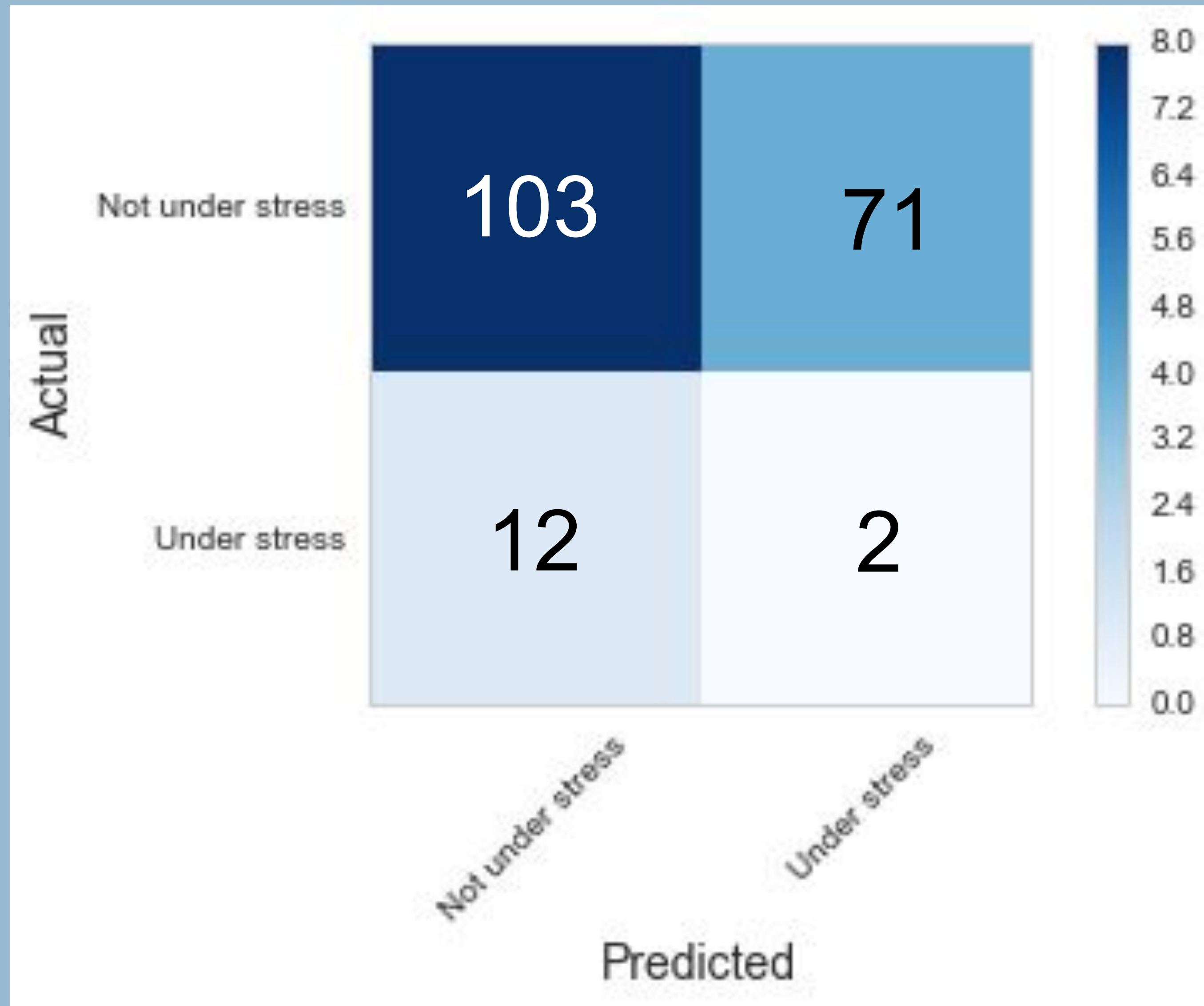
Using Social Resilience Data to Predict Refugee Counts



Algorithm	Accuracy	F1 Score	Precision	Recall
DecisionTreeClassifier	0.909861	0.307692	0.240741	0.426230
GaussianNB	0.131741	0.082994	0.043664	0.836066
BernoulliNB	0.081664	0.090076	0.047238	0.967213
LogisticRegression	0.953005	0.000000	0.000000	0.000000
RandomForestClassifier	0.927581	0.364865	0.310345	0.442623
KNeighborsClassifier	0.662558	0.130952	0.074492	0.540984

2013 Predictions

Random Forest Classifier



Emily - Climate

Feature Selection



Rainfall

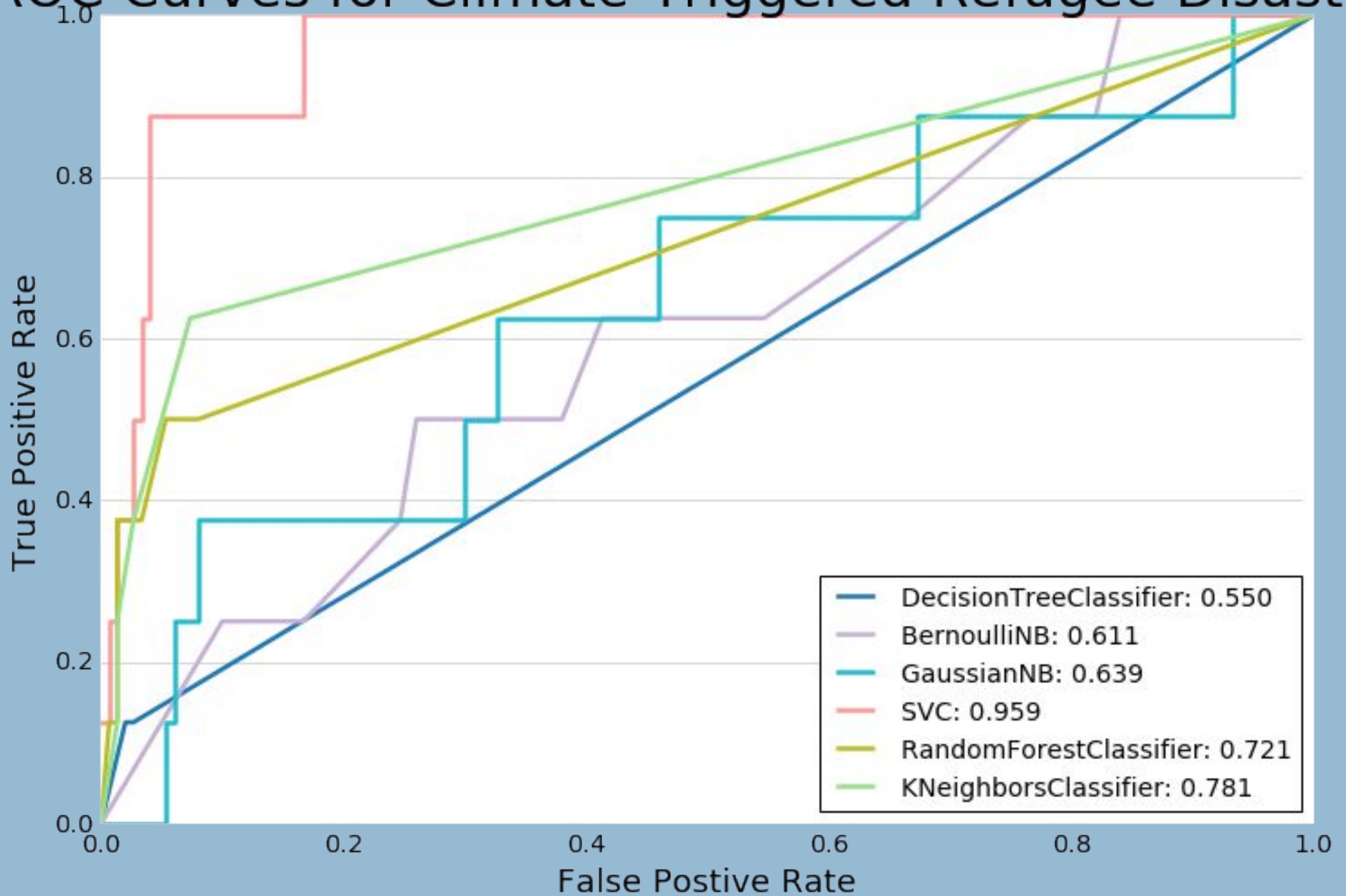
Forest
Area

Freshwater

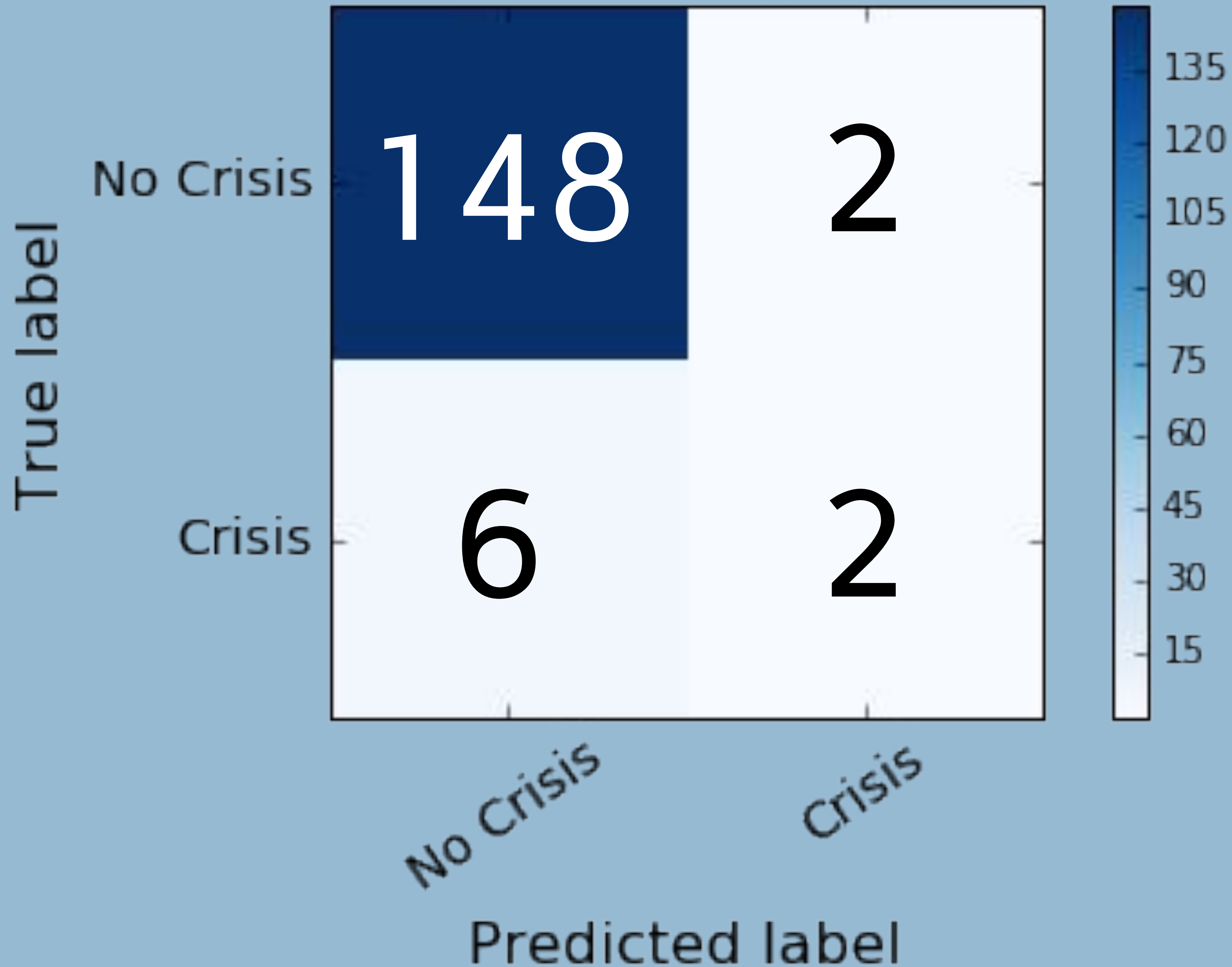
Extreme
Weather
Disasters

Arable
Land

ROC Curves for Climate-Triggered Refugee Disasters



Confusion matrix



Bryan - Economic Data

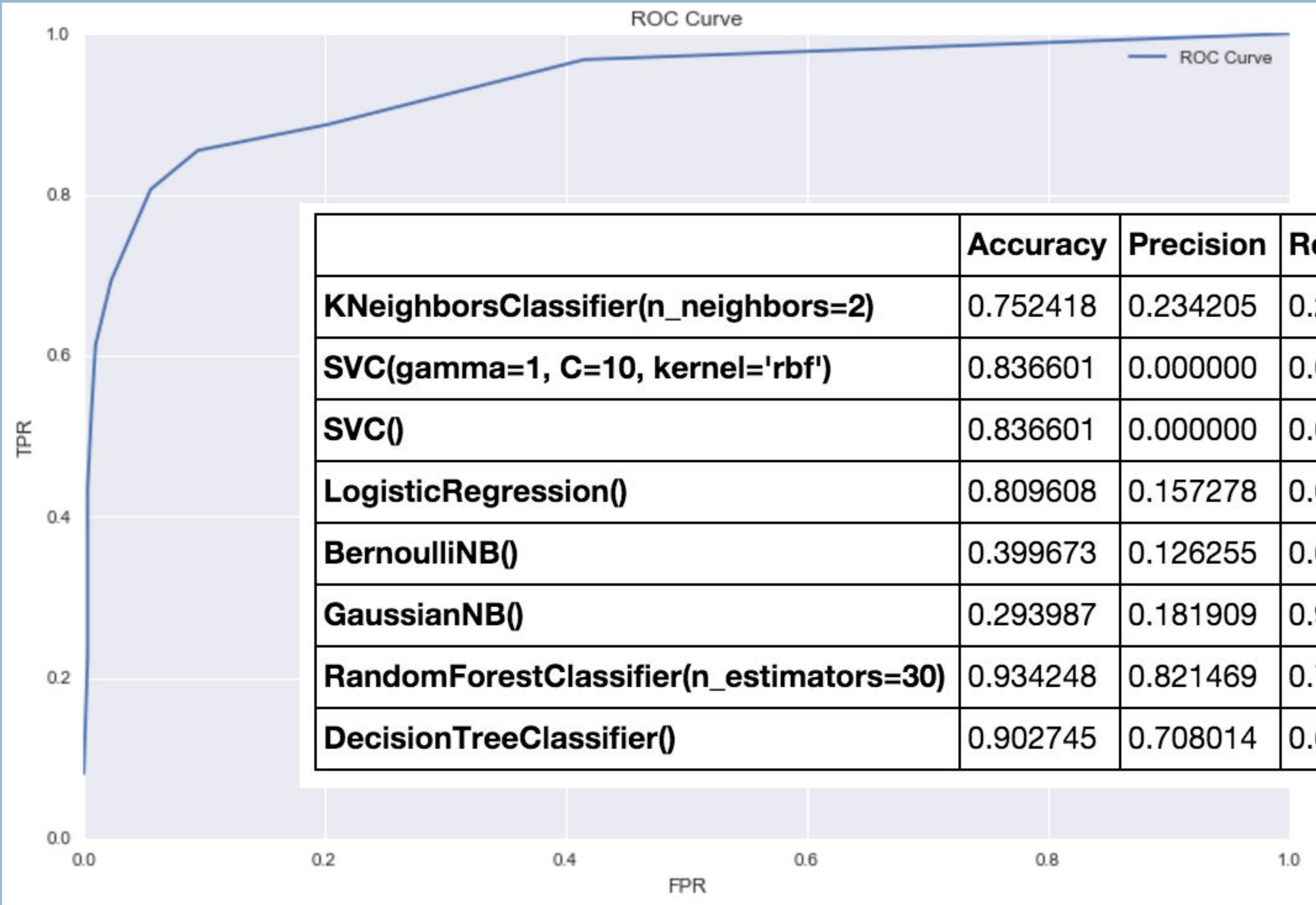
"In a country well-governed, poverty is something to be ashamed of. In a country badly governed, wealth is something to be ashamed of."

- Confucius

Did research and tested top economic factors:

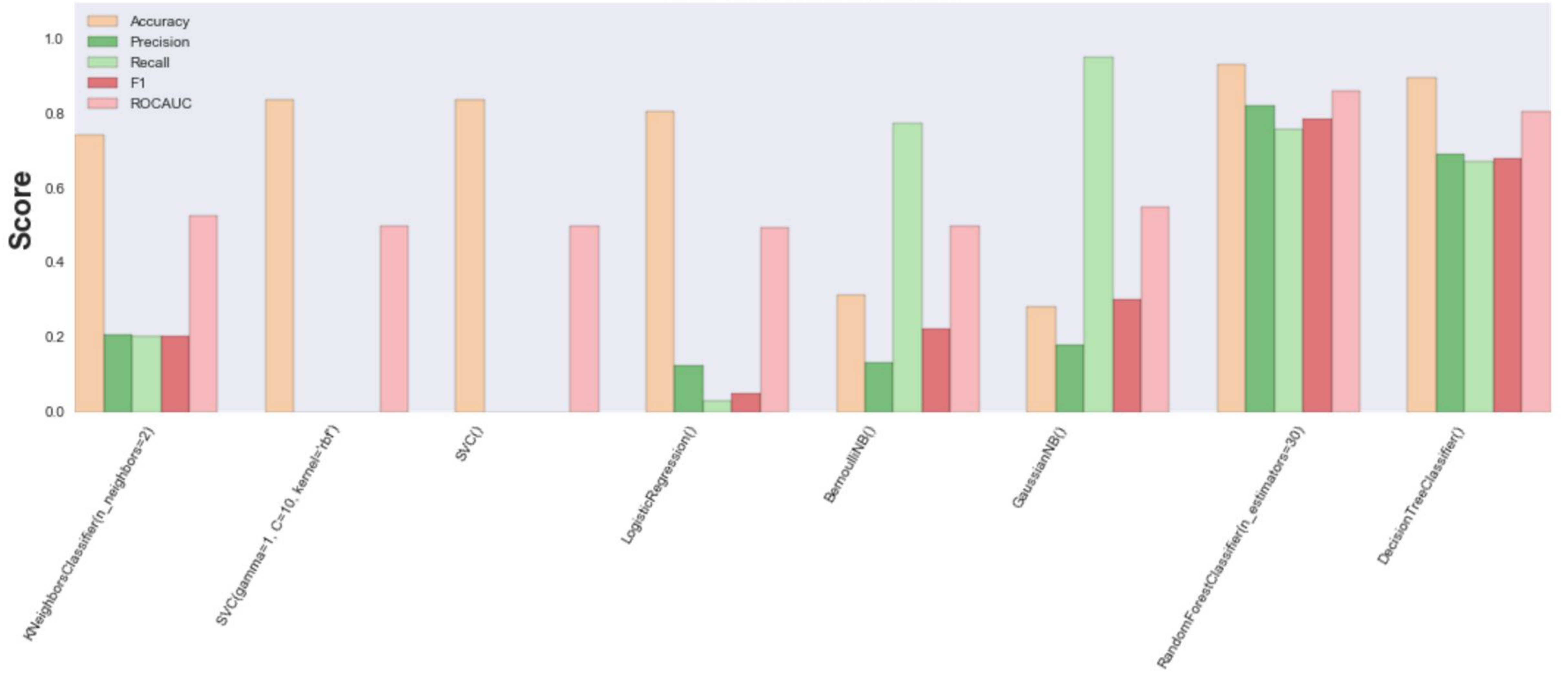
1. Percentage of Domestic Food Production
2. Labor Force Participation
3. Youth Unemployment
4. Foreign Investment
5. Normalized GDP

Best model: Random Forest Classifier



AUC: .95

Scores for Different Models



Ken C - Security

SECURITY FEATURES

- Peace Index - 2008-2015¹
- Terror Index - 2002-2014¹
- Uppsala Universitet, Uppsala Conflict Data Program, UCDP/PRIO Armed Conflict Dataset v.4-2015, 1946 – 2014²
- Council on Foreign Relations, Invisible Armies Insurgency Tracker: A Visual History of Guerrilla Warfare From 1775 to 2012³

1. Institute of Economics and Peace

2. Uppsala Universitat, Department of Peace and Conflict Studies

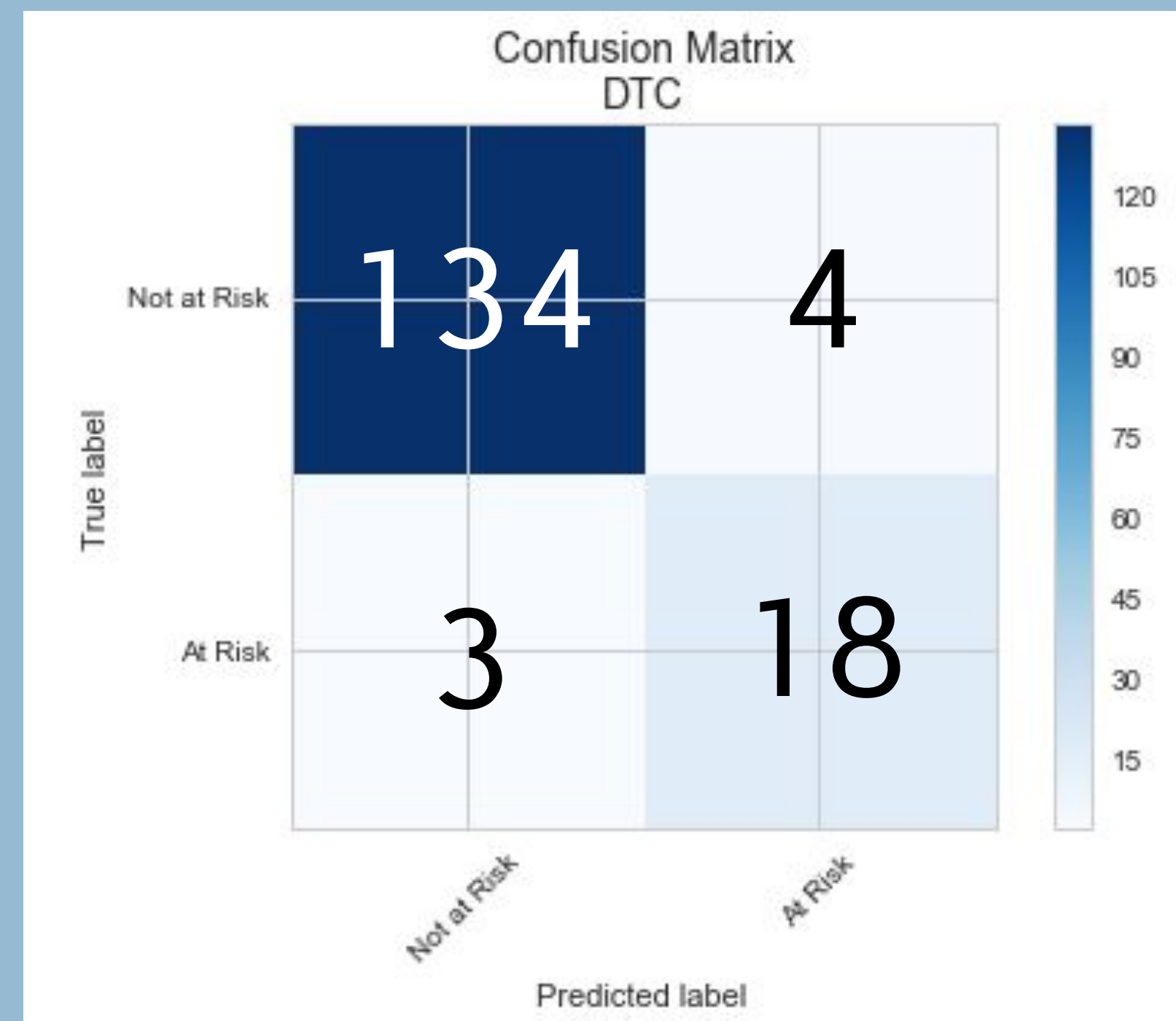
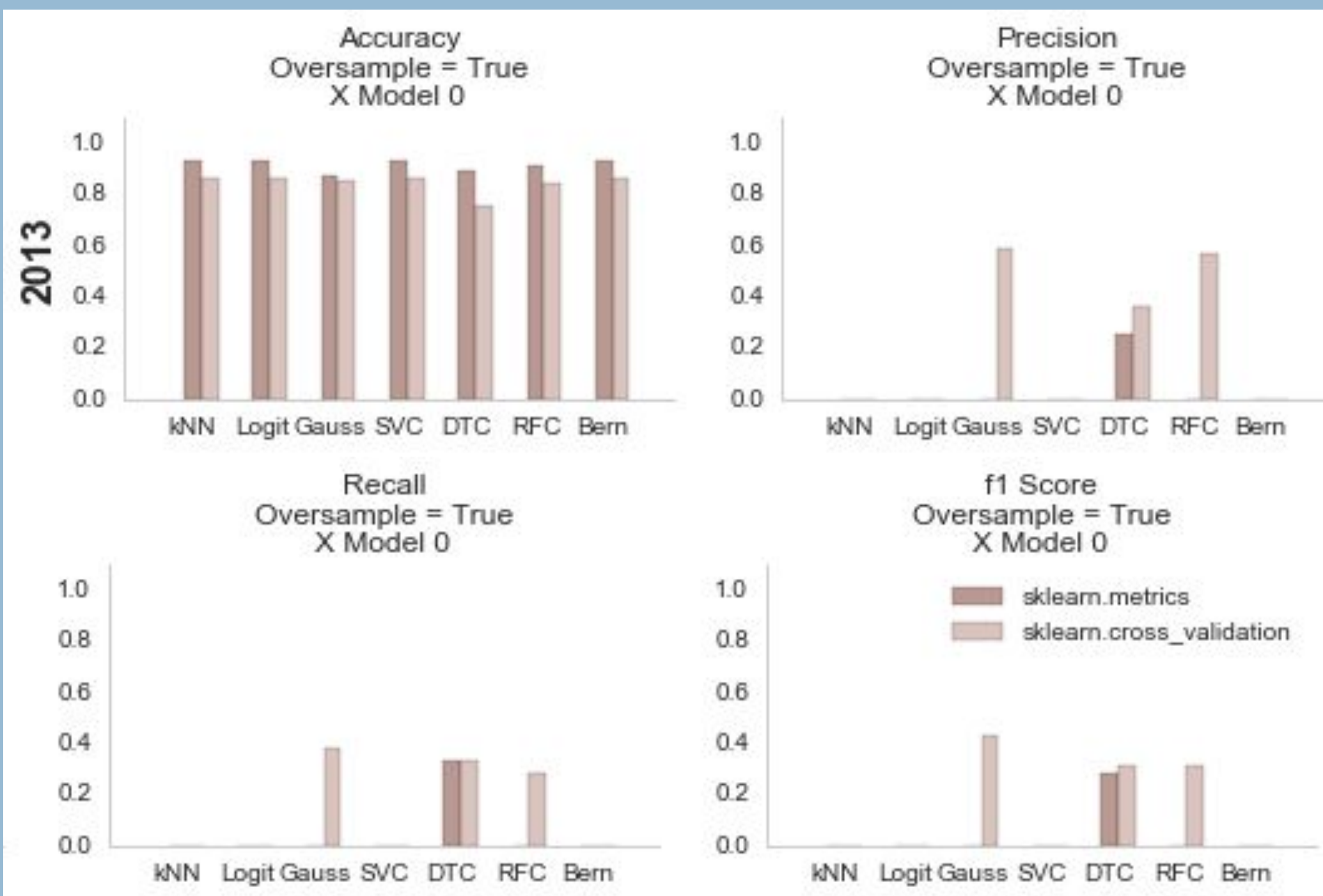
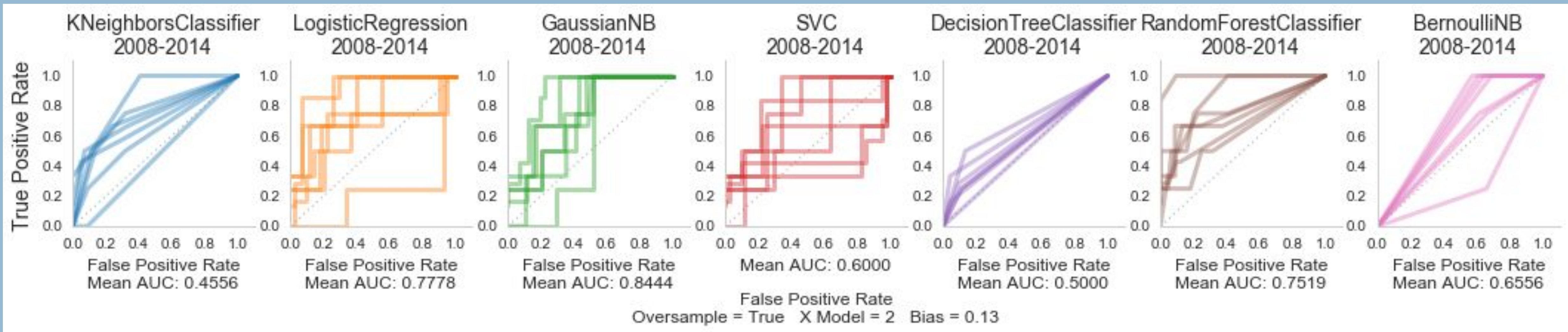
3. Council on Foreign Relations

SECURITY FEATURES

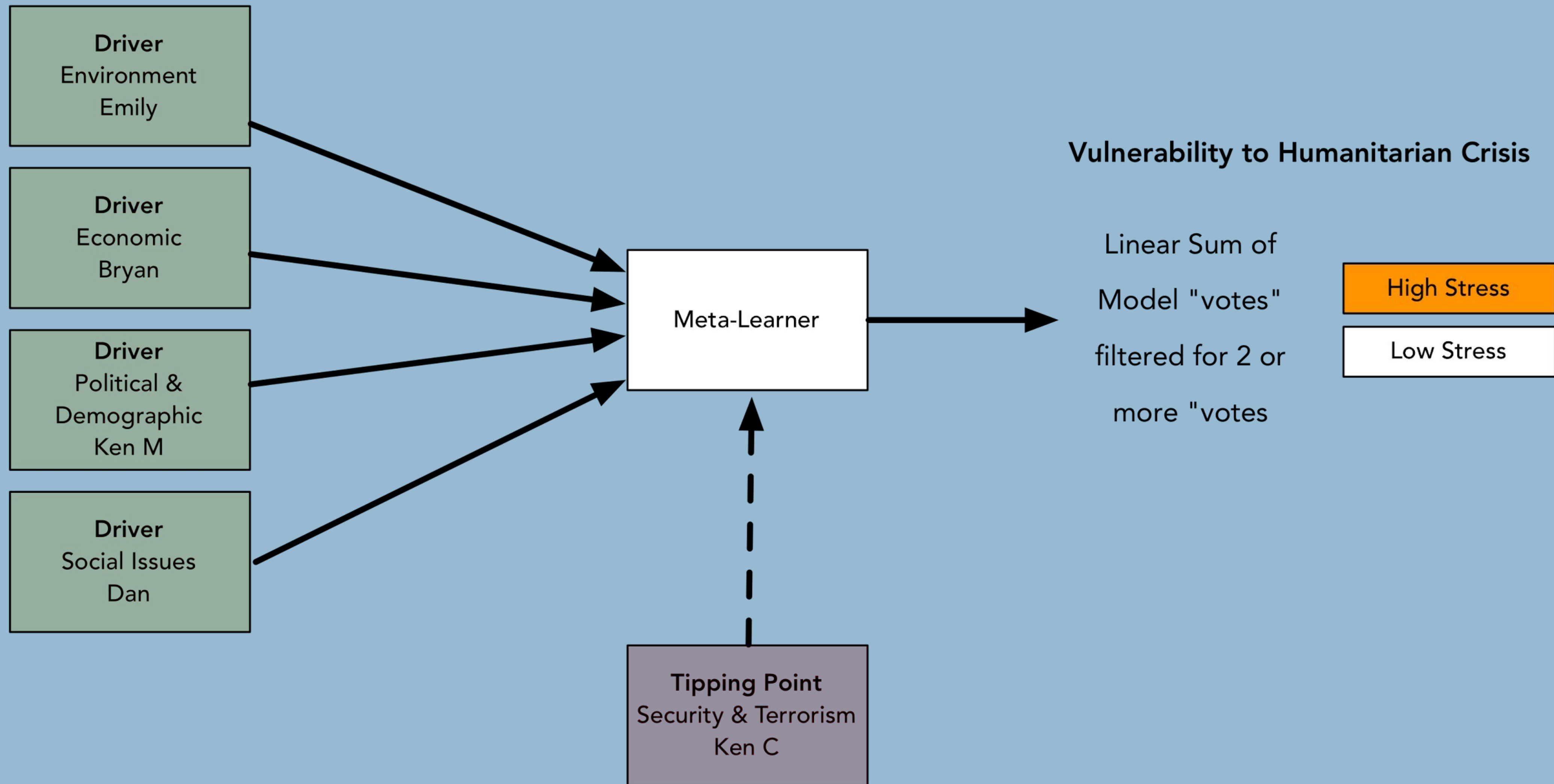
- Peace Index - 2008-2015¹
- Terror Index - 2002-2014¹
- Uppsala Universitet, Uppsala Conflict Data Program, UCDP/PRIO Armed Conflict Dataset v.4-2015, 1946 – 2014²
- ~~Council on Foreign Relations, Invisible Armies Insurgency Tracker: A Visual History of Guerrilla Warfare From 1775 to 2012³~~

1. Institute of Economics and Peace
2. Uppsala Universitat, Department of Peace and Conflict Studies
3. Council on Foreign Relations

Under the hood ...



Classification Model: Stacked Generalization (Stacking)



Drivers-Tipping Point concept drawn from the Internal Displacement Monitoring Centre (IDMC) paper "Understanding the Root Causes of Displacement: Towards a Comprehensive Approach to Prevention and Solutions" published in December 2015.

Aggregate Visual Analysis

<http://bit.ly/RefugeeMap>

Thank you!

Ken J Myers

| @KennethJMyers

Daniel Yawitz

| @YawitzD

Kenneth Chadwick

| OutsideKen@gmail

Bryan Bumgardner

| @BryanBumgardner

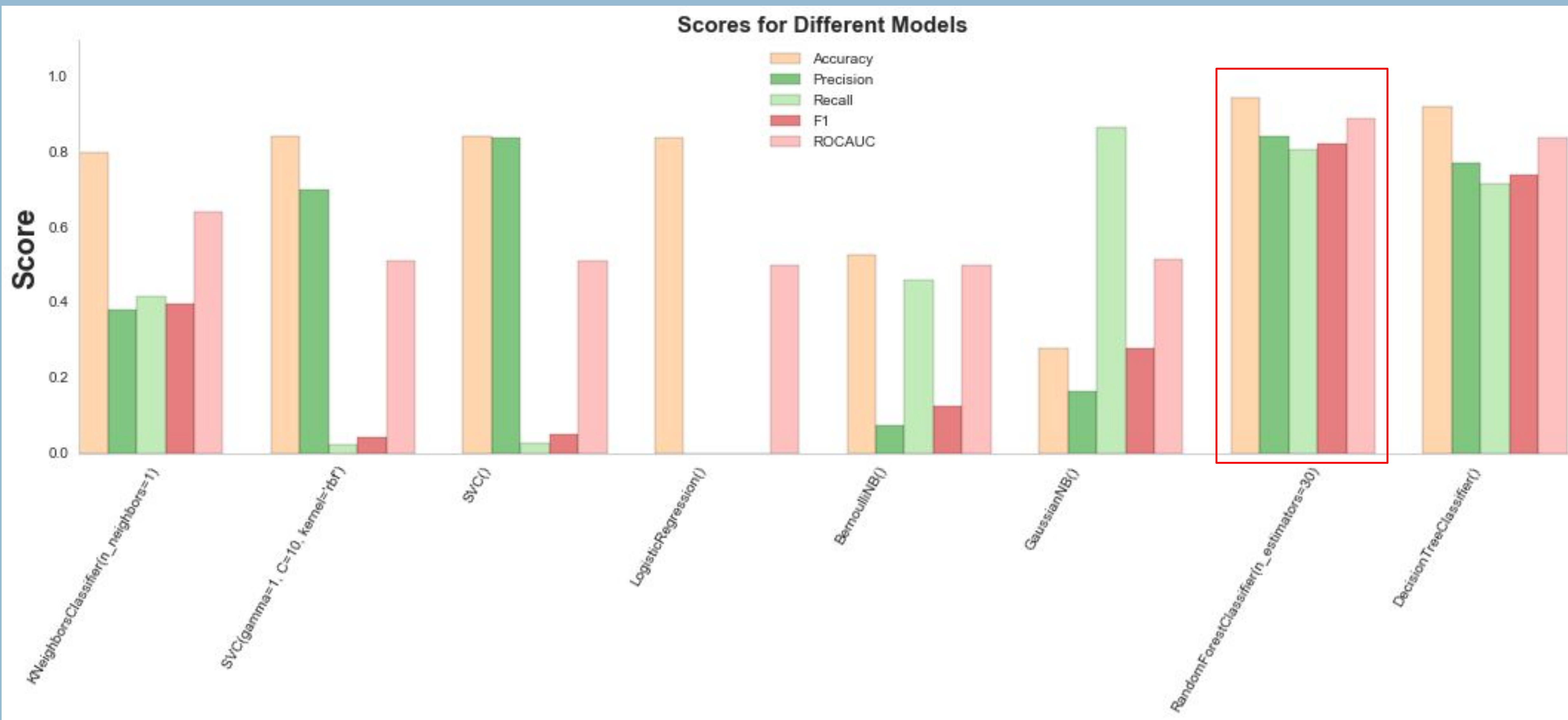
Emily Hough-Kovacs

| www.emily-hk.com

EAC
InterstateAC
NatureOfConflictTerr
CumIntensity
InternalAC
IIAC
NumKilled
NumArmedConflicts
NatureOfConflictGov
inflation
food_production_dom
terror_index
forestarea
female_legislators
peace_index

population_female
arable_land
political_rights
population_growth
population_15_64
unemployment
life_expectancy
youth_unemployment
population_total
labor_force_participation
civil_liberties
adolescent_fertility
population_65_up
have_good_sanitation
gdp_ppp

Predicting 2013



Predicting 2013

