

Modelling Migration in Europe

Using climate change and real time data sources



- 272 million people migrated internationally in 2019, a figure that has increased by 51 million people in the last 10 years (UN 2019)
- 82.3 million of these people migrated to European countries
- UK, Spain and Germany experienced their highest number of applications for migration ever (EASO 2021)
- Forced migration has been increasing faster than migration as a whole by 13 million in 5 years
- The top 3 countries of origins for European migrants are (EASO 2021):
 - Syria (80,000)
 - Afghanistan (61,000)
 - Venezuela (46,000)

Introduction - why migrate?

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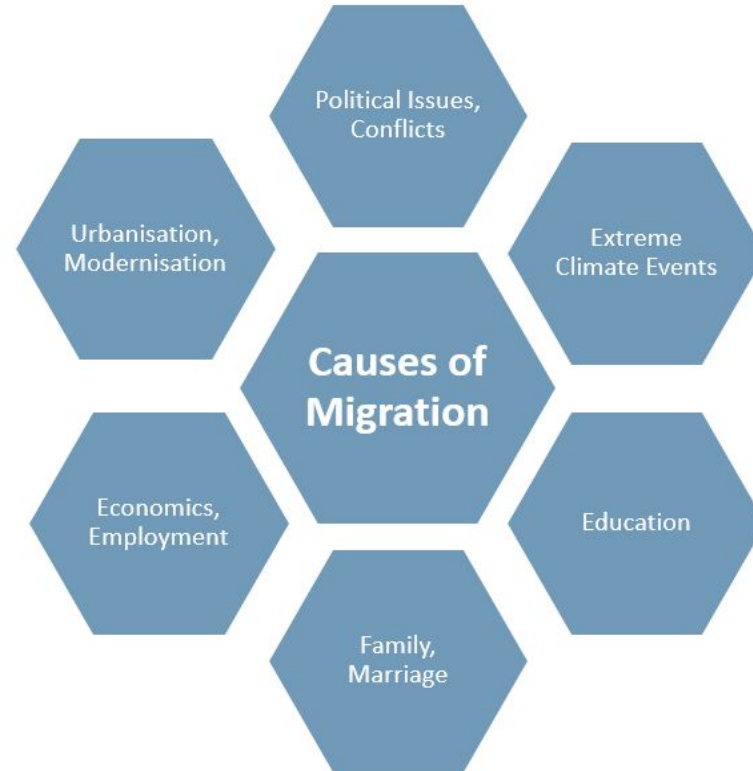


Figure: adapted from figure 12, Rahmati & Tularam 2017

How do we accurately predict migrations into Europe?

- Including the impact of current climate and then extrapolated to various future climate scenarios
- Increase use of data sources such as social media sentiment analysis and other real time sources

How do policy makers access all this information about migration modelling?

- Current models available to policy makers generally do not incorporate climate change and big data sources such as social media and aerial imagery analysis
- There is lots of information on the impact of climate change on migration but this mainly sits within the research community



Image: Perrone 2019

- 200 million climate refugees expected by 2050
- EU comprised of 27 countries with different data and processes
- Data integrity and quality issues
- No consolidated view into historic, real-time and future events

- Destination country expenditure on migration can be large
- Changes to social welfare, employment, taxation, etc
- Complexity in government policy decision making
- Governments need accurate predictions to make informed decisions



Figure: adapted from figure 13, Rahmati & Tularam 2017

Proposed Solution

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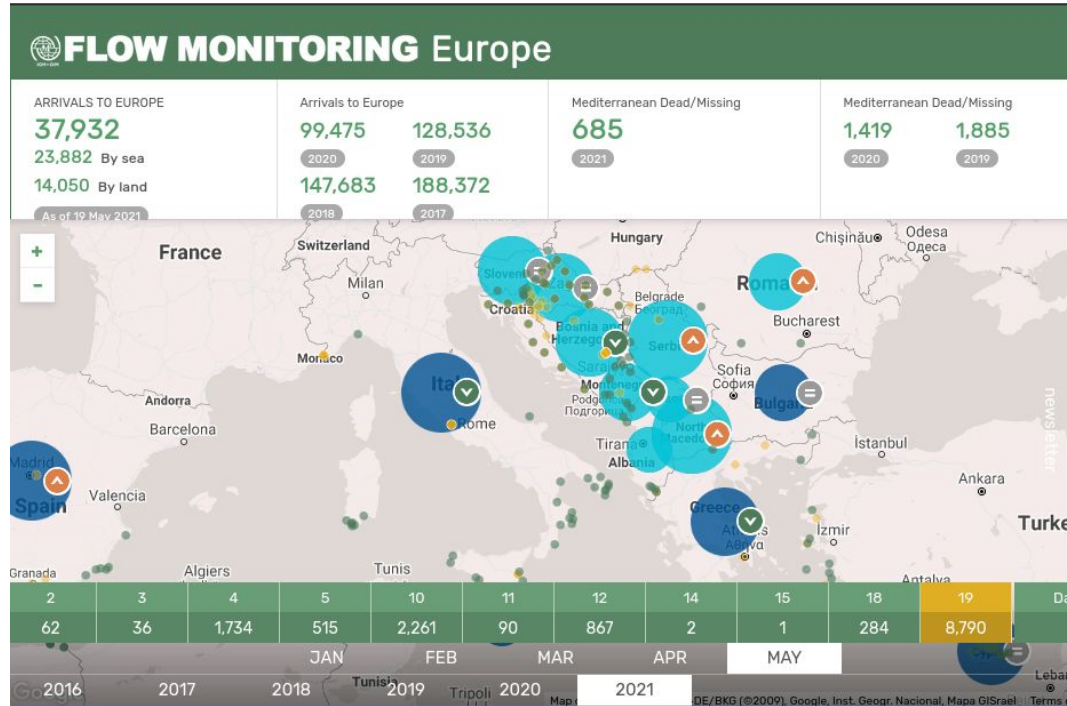


Image: IOM 2021

- Dashboard to display current real-time migration
- Real-time events overlaid onto map e.g. war, political turmoil
- Provides predictions on future migration
- Predicted future events overlaid onto map e.g. drought, flooding

- Composite model provides real-time reactivity and more accurate future predictions
- Visual changes more easily communicated than hard numbers
- Clearer causal link between events (e.g. war, drought) and migration to help policy decisions



Image: Fauxels 2019

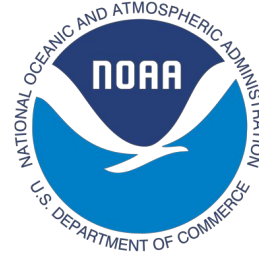
- Data accuracy/ integrity
- Vulnerable people
 - People smugglers
 - Discrimination
- Transparency



Image: Kovacevic 2021

Methodology

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The GDELT Project



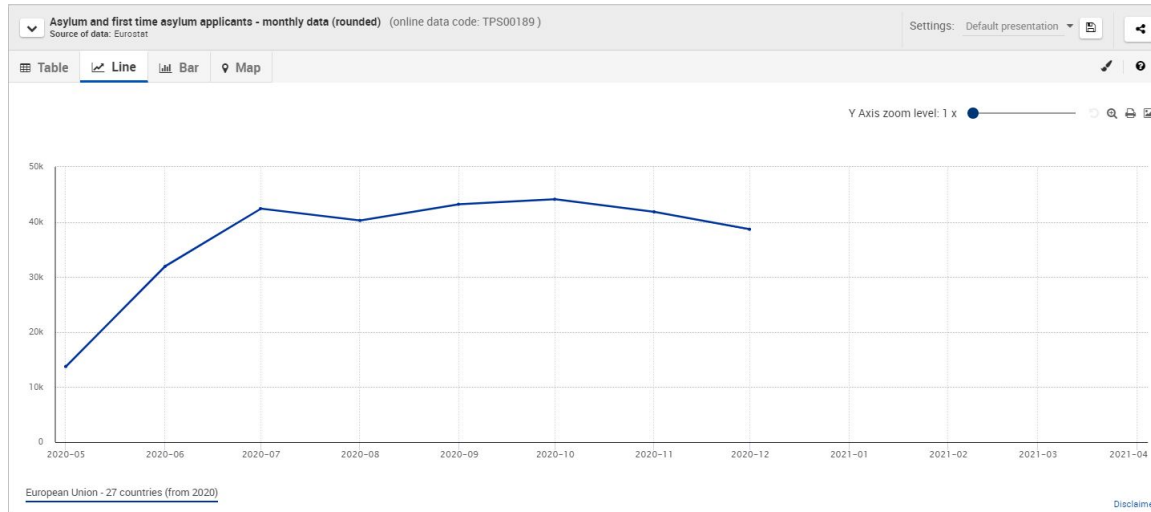
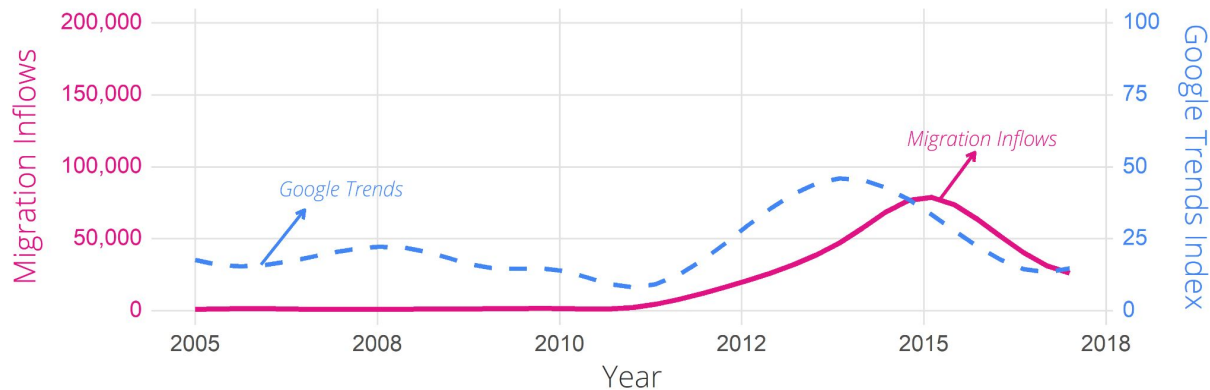


Image: Eurostat 2021

National Statistics Agencies

- Eurostat
- Updated monthly
- Asylum applications and arrivals
- Multilinear Regression Model

Correlation Between Google Trends Index & OECD Migration Inflows Syria to Sweden



Data: OECD Inflows of Foreign Population, 2020 | Google Trends, November 2020 | Chart: GMDAC

Social Media Sentiment Analysis

- Google Trends
- Twitter
- GDELT

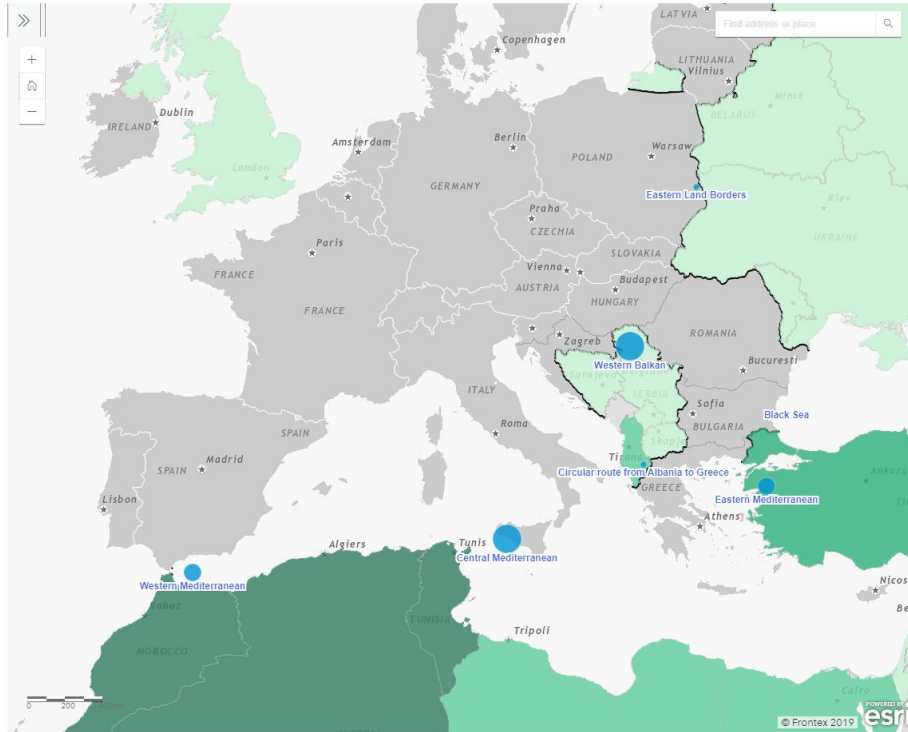


Image: Frontex 2021

Frontex and IOM's Displacement Tracking Matrix

- Detected Border Crossings
- Migrant Flow



This nighttime satellite view shows the location of each detention and re-education camp in Urumqi, Xinjiang province, China, January 2021

Image by NOAA VIIRS and OpenStreetMap

NOAA VIIRS

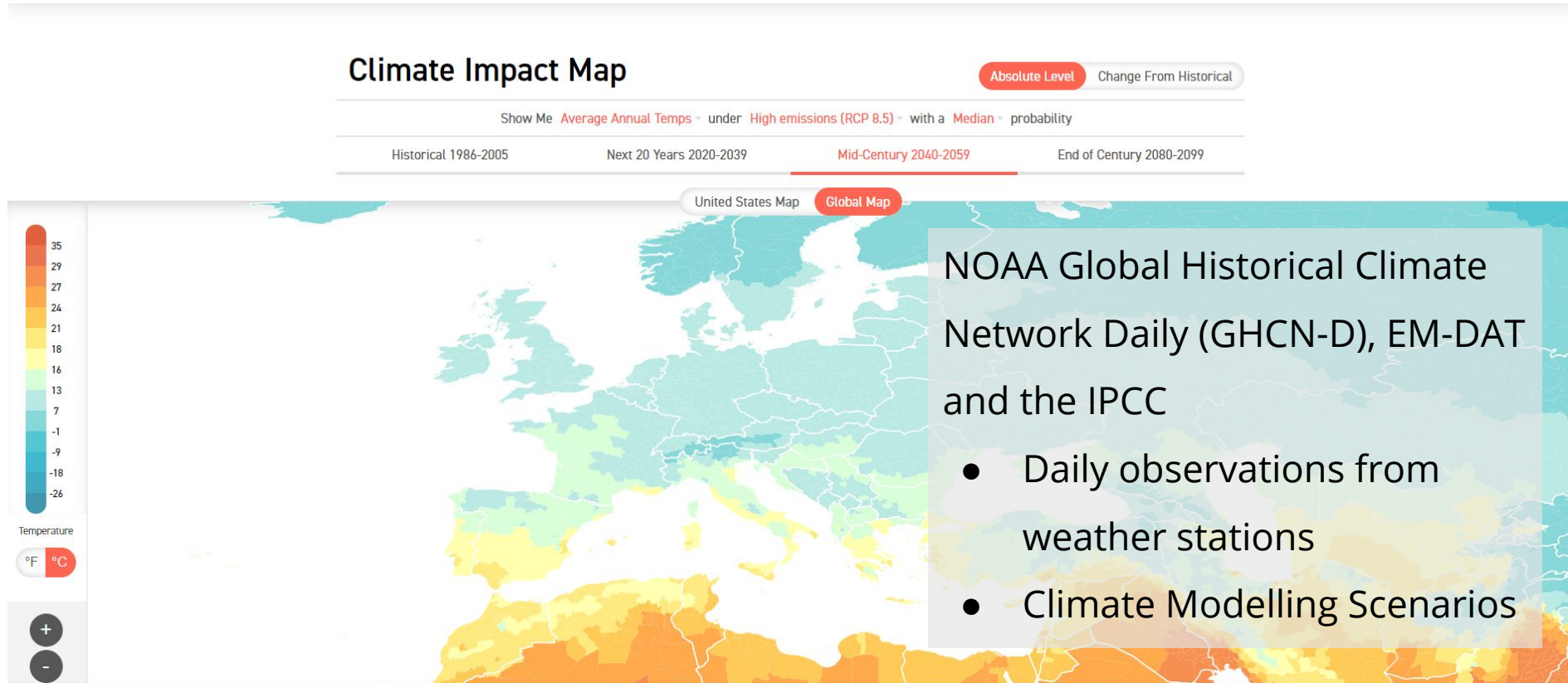
- Human activity through thermal and night-time imagery
- Convolutional Neural Network



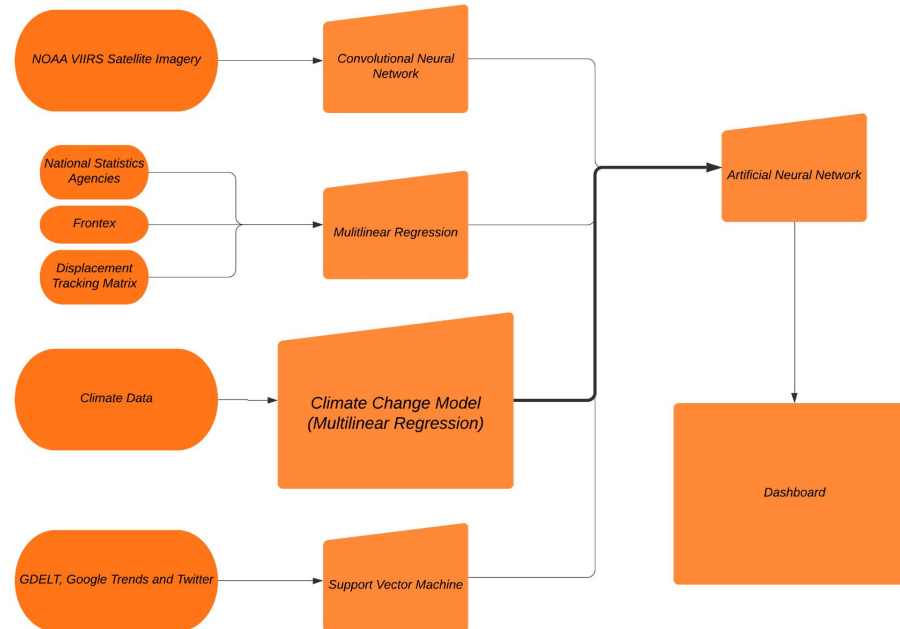
Image: UN Global Pulse 2021

PulseSatellite

- Satellite Mapping
- Roof Density
- Flood Mapping



Composite Machine Learning Pipeline



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