Disaster Response: Leveraging Wide Area Earth Observation with Machine Learning

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Challenge driven machine learning research

- Multi-sensor data including satellite imagery
- Applications in disaster management and environmental protection
- Co-designing/creating solutions with end-users

Satellite Applications Catapult UKSA project (EASOS)

- Oil source estimation
- Rainfall nowcasting
- Million parameter estimation
- Human/Computer satellite imagery annotation
177 million disaster-related tweets the day after Japan earthquake in 2011.

11,180 km² area covering 10 islands/archipelagos following hurricanes Irma and Maria in 2017.
Hybrid human-automatic satellite imagery annotation

Raw Data
Digital Globe, Planet imagery

Machine Learning Algorithm

Open Street Map
Principled Bayesian modelling framework

<table>
<thead>
<tr>
<th>t = actual damage</th>
<th>c = labelled damage</th>
<th>c = labelled no damage</th>
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<td>70%</td>
<td>30%</td>
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“Generative model”
State-of-the-art parameter inference methodologies

Accuracy

VB all classes
VB background class
VB undamaged building class
VB damaged building class
EM
CL
Uncertainty, risk and targeted data acquisition

Data

Interpolation

Uncertainty

Intelligent tasking
New applications

- Tracking bomas in Africa
- Mapping tailings dams in Brazil
- Health monitoring of schools across Africa
- Seismic fault detection world-wide

NeurIPS workshop 2018

Machine Learning for the Developing World: Achieving Sustainable Impact

Python code: https://github.com/OlgaIsupova/BCCNet