Disaster Response: Leveraging Wide Area Earth Observation with Machine Learning

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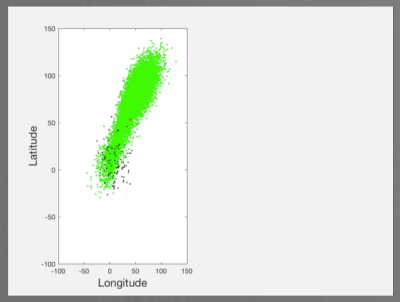
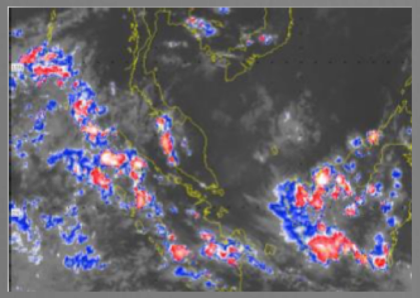
Challenge driven machine learning research

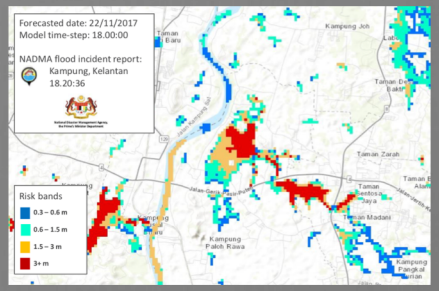
- Multi-sensor data including satellite imagery
- Applications in disaster management and environmental protection
- Co-designing/creating solutions with end-users

- Satellite Applications Catapult UKSA project (EASOS)

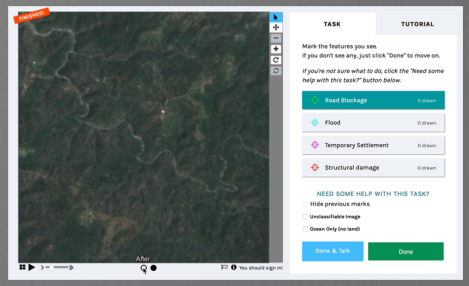


Oil source estimation


Rainfall nowcasting



Million parameter estimation



Human/Computer satellite imagery annotation

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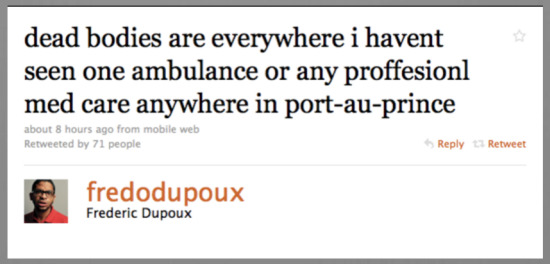
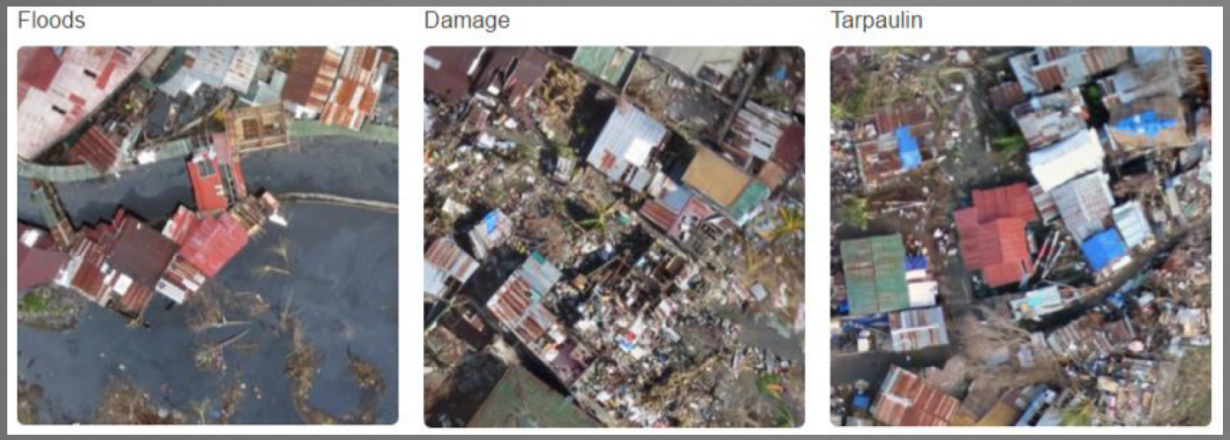
Scalable multi-sensor data fusion

Disaster Response
Rescue Global



177 million disaster-related tweets the day after Japan earthquake in 2011.



11,180 km^2 area covering 10 islands/archipelagos following hurricanes Irma and Maria in 2017.

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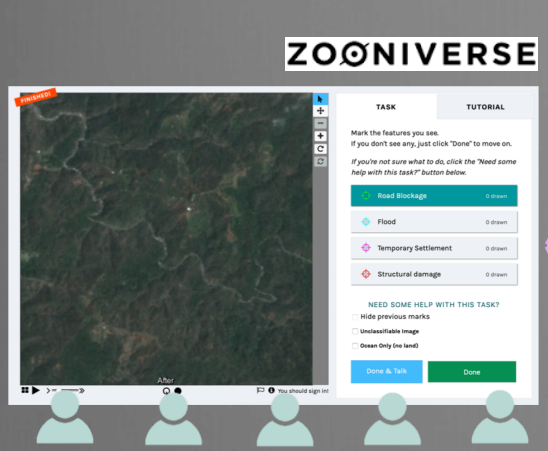
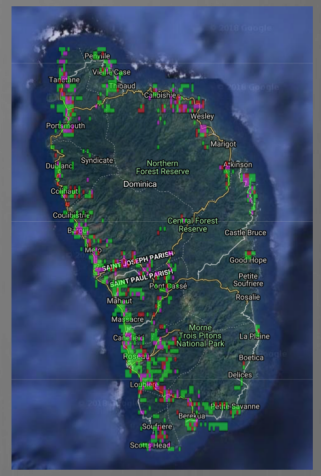
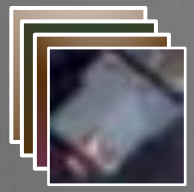
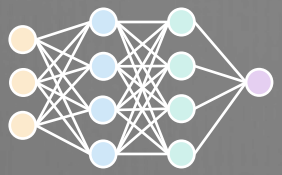
Hybrid human-automatic satellite imagery annotation



Machine Learning Algorithm







Raw Data
Digital Globe, Planet imagery

Open Street Map

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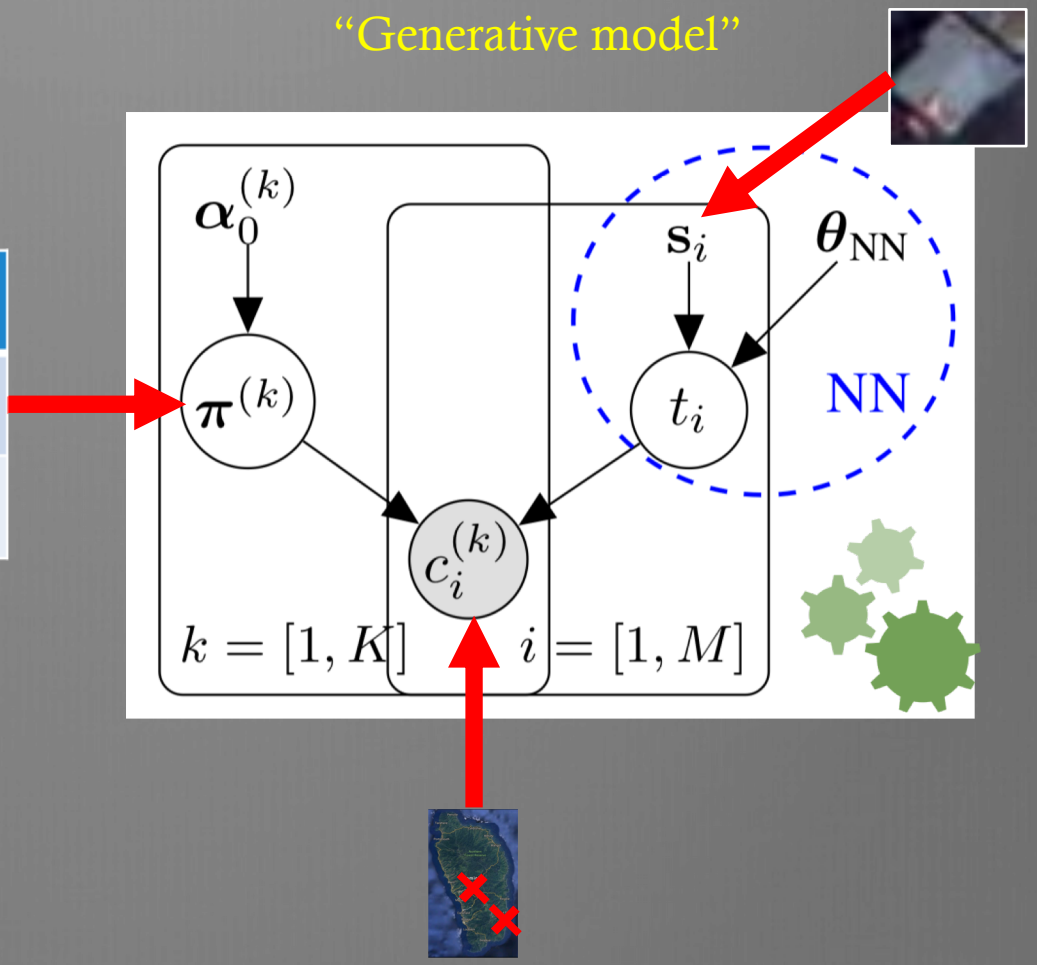
EASOS EARTH AND SEA OBSERVATION SYSTEM

Principled Bayesian modelling framework

	c = labelled damage	c = labelled no damage
t = actual damage	70%	30%
t = actual no damage	25%	75%



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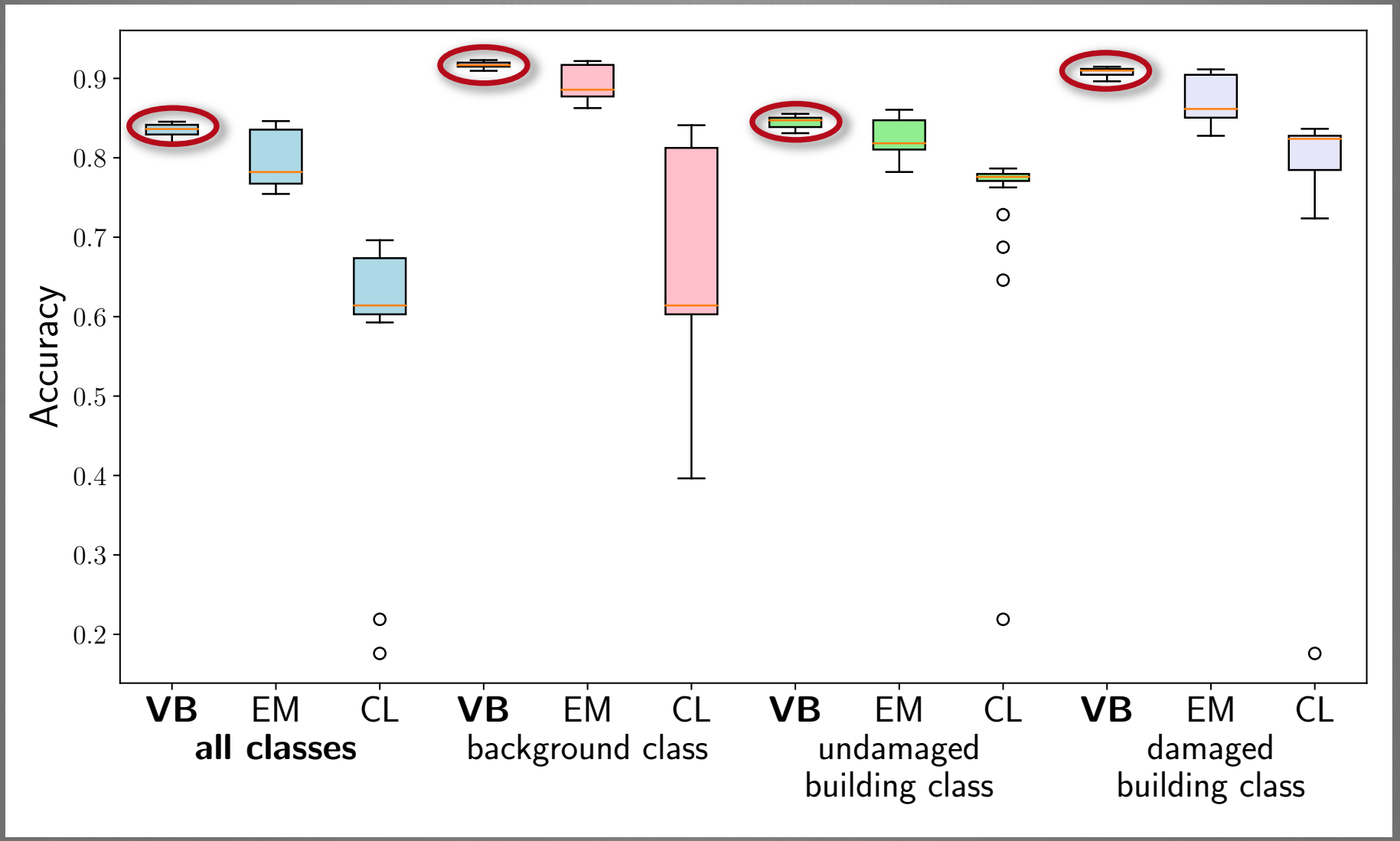
State-of-the-art parameter inference methodologies



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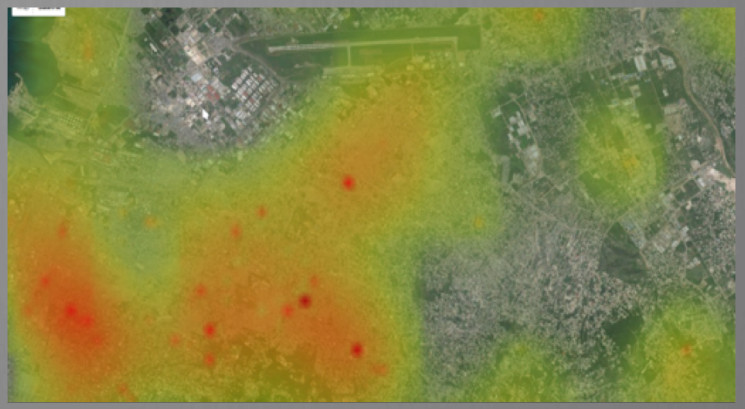
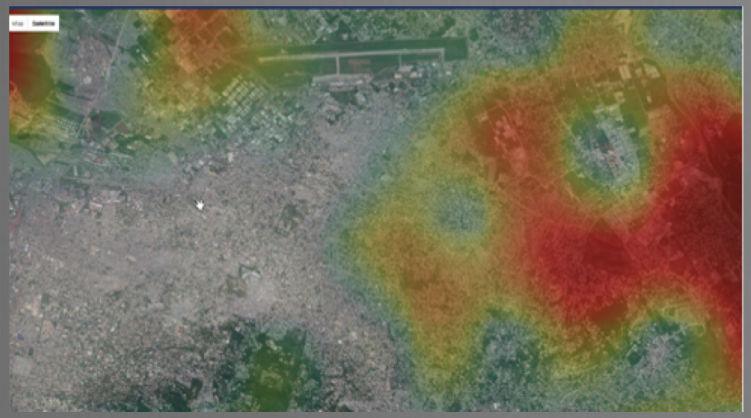
Uncertainty, risk and targeted data acquisition

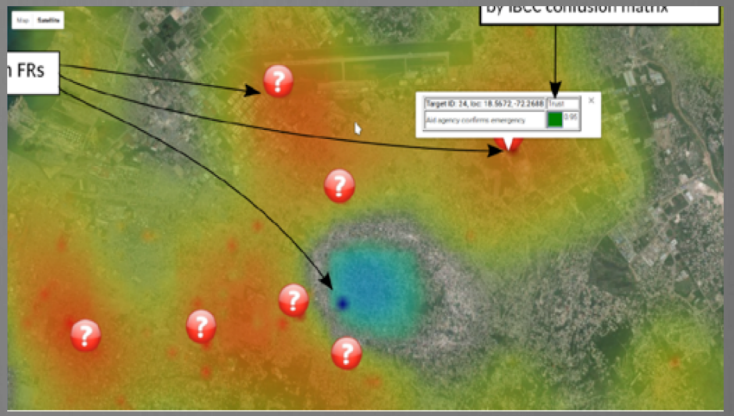
Data



Interpolation



Uncertainty



Intelligent tasking

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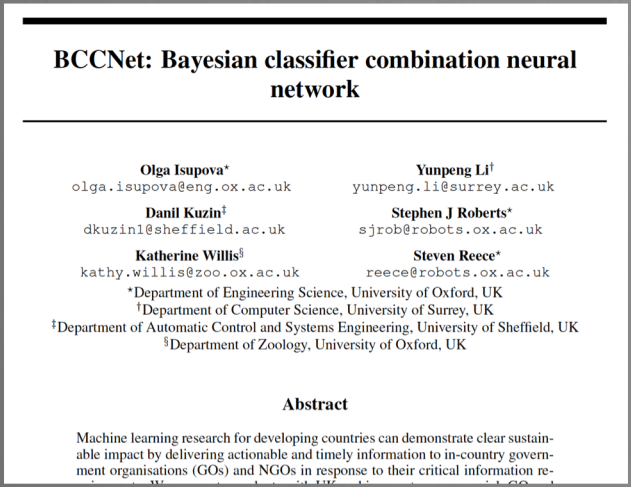
Further work …



BCCNet: Bayesian classifier combination neural network

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Abstract

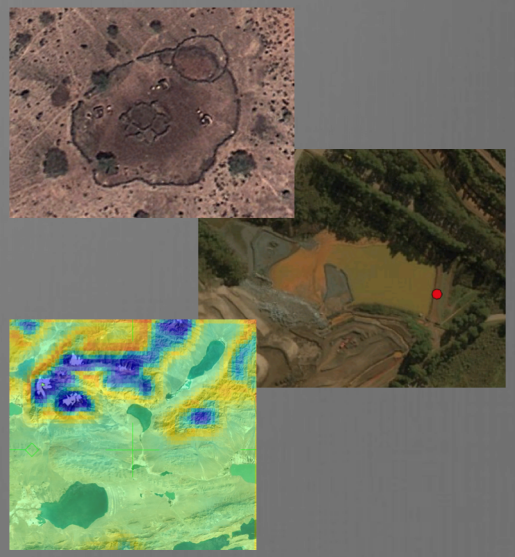
Machine learning research for developing countries can demonstrate clear sustainable impact by delivering actionable and timely information to in-country government organisations (GOs) and NGOs in response to their critical information re-

NeurIPS workshop 2018

Machine Learning for the Developing World: Achieving Sustainable Impact

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

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



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