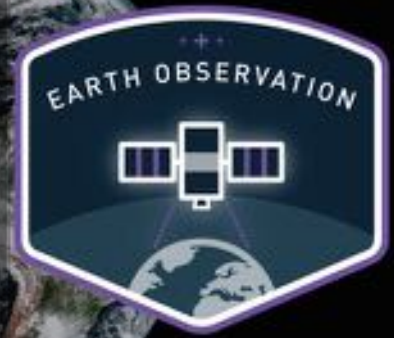
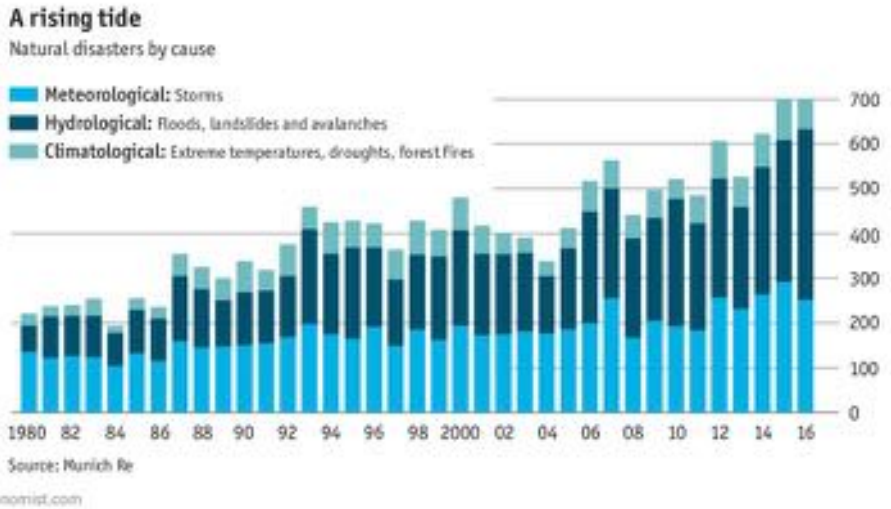
Machine Learning-aided Disaster Response

Multi^{3}Net: Segmenting Flooded Buildings via Fusion of Multiresolution, Multisensor, and Multitemporal Satellite Imagery

Ben Bischke Jakub Fil Ramona Pelich
Tim G. J. Rudner Marc Rußwurm



Global Natural Disaster Event Occurrences



https://www.bbc.com/news/world-latin-america-37582009

2016 and 2017 were one of the most impact-full **hurricane seasons** with

Hurricanes **Mathew**, **Harvey**, **Irma**, and **Maria**

devastating the Caribbean islands and causing **subsequent floods**.

First-responders are often **restricted** by **lack of information** about

the location of **affected communities** and the **level of damage**

https://www.army.mil/humanitarian/hurricanes.html

https://www.ecowatch.com/us-climate-report-2507835341.html

After such disaster events,
first responders

initially prioritize

access to information
over map accuracy.

Case Studies

Our Approach: Multi^{3}Net

Key idea

Fast, high-accuracy **building** and **damage detection** by fusion of **multiresolution**, **multisensor**, and **multitemporal** satellite imagery in CNN.

Input data sources:

- Radar: Sentinel-1 (public)
- Optical: Sentinel-2 (public)
- Very high resolution (commercial)

Input data: Multiresolution satellite imagery

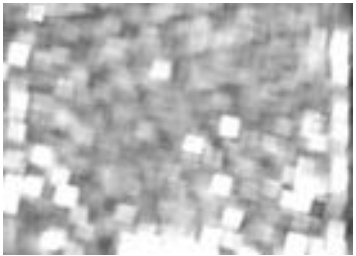
0.5m post-disaster

Very high-resolution optical

10m pre/post-disaster

Medium-resolution optical

10m pre/post-disaster



Medium-resolution radar

Input data: Multiresolution satellite imagery

0.5m post-disaster

Very high-resolution optical

10m pre/post-disaster

Medium-resolution optical

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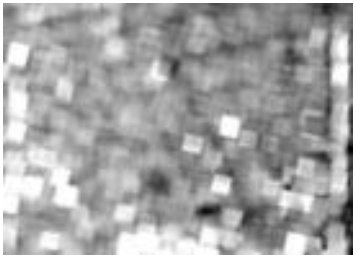

Medium-resolution radar

Ground truth data: towards two objectives

Building footprints

Damaged sites

Open Street Map

unitar
United Nations Institute for Training and Research
UNOSAT

UNOSAT

Qualitative results: Houston—Flood Damage

RGB input

Target

Prediction

Qualitative results: Ecuador—Hurricane Damage

final prediction overlay

Publications

NIPS Conference *December 2–8, 2018 in Montreal, Canada*

Workshops on

- **Modeling and Decision-making in the Spatiotemporal Domain**
- **AI for Social Good**

AAAI Conference *January 27–February 1, 2019 in Honolulu, Hawaii, USA*

- *Multi^{3}Net: Segmenting Flooded Buildings via Fusion of Multiresolution, Multisensor, and Multitemporal Satellite Imagery*

Thank you!

If you'd like to learn more, come join us for our presentation **today at 2:00pm at Φ-Lab**.