Photogrammetry and Neural Networks to Detect Form Changing Slope Conditions

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Application: Landslide detection

2018: Record year of landslides in our region

- Record **rainfall**: wettest year
- Soil: **red clay**
- Many **hills**
- Not enough **$$$**

Route 30

Greenleaf St. /
West End

What is Deep Learning?

Example: Find the function that marks each pixel with the probability that it is “road”

=F(

)

~1 million elements

~10 million parameters

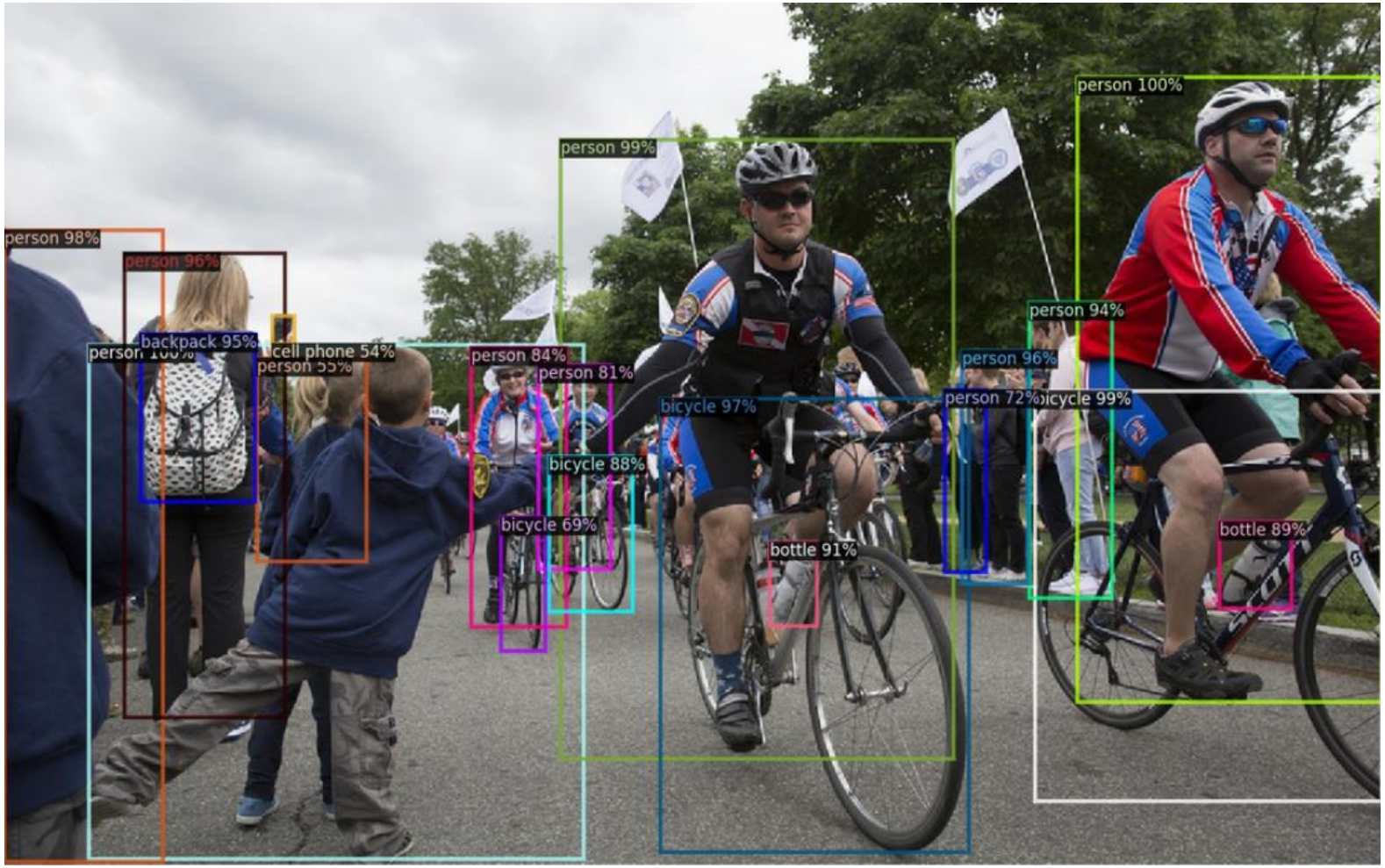
~1 million elements

Advantage: Only need to show it enough examples!

Disadvantage: Need to show it >10,000, sometimes millions of examples

RoadBotics

State of the Art computer vision / machine learning



Object classification and localization

State of the Art computer vision / machine learning

Panoptic segmentation

State of the Art computer vision / machine learning

Keypoint detection

Indicator events in images

Debris on road

Cracks: longitudinal, then curving

Persistently wet =>reduced friction

Leaking pipe => Earth movement might cause leak.

3D reconstruction from images (Photogrammetry)

From 80 images:

Indicator events in 3D

Tree

Retaining wall: bulges, tilting, bowing, undermining

Rail guard

Current focus: development of cracks

Example: Spring Run Road

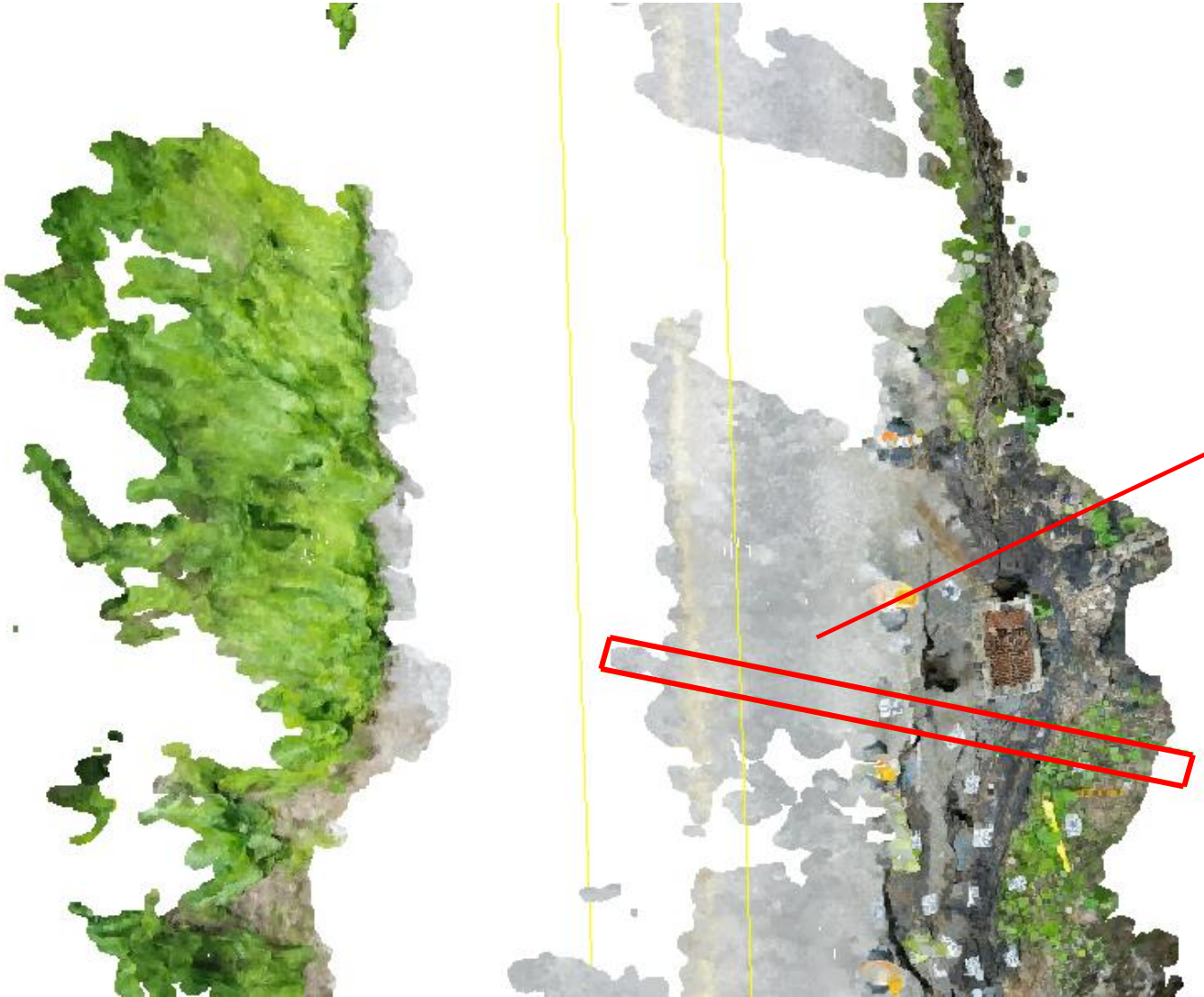
November 11, 2018

March 12, 2019

May 20, 2019

3D model of Spring Run Road landslide

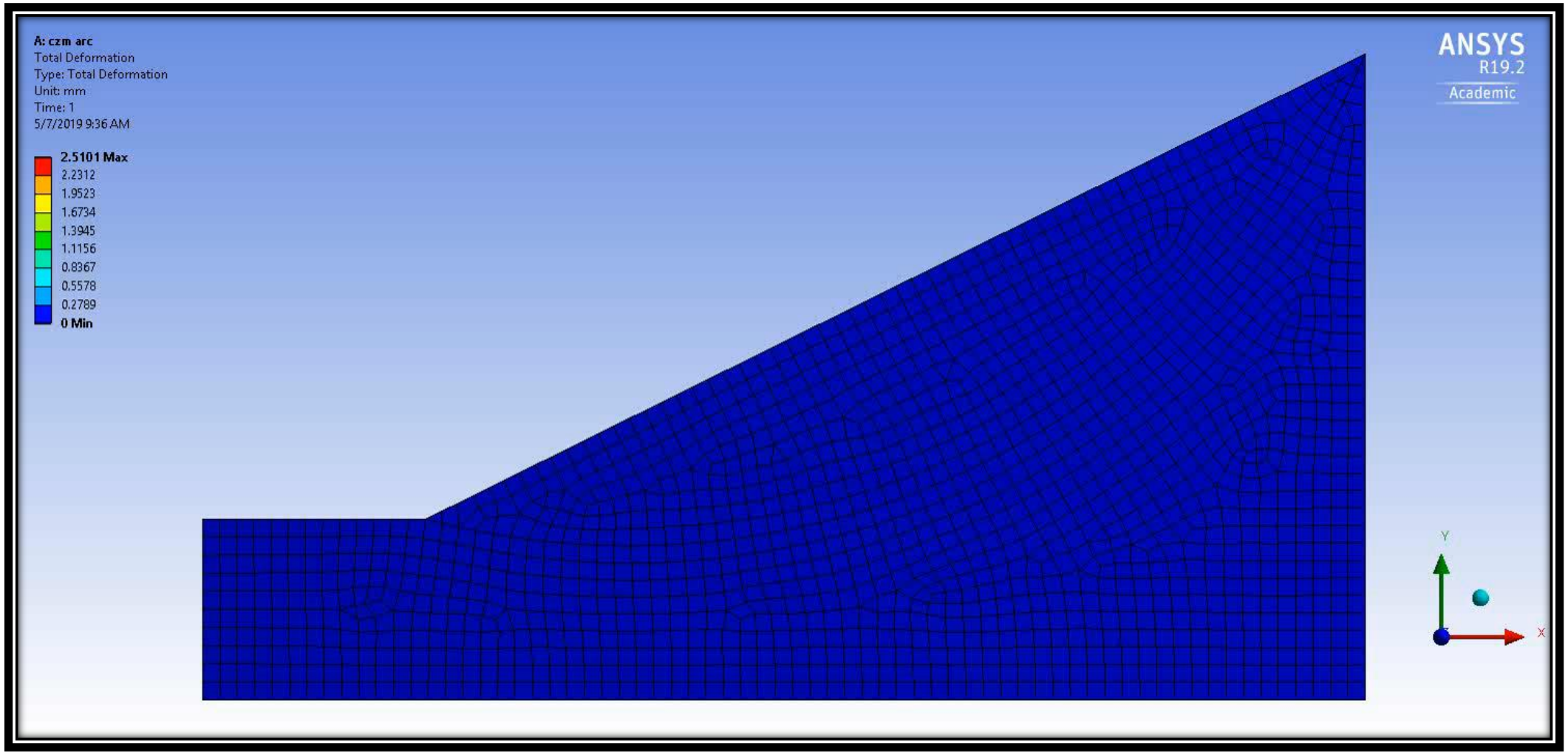
Cross section



top view

side view (cross section)

Work with Civil Engineering: Modeling of failing slope

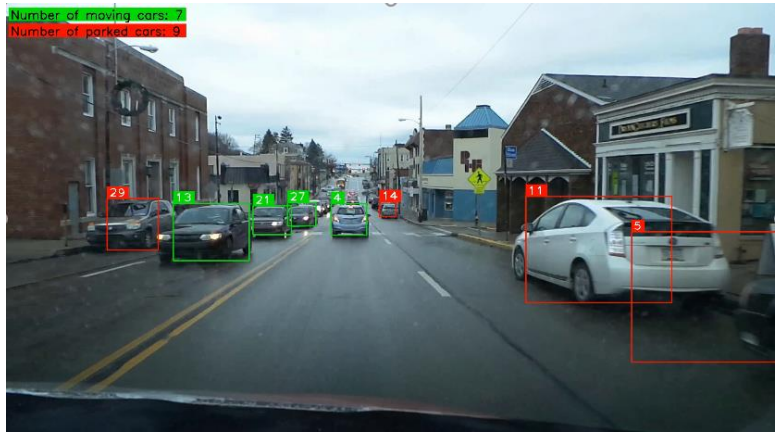


Get lots of data with Transit bus

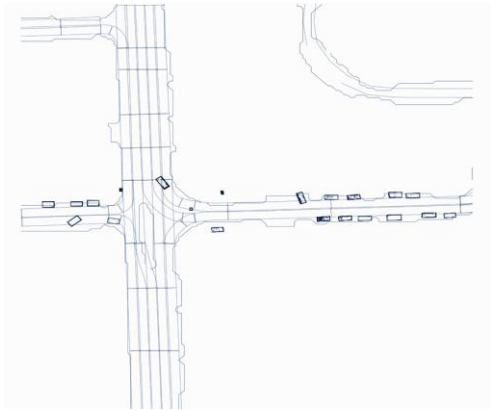
Applications:

Monitor and assess infrastructure and traffic

Damage detection – e.g. landslides



Traffic counts – parked and moving cars



Update HD maps

Detect relevant changes and events
Send only relevant information, given bandwidth, time, and privacy constraints

Bus with cameras, GPS, storage, communication and computing

Traffic management center