



Edge Computing for Road Assessment

Christoph Mertz



Roman Road Inspection

CURRENT METHOD

Subjective

Dangerous

Expensive

Infrequent

Labor Intensive



VISUAL
INSPECTION



SENSOR VANS

ROADBOTICS

Objective

Time Saving

Affordable

Convenient

Automated



Deep Learning

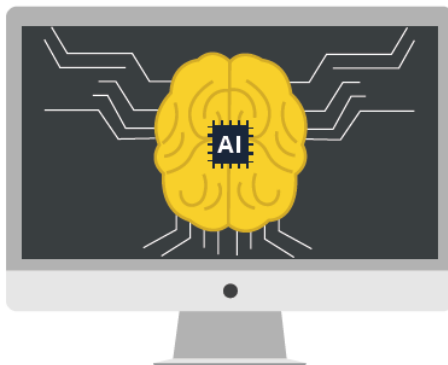
SIMPLE THING, HARD TO DO

STEP 1



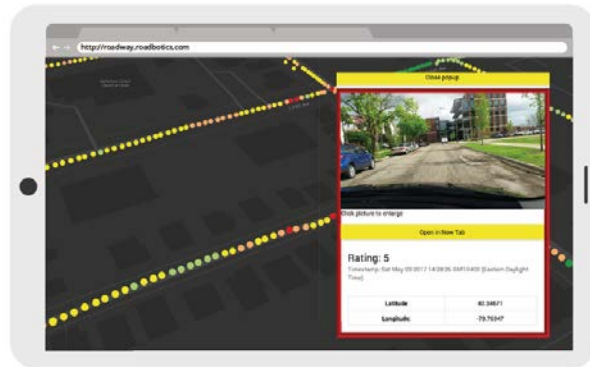
Passive &/or active
data collection

STEP 2



Automated assessment

STEP 3



Comprehensive condition
map

Analysis

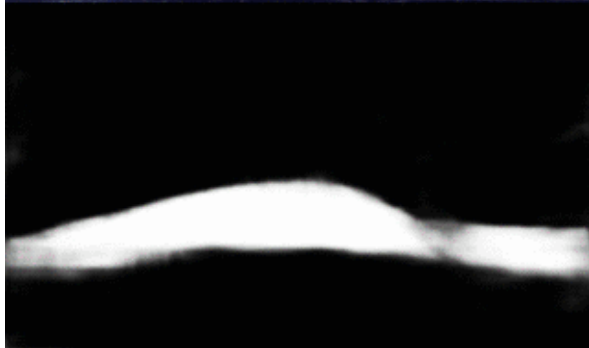
Raw Video



Overall
Rating



Road Surface
Detection



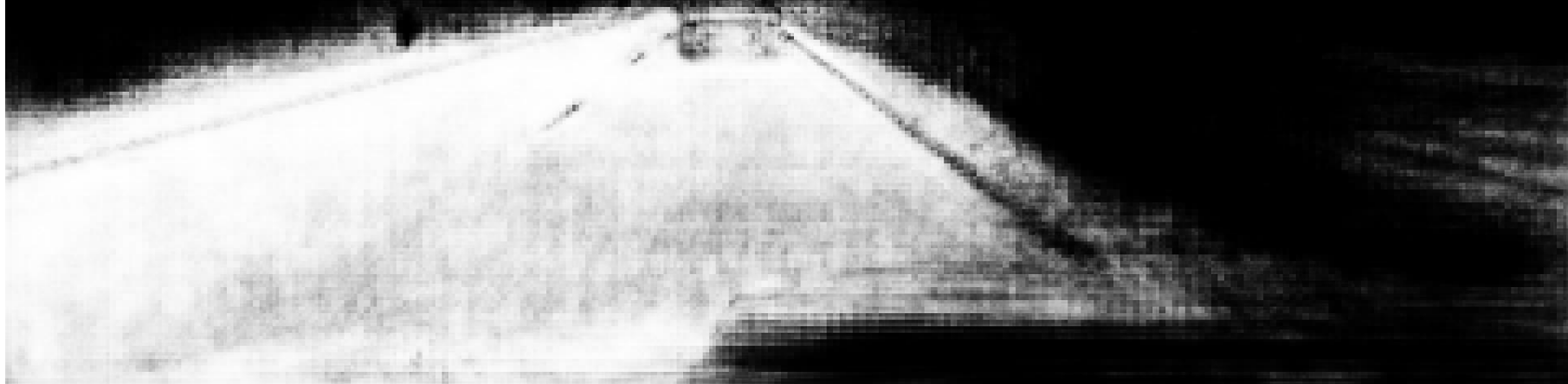
Road
Anomaly
Detection



RAW



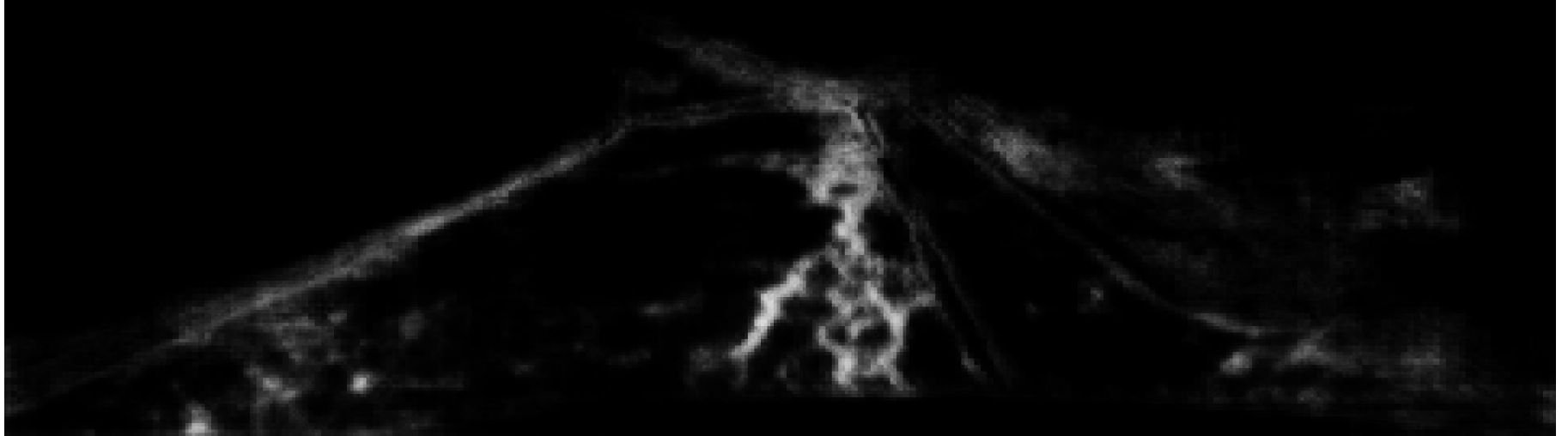
UNDAMAGED PAVEMENT



RAW



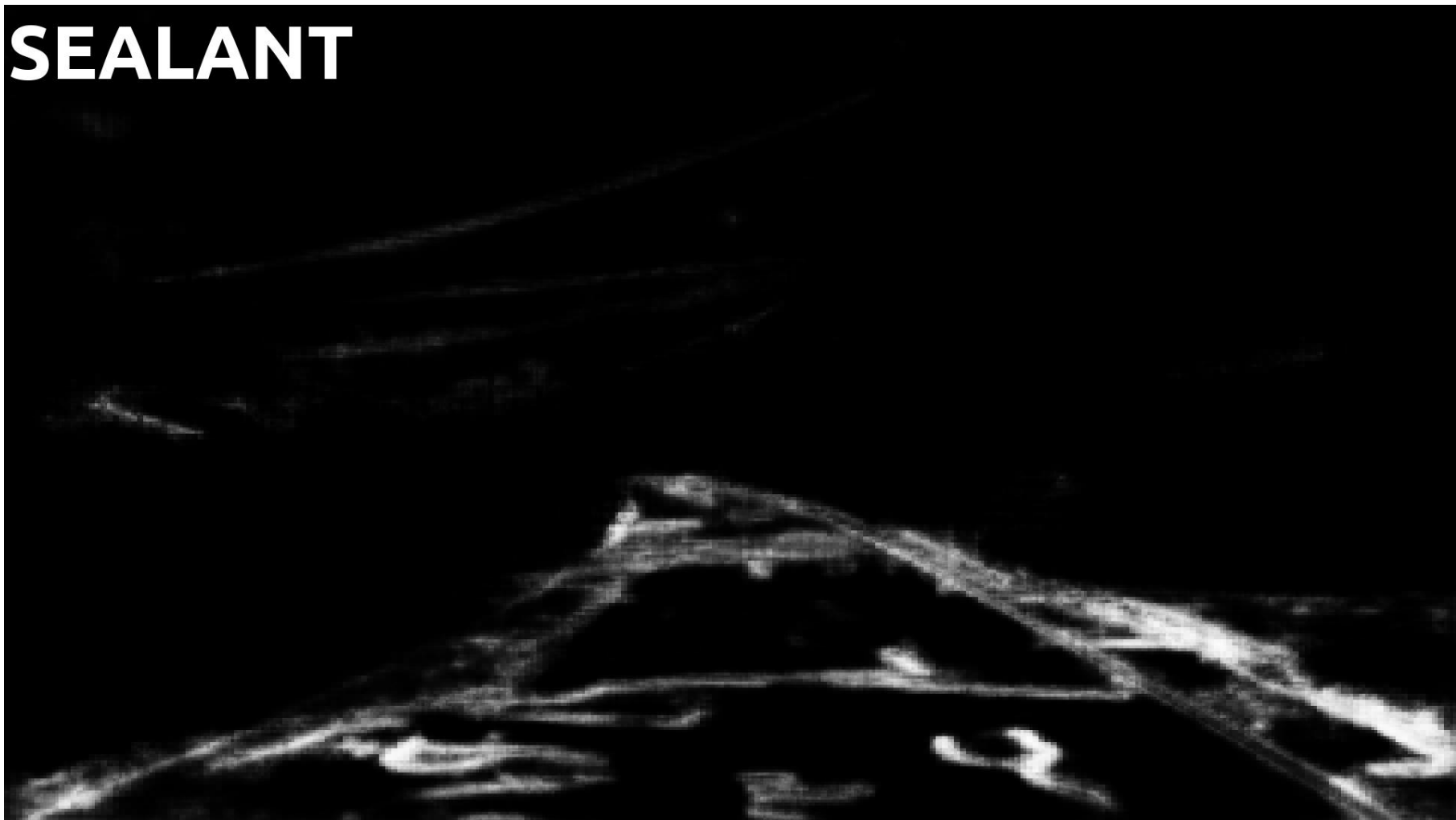
UNSEALED CRACK



RAW



SEALANT



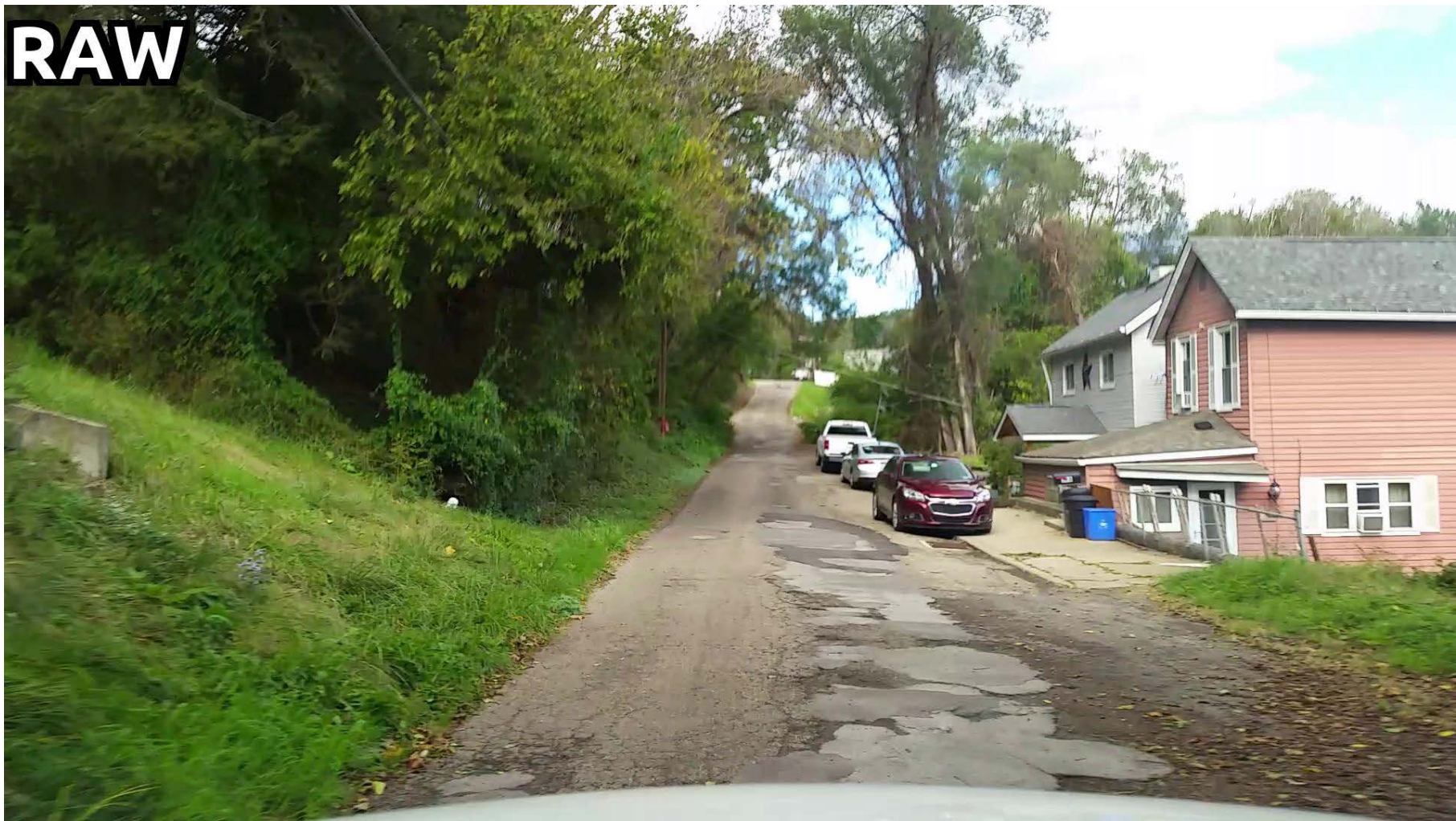
RAW



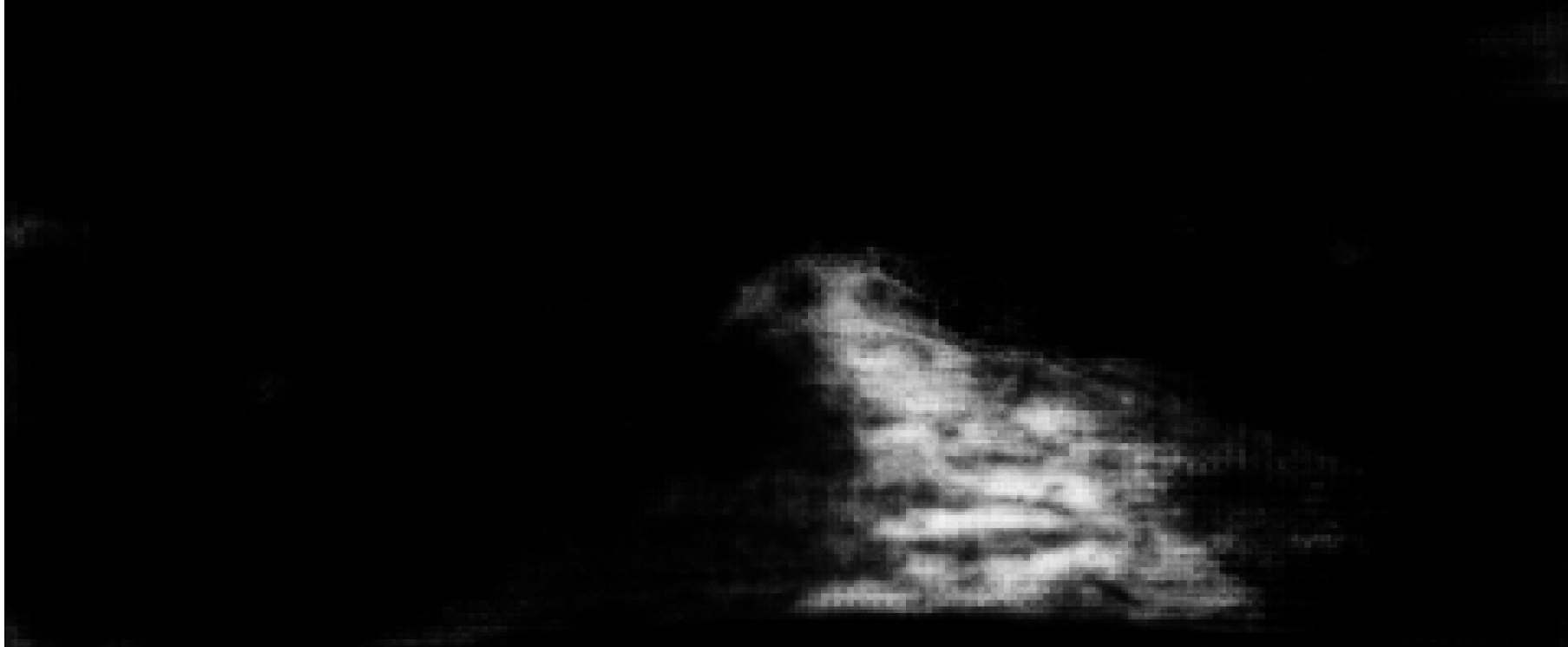
POTHOLE



RAW



COLD PATCH



INTUITIVE



Accomplishments after 3 years:

- >\$10M investments
- 180 customers
- 60+ employees
- 34 US states
- 14 countries
- 5 continents



Pennsylvania	Ohio
Arizona	Utah
Texas	New Hampshire
Massachusetts	Connecticut
Georgia	Rhode Island
Illinois	Mississippi
Maryland	Michigan
Washington	Nebraska
Arkansas	Oregon
North Carolina	Colorado
South Carolina	Tennessee
Florida	Minnesota
New Jersey	Alabama
New York	Delaware
Kansas	Virginia
California	Washington, DC
Indiana	

USA
Canada
Australia
New Zealand
Malaysia
India
Spain
France
UK
Wales
Portugal
Kenya
Jamaica
Bahamas



Edge: Current data collection with smartphone

1. Collect with smartphone



1. Lunch break => upload GPS trace and subset of data

1. Home office: Evaluate for completeness and quality.

1. Collect missing or repeat low quality

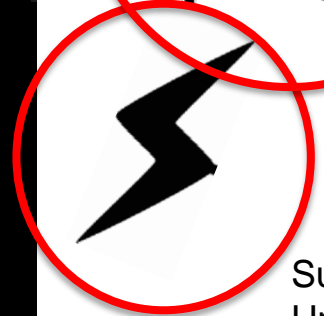


Turnaround: half day



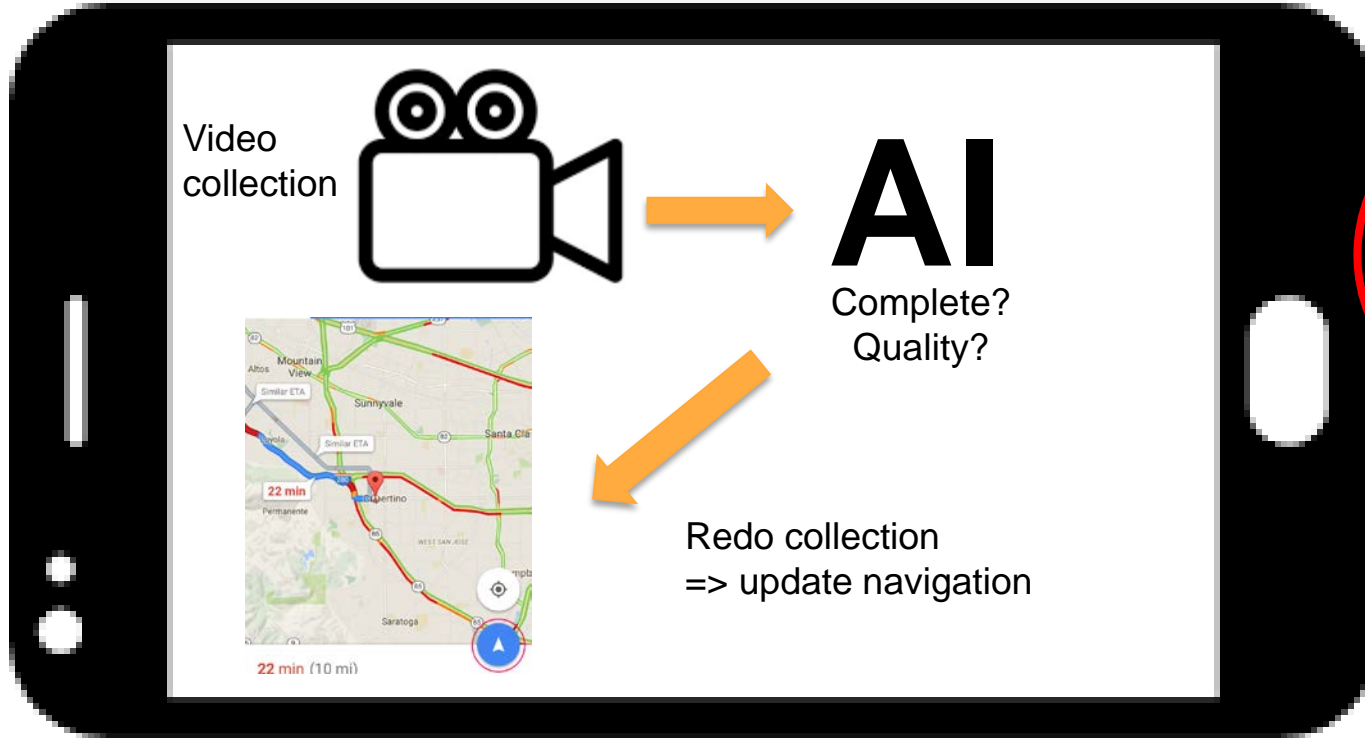
Edge: Ideal data collection

Human in the loop



Supervision
Updates

Worldwide
connectivity



SDK: Remote updates, remote + local management, privacy (international!), security

CMU research

Computer Vision:

Monitor and assess infrastructure and traffic



Damage detection – e.g. landslides



Traffic counts – parked and moving cars

Updates for HD maps

Edge computing:

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

Most of the data won't leave the bus

First pass of video analysis is done on the bus

Sensors and computing already exists on the bus

THANK YOU

