Collecting and sharing large quantity of digital locational information – Google Maps, Google Earth, and Drone Flying

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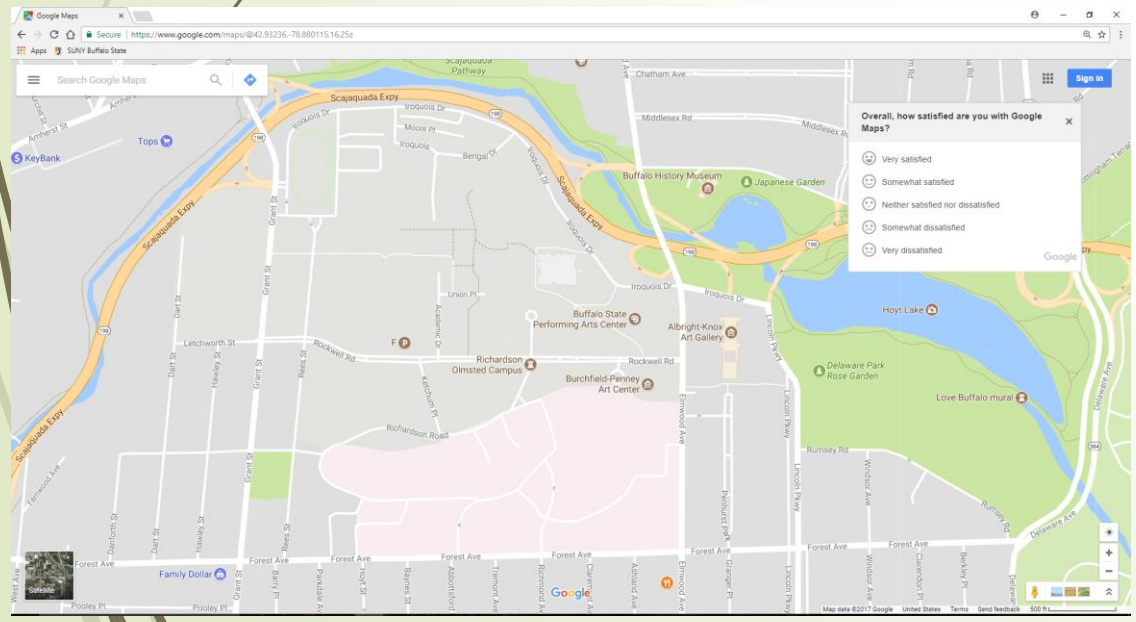
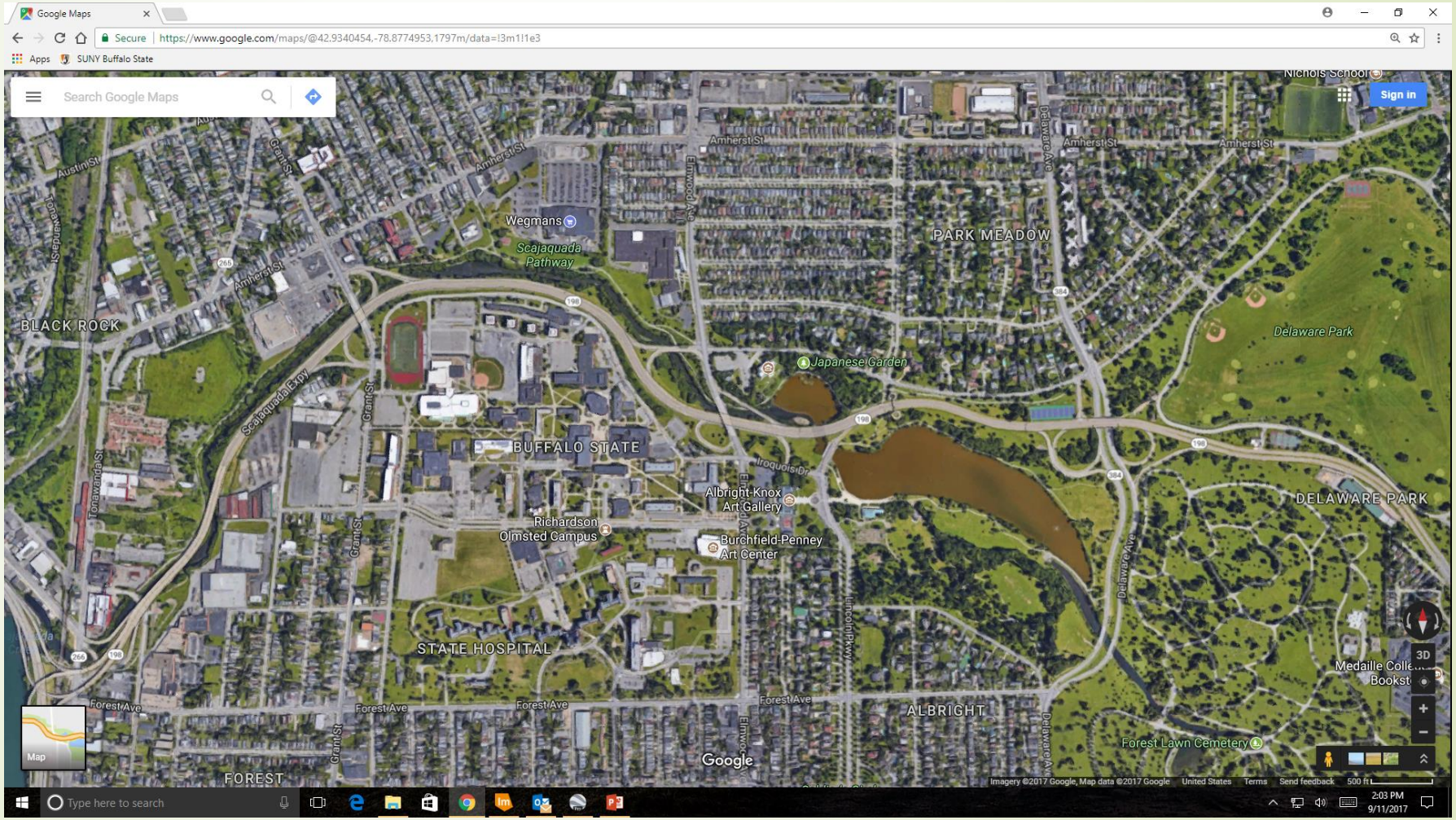
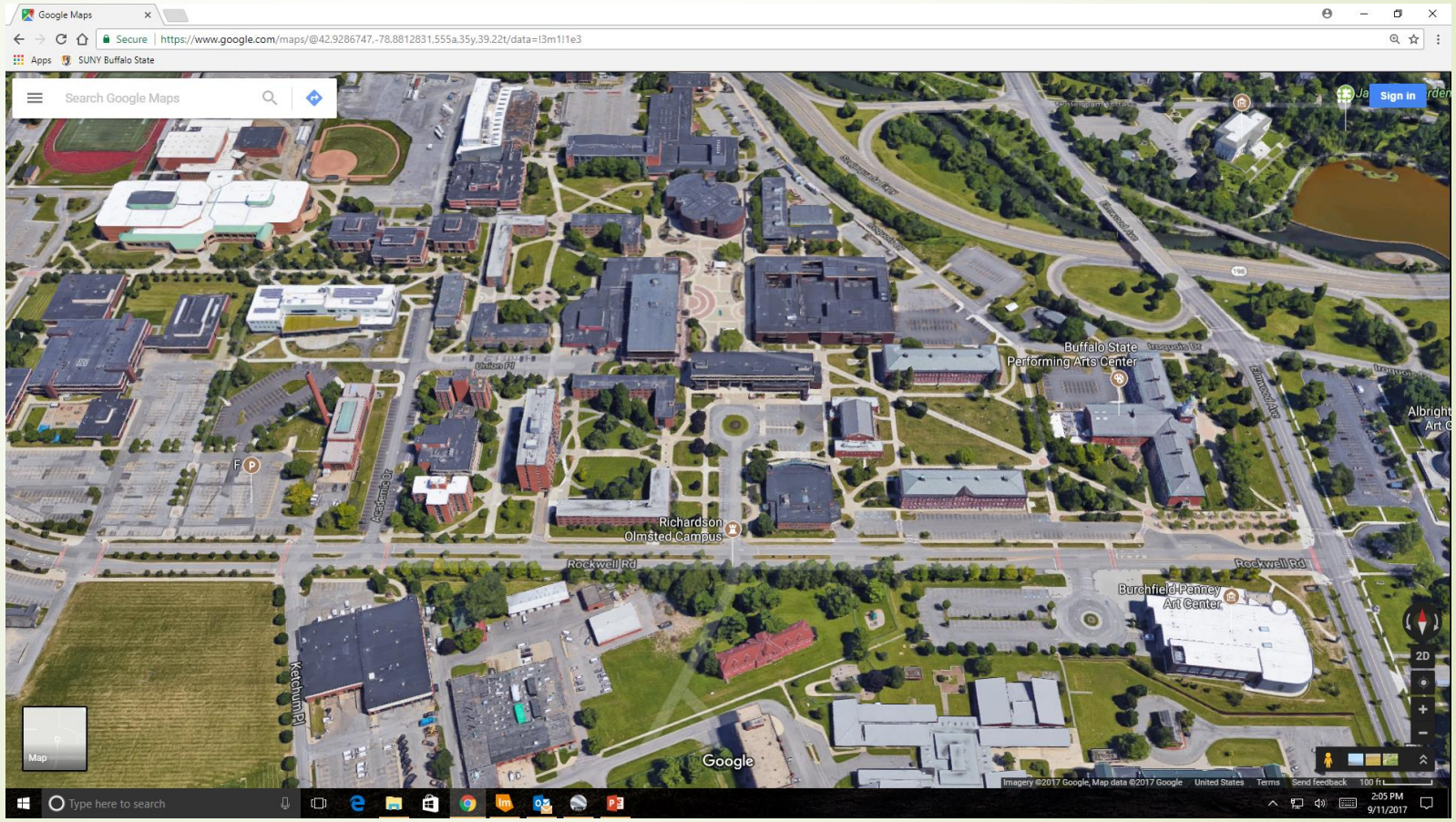


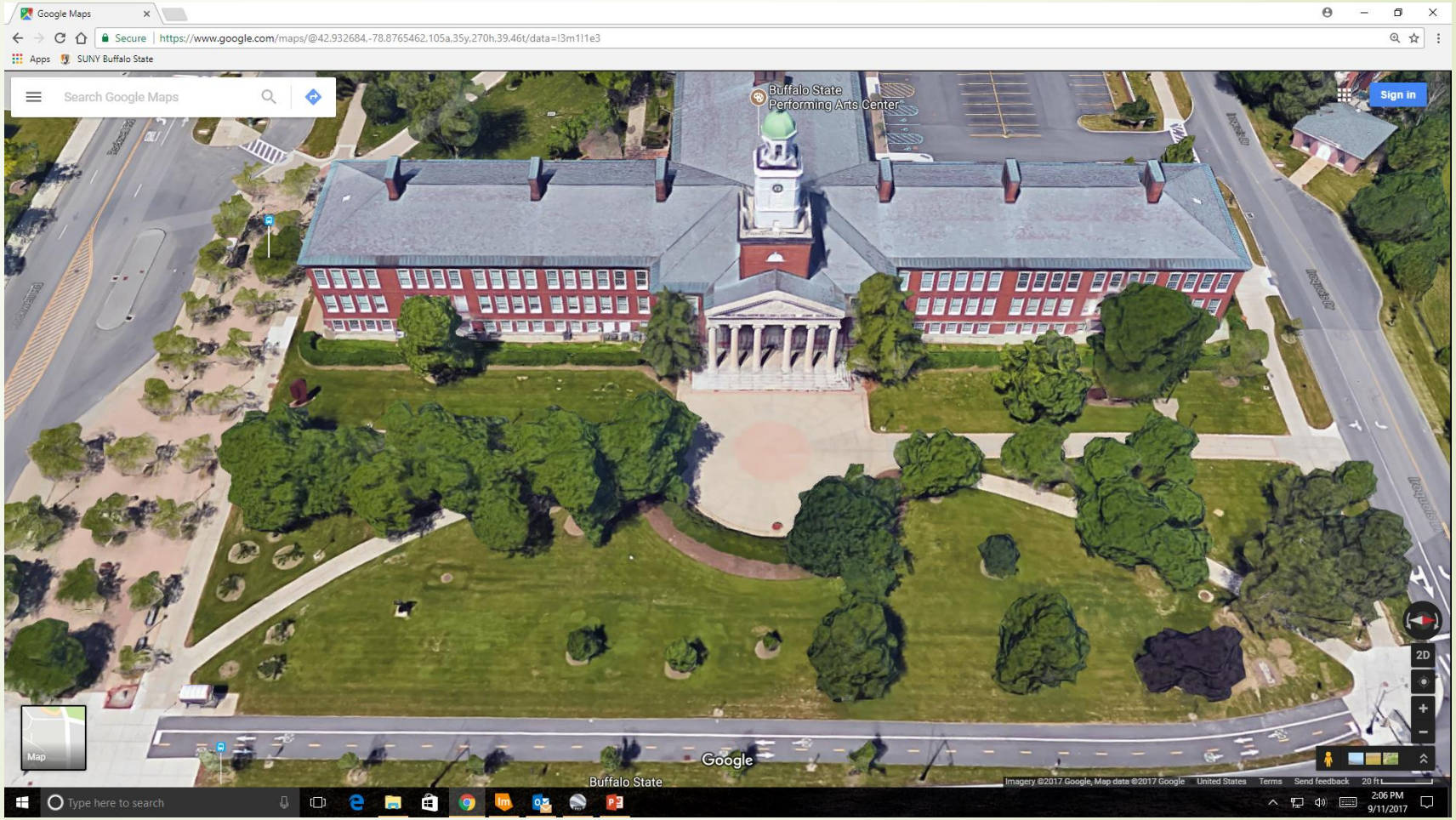
Google Maps are the front end of Geographic Information Systems (GIS)
Google Earth is the front end of Remote Sensing



- Geographic Information Systems (GIS) and Remote Sensing are highly related to Computer Information Systems (CIS)
- But, GIS is not part of CIS, or not a CIS – Highly connected.
- GIS processes locational data, or spatial data, or geographic data only.

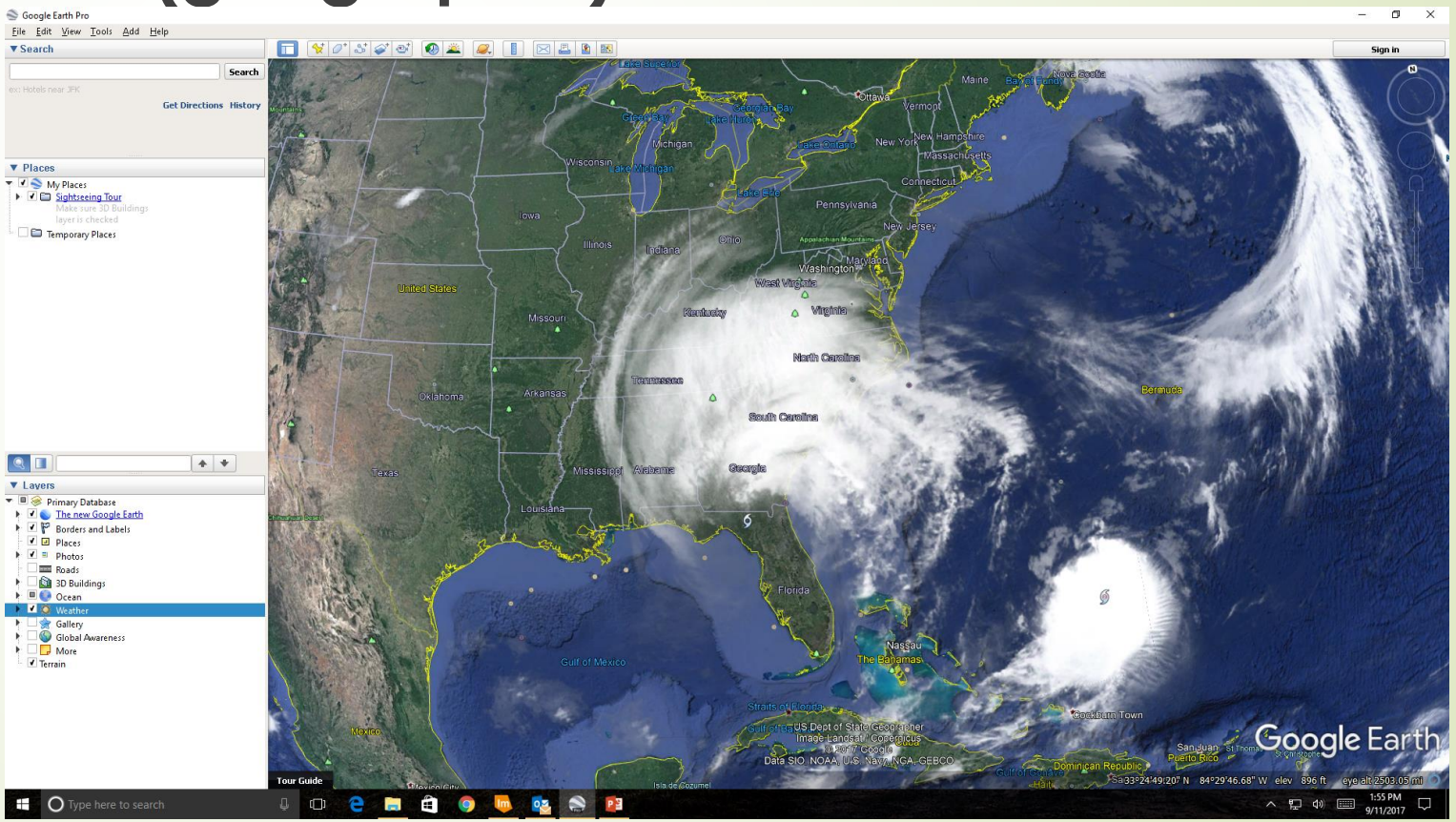


- Geographic Information Systems (GIS) - One word different than the Computer Information Systems (CIS)
- It is the "Geography" or "Digital Locational Information"



Definition of GIS

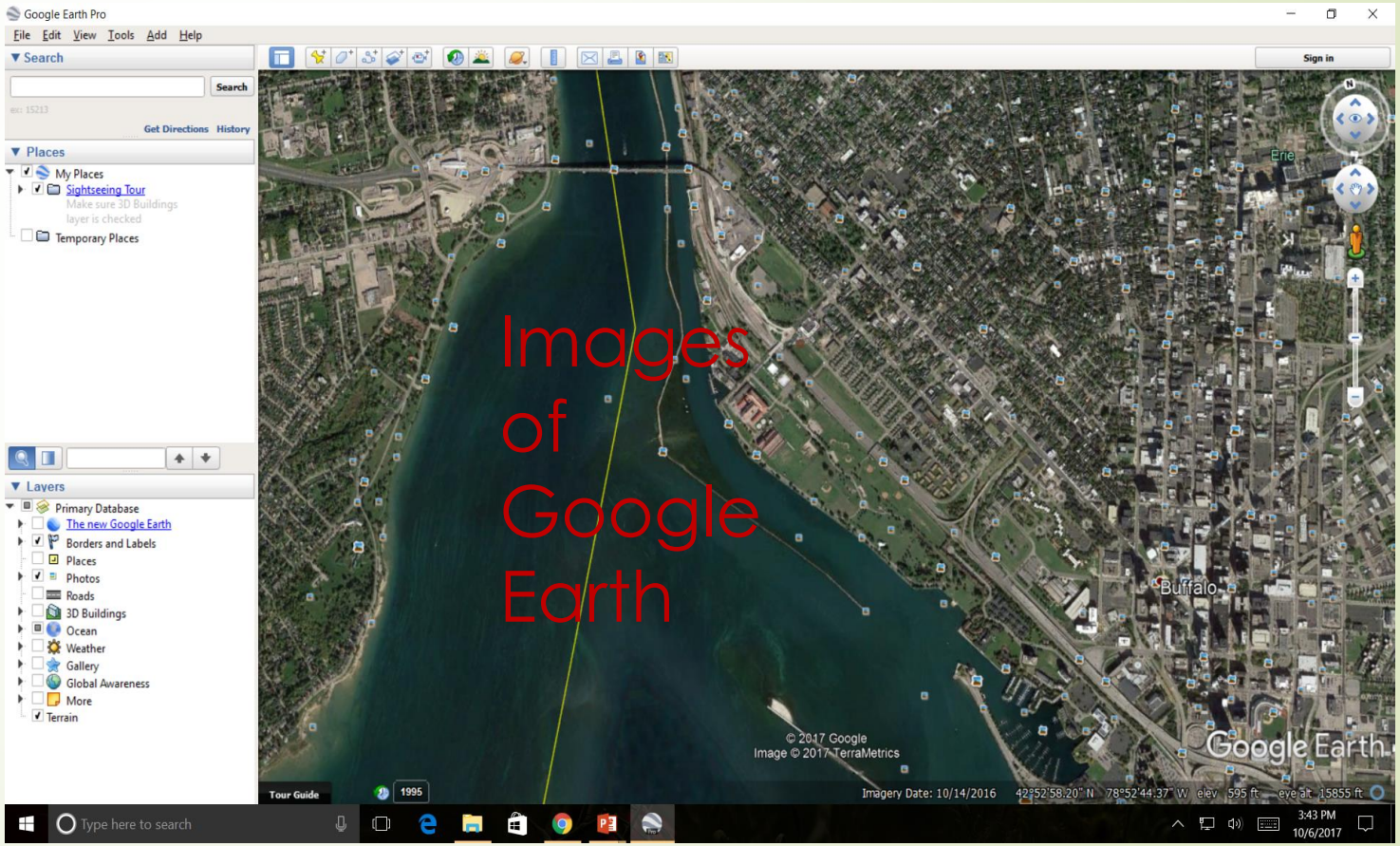
- **GIS:** is a special information system that combines digital map layers with database to capture, analyze, and model **spatial (geographic) features** or objects



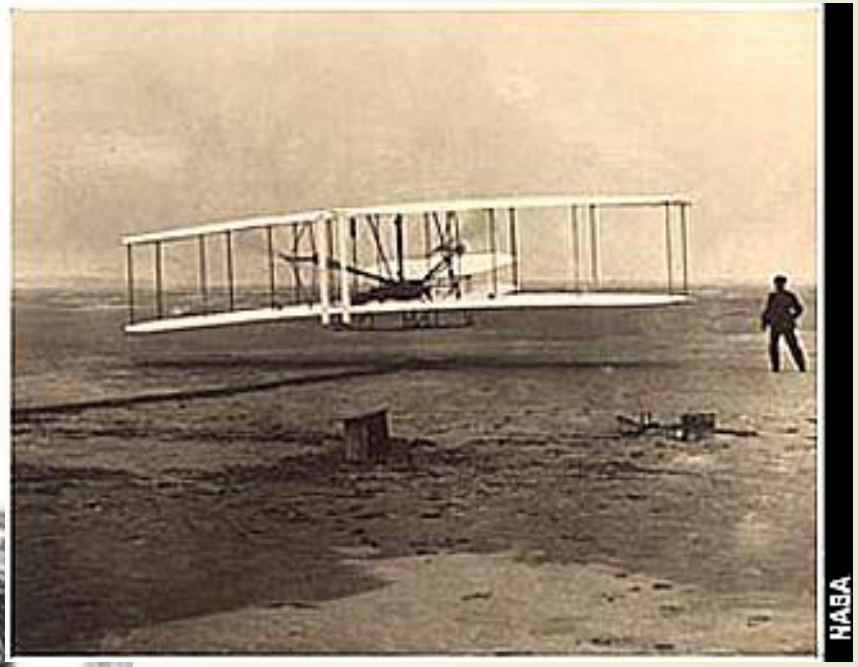
Capture Spatial Data

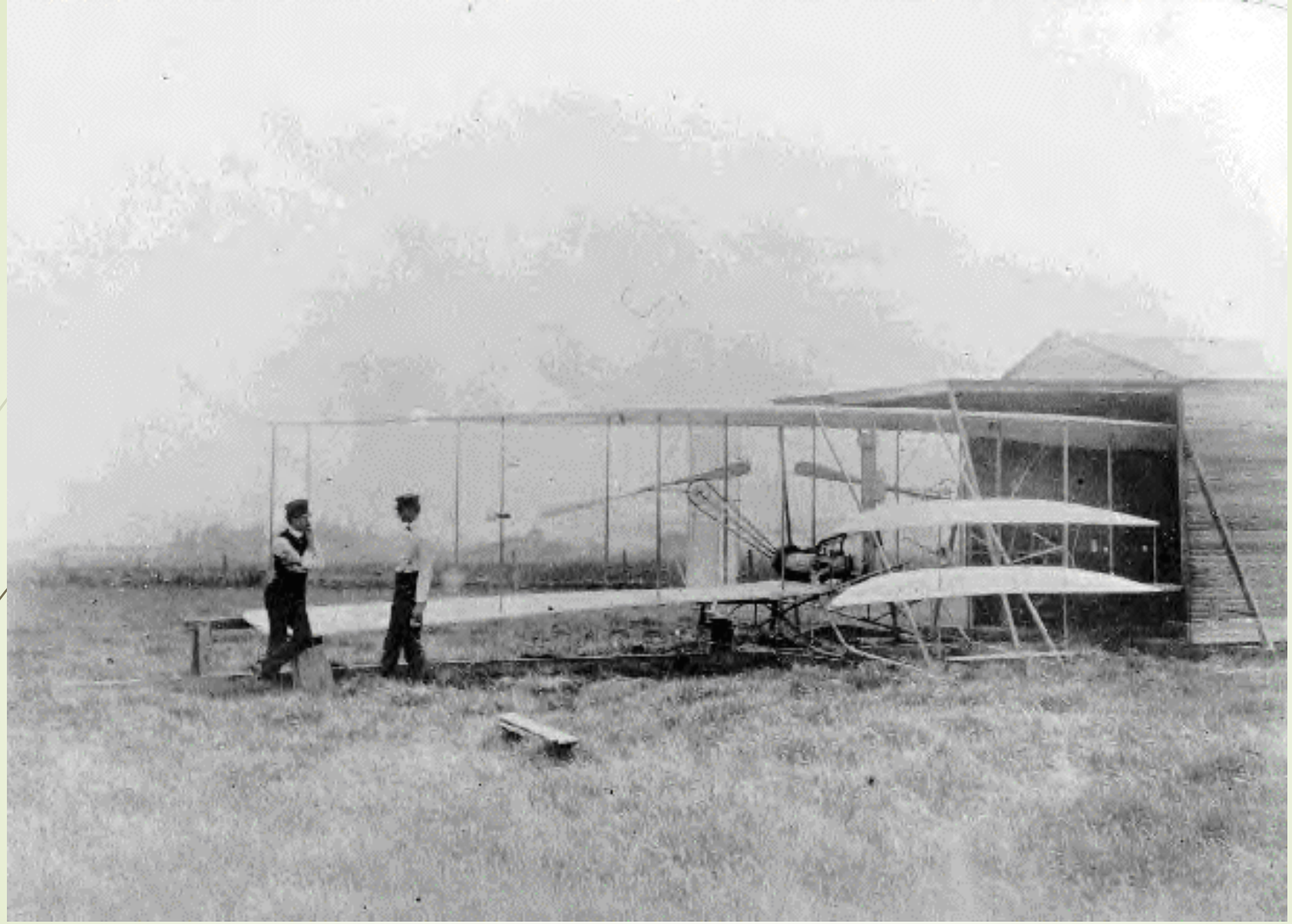
- Remote Sensing is a major science or method to capture

1) Remote Sensing - Orbital or Space Platform

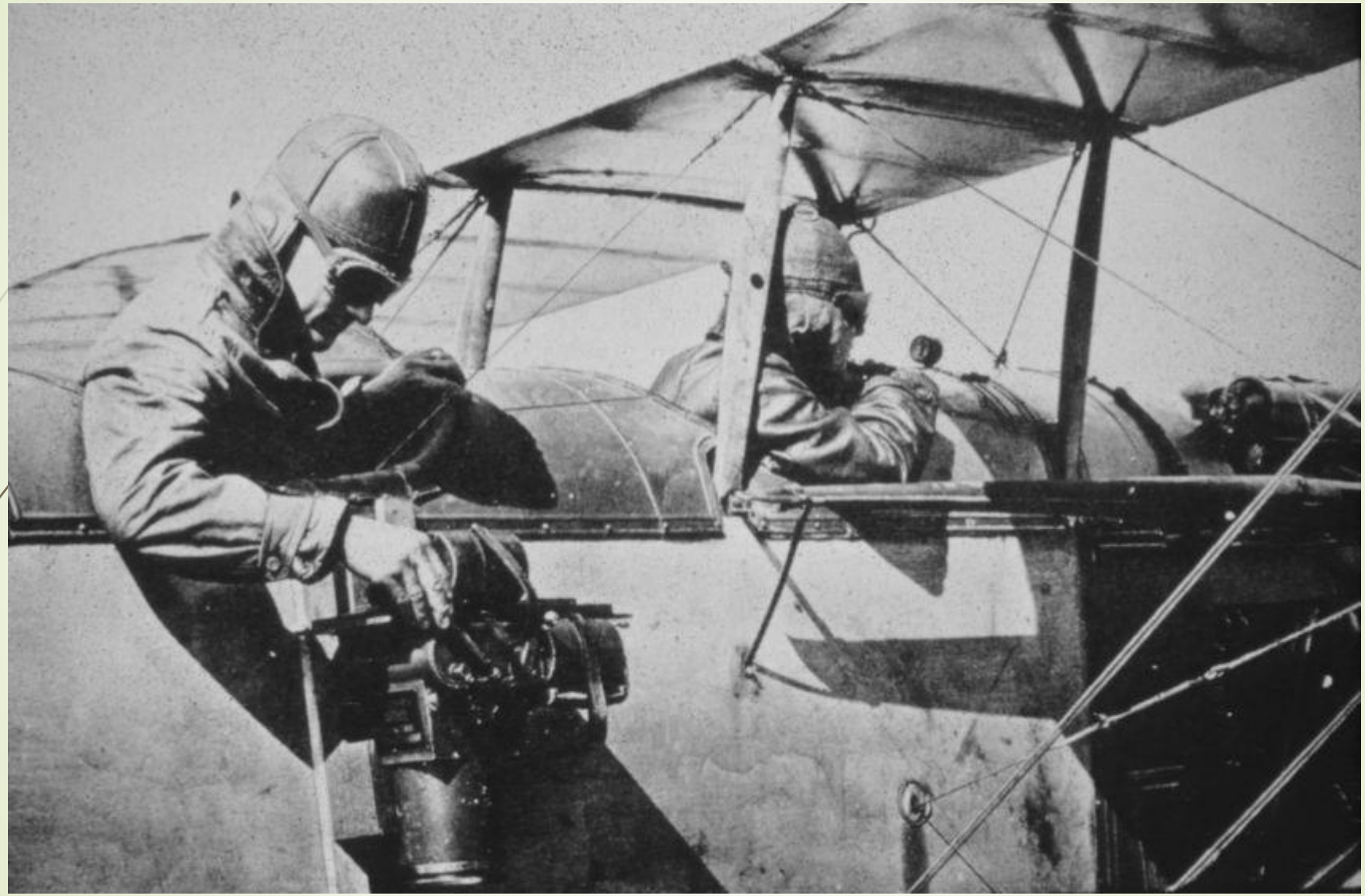


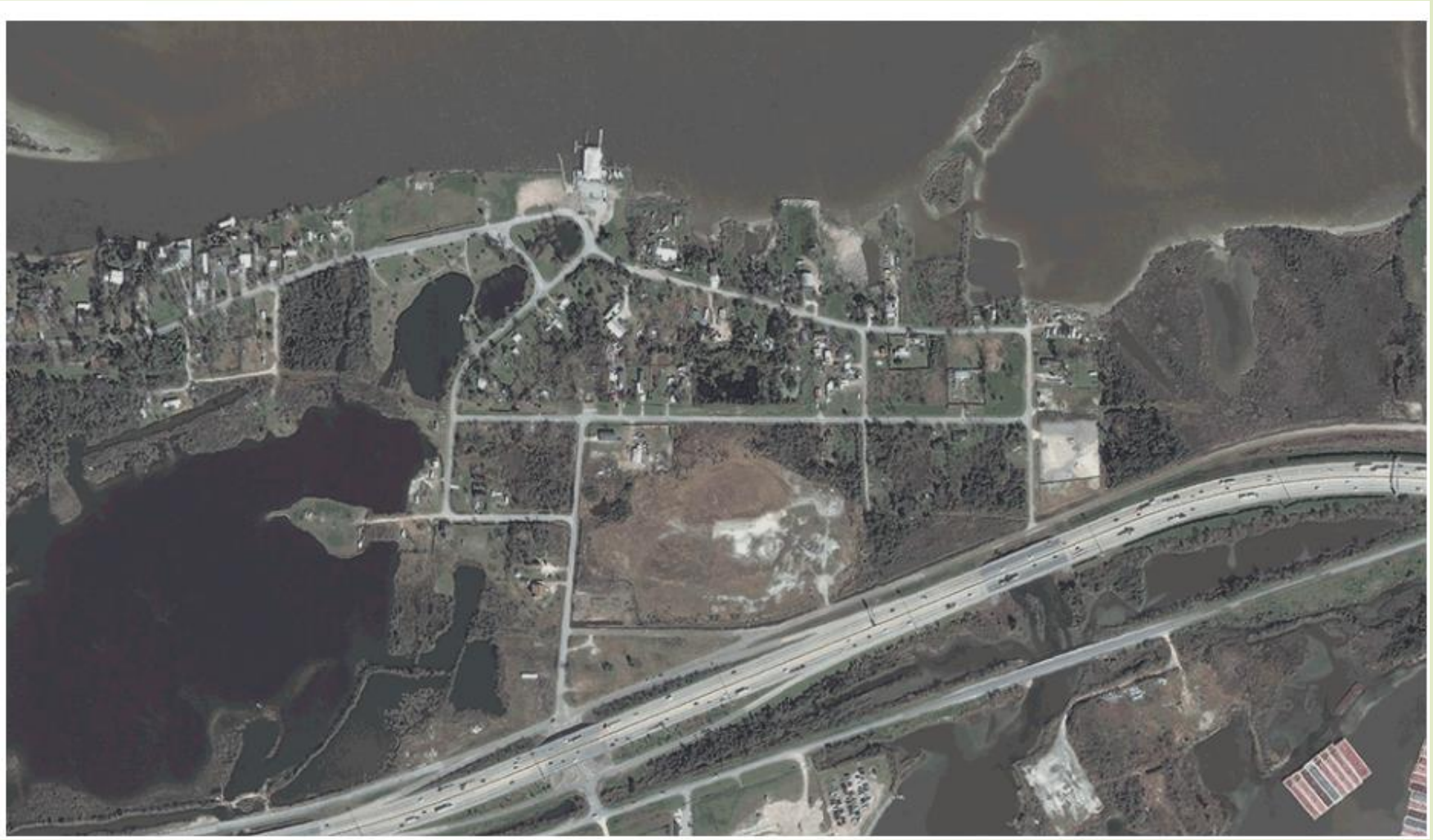
2). Remote Sensing -Airborne Platform


NASA



- Wright brothers invented first airplane - December 17, 1903

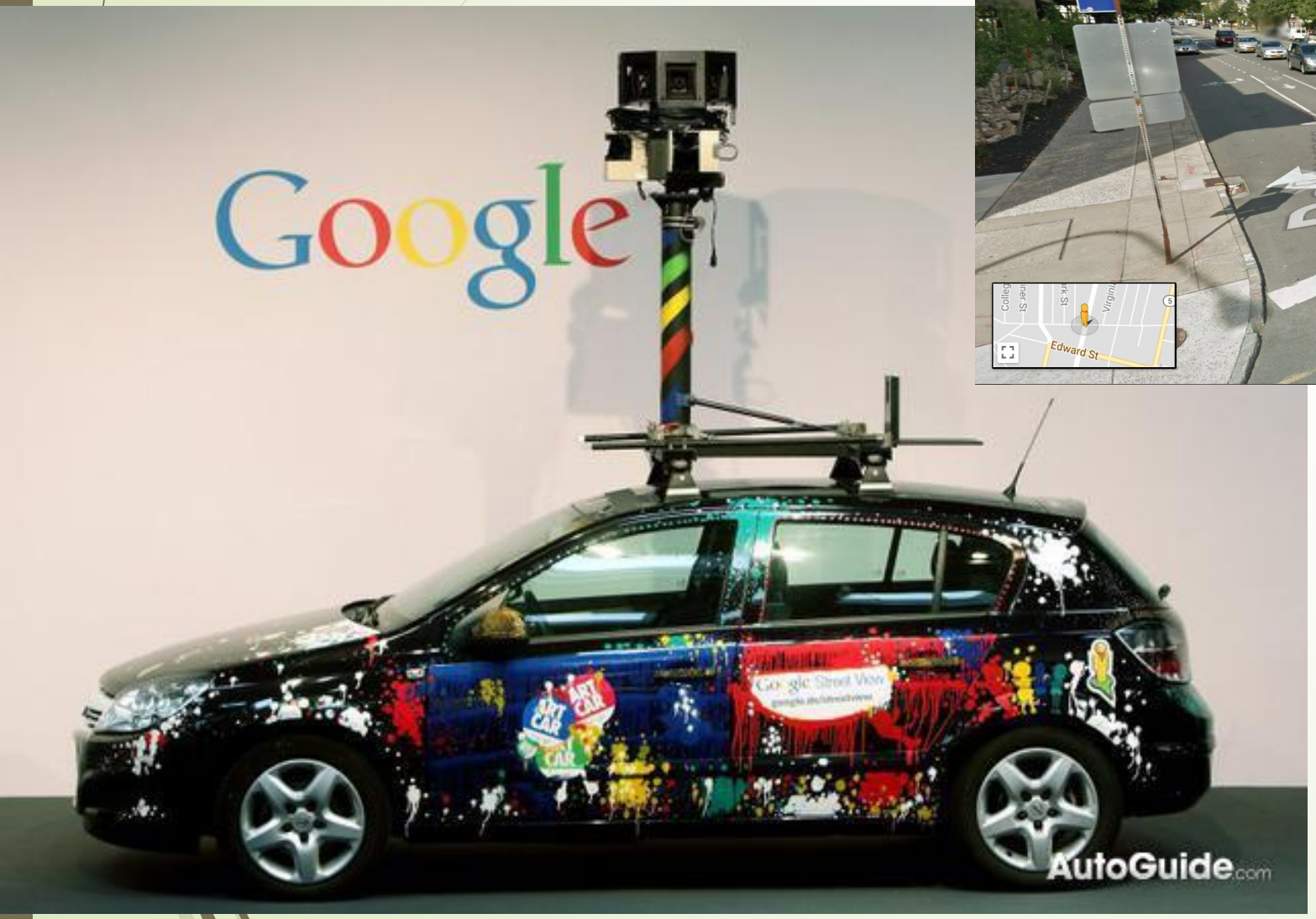




Houston, TX - Hurricane Harvey Flooding before

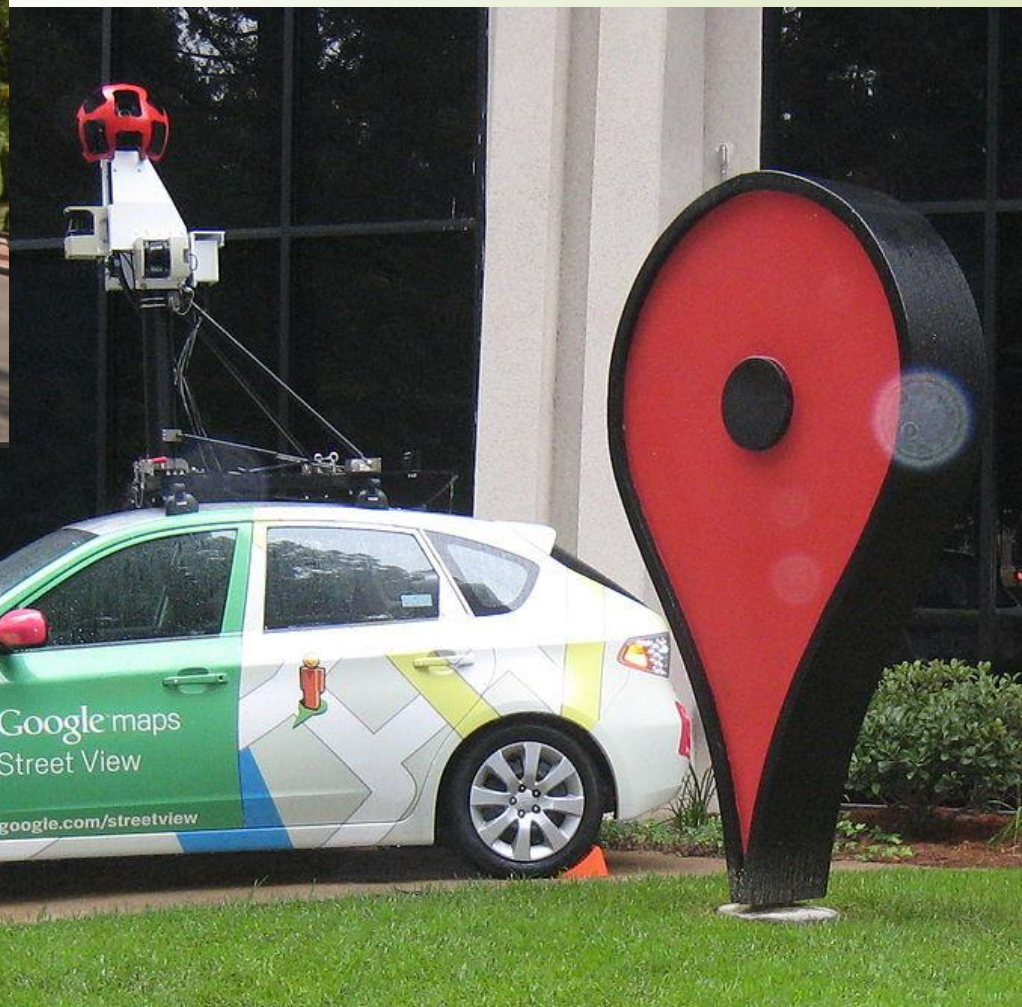
Houston, TX - Hurricane Harvey Flooding after

3) Remote Sensing - ground platform



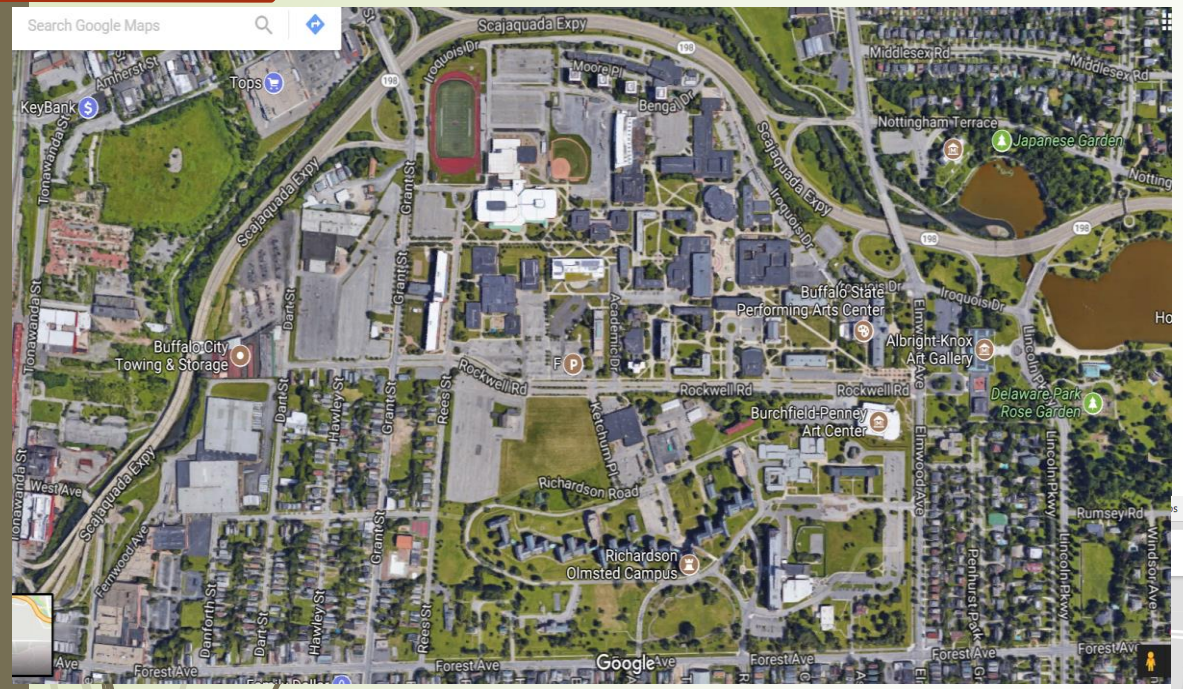
- Google Maps – Street View


3298 Main St
Buffalo, New York
Google, Inc.
Street View - Oct 2016
ONLY
Wendy's
UNIVERSITY
Englewood Ave
Main St
Google


Google maps
Street View
google.com/streetview


SUPER DUTY

Analyze Spatial Data



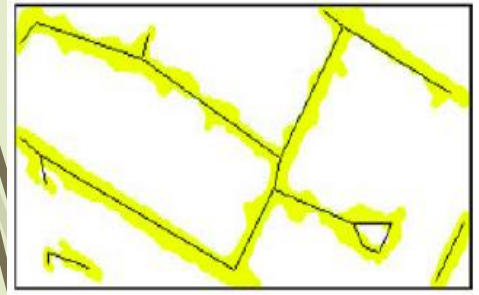
- Google converts the image data on left to the vector data on right

General Work Flow of Feature Extraction

- Tao Tang and Xiao Wang

Step 1. Preprocessing

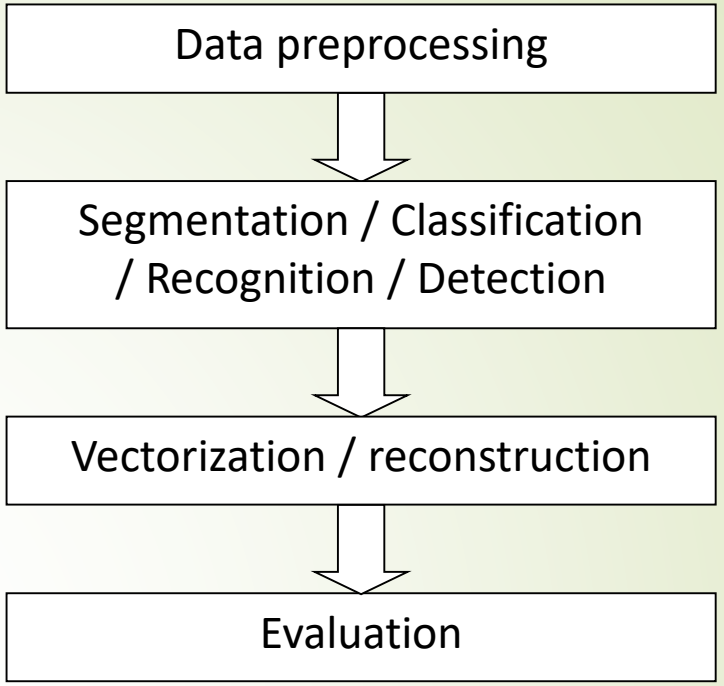
Step 2. Segmentation



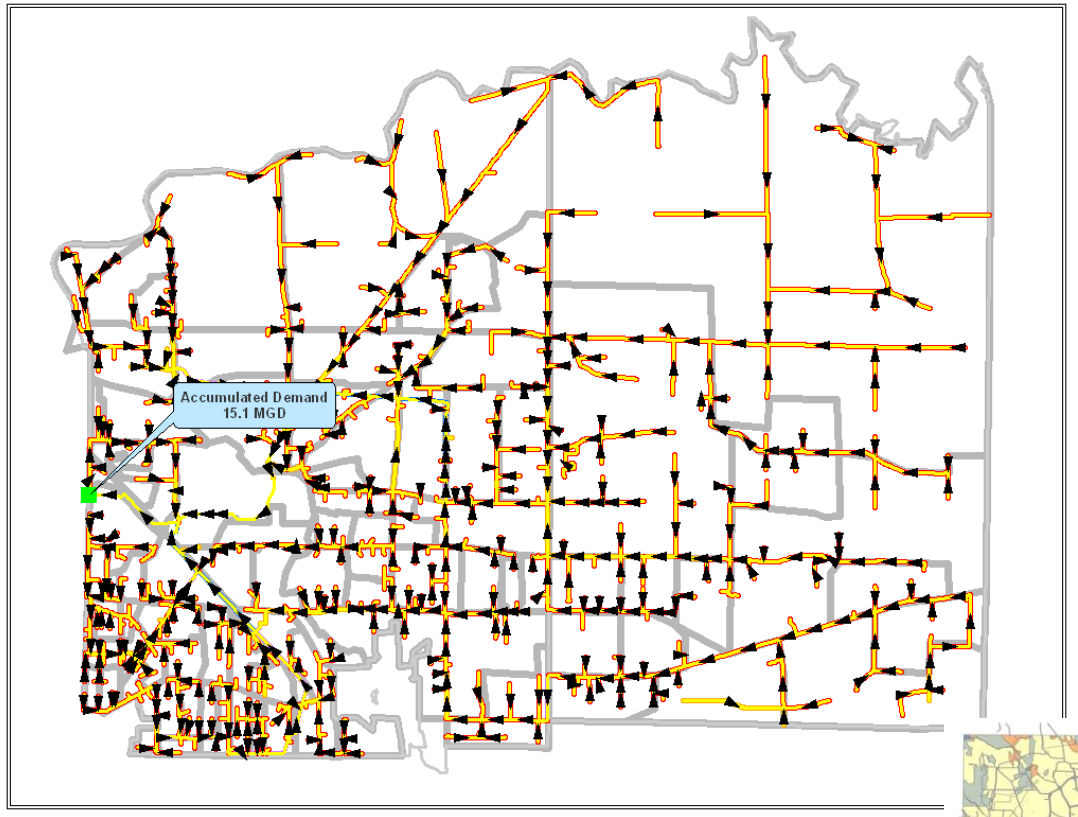
Step 3. Vectorization

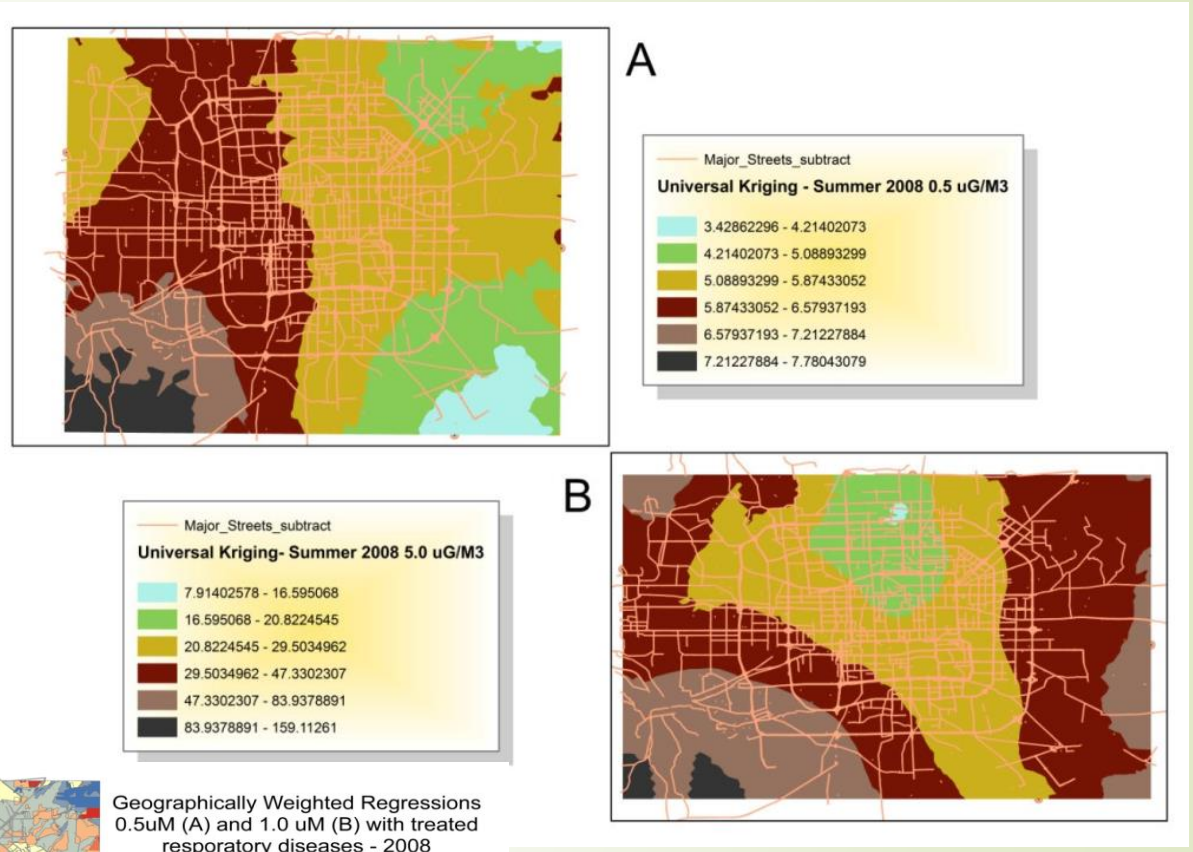
Variables	Fig. 8	Fig. 9	Fig. 10	Fig. 11	Fig. 12	Means
Resolution	3	2	1	2	2	2m
Completeness	86	66	86	75	91	81%
Correctness	96	65	93	85	94	87%
Quality	83	48	81	67	87	73%
RMS	1.7	1.2	0.6	1.2	1.2	1.2m
Redundancy	0.01	0.01	0.02	0.01	0.01	0.01
Gaps number	3	0	0	2	0	1
Gaps/km	1	0	0	1	0	0.4
Mean gap length	73	0	0	63	0	27m

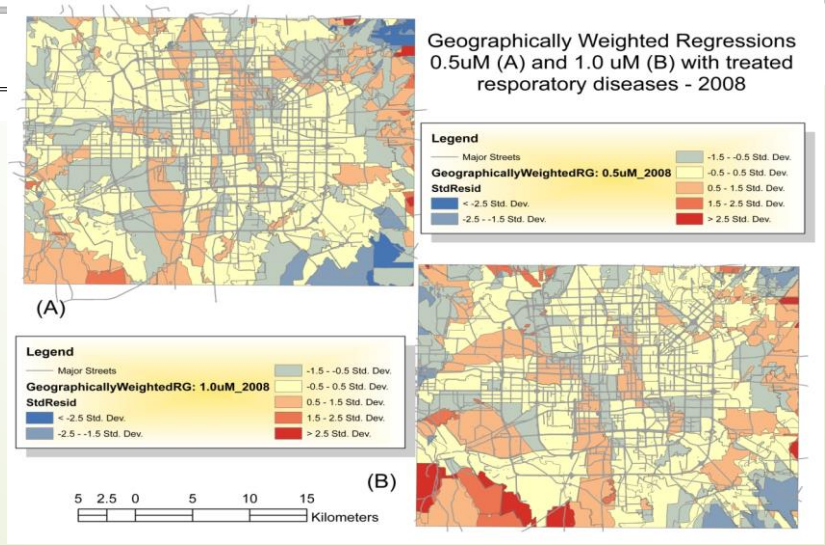
Step 4. Evaluation

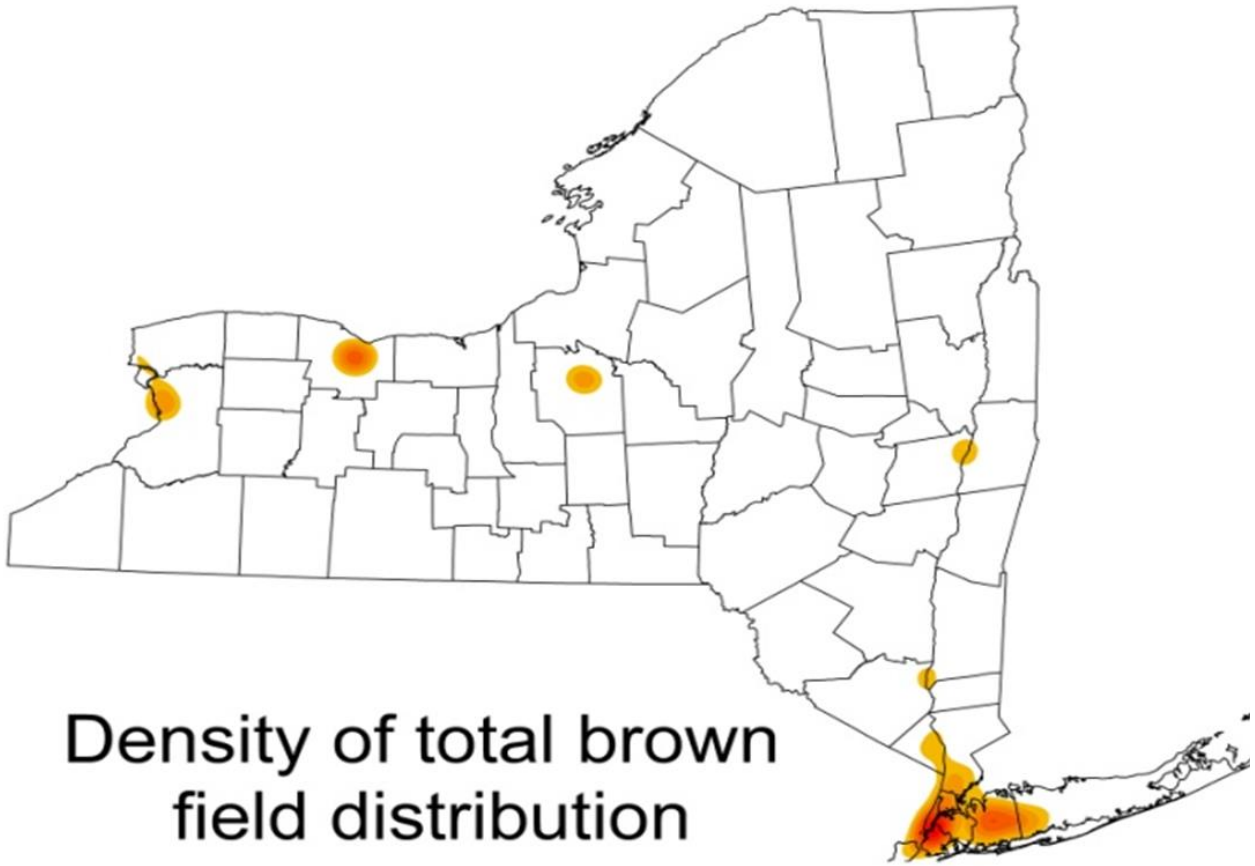


Model the spatial data

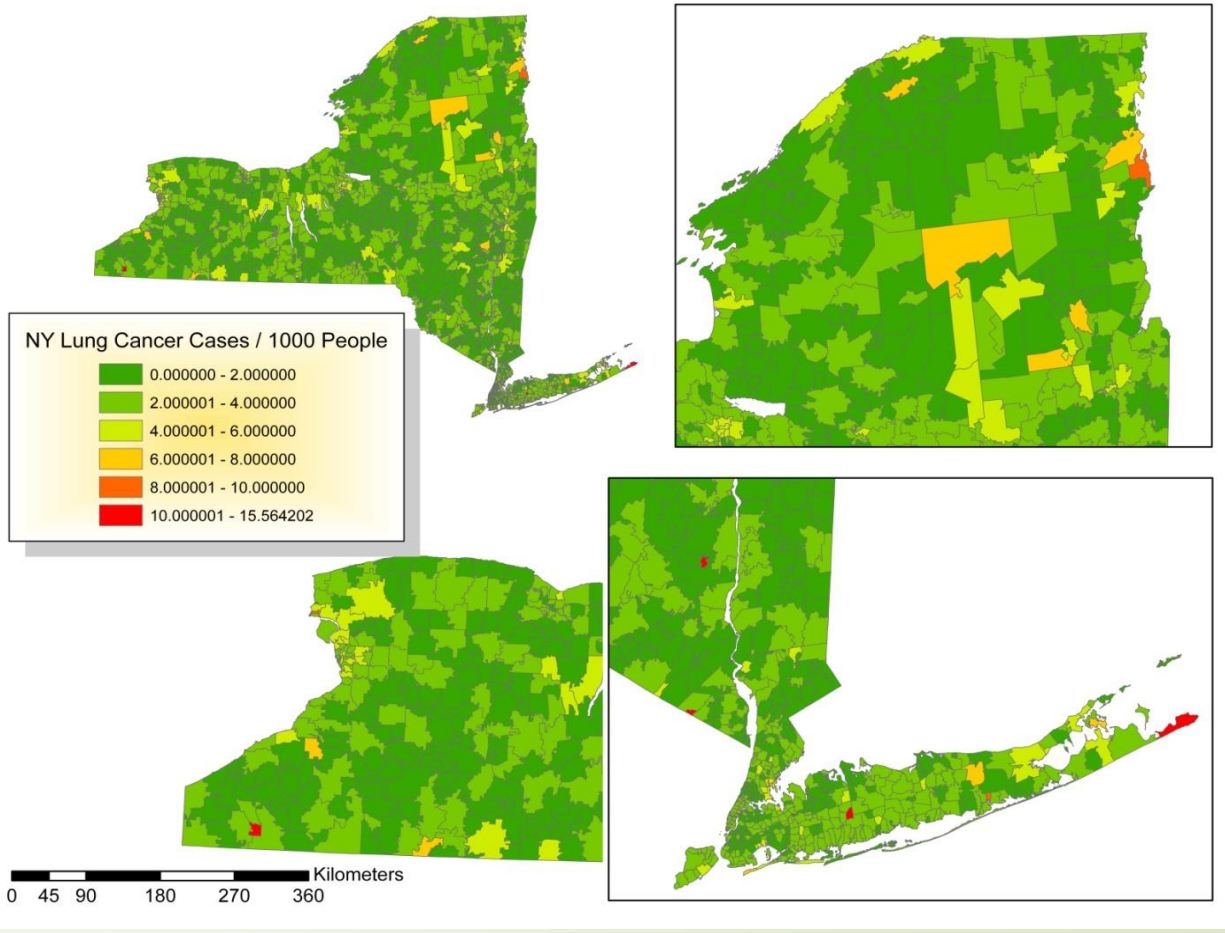






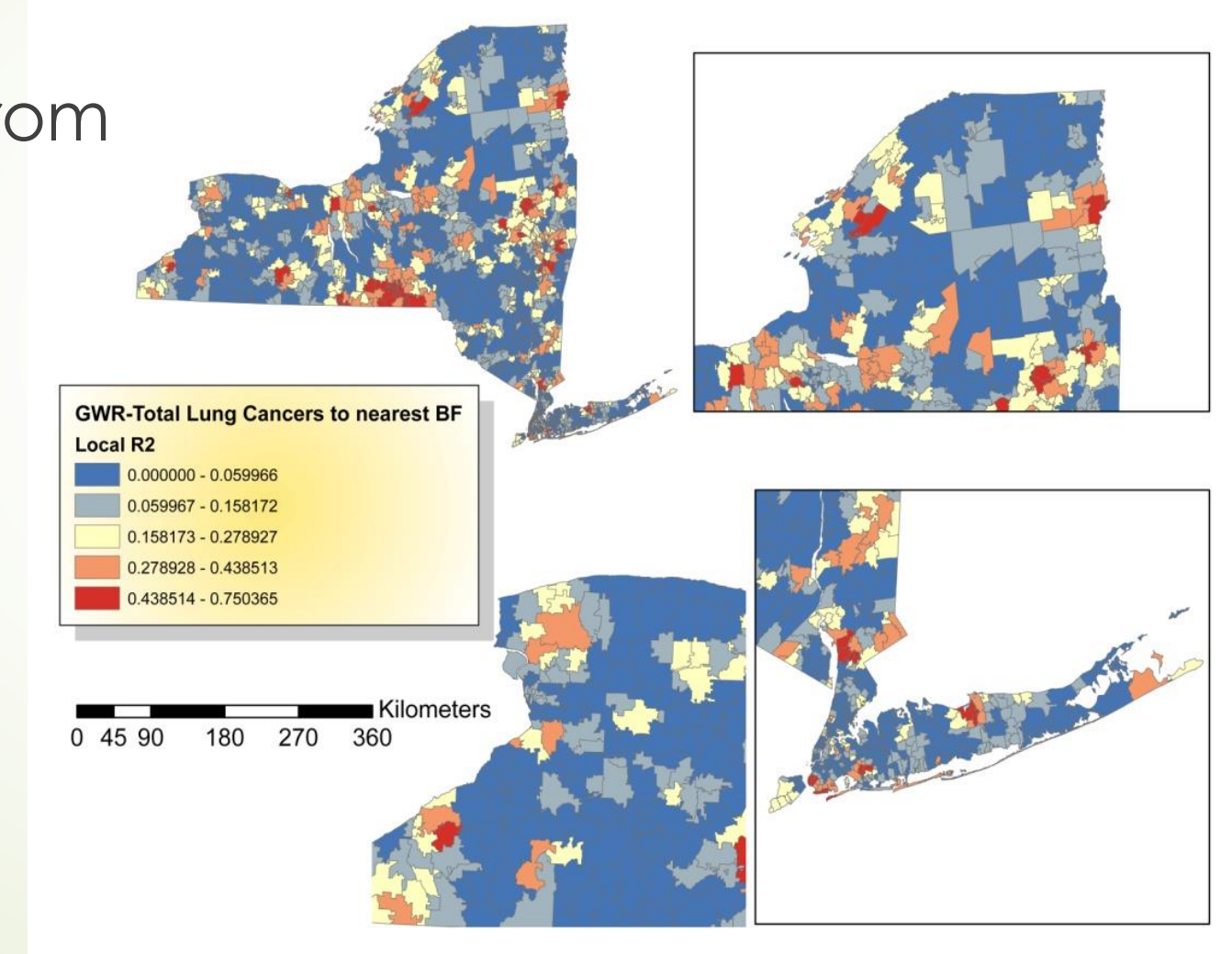


Density of total brown field distribution

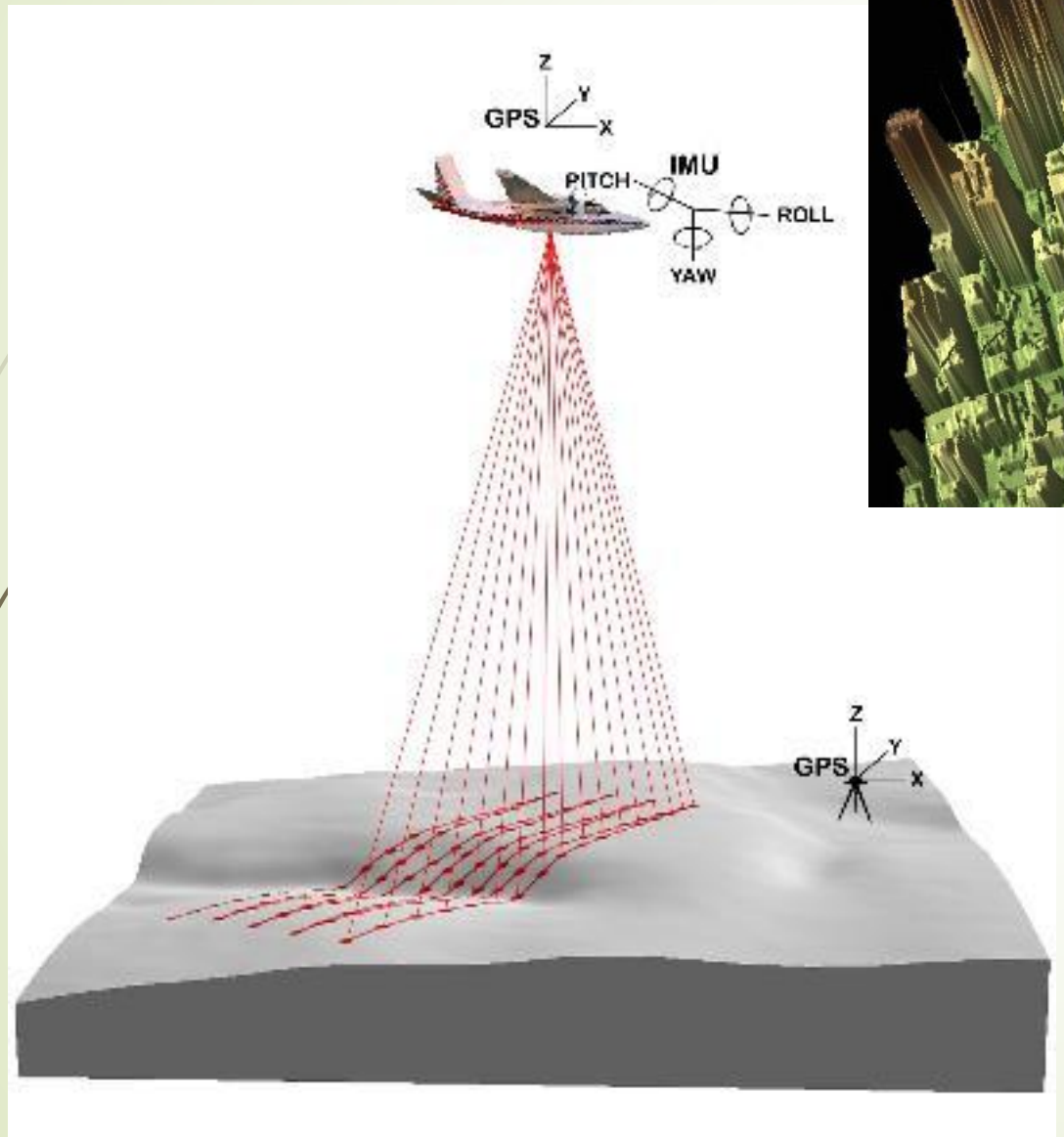


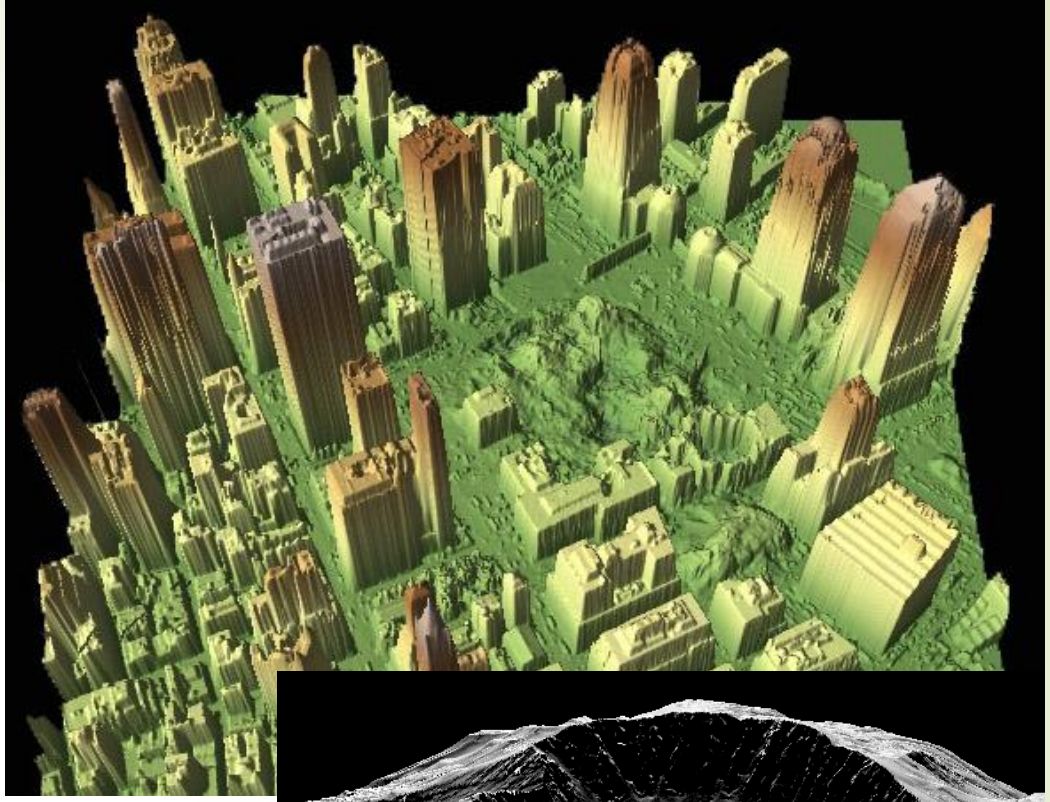
The GWR modeling results indicated that there is a strong local relation between old industrial sites and high and moderate lung cancer incidents.

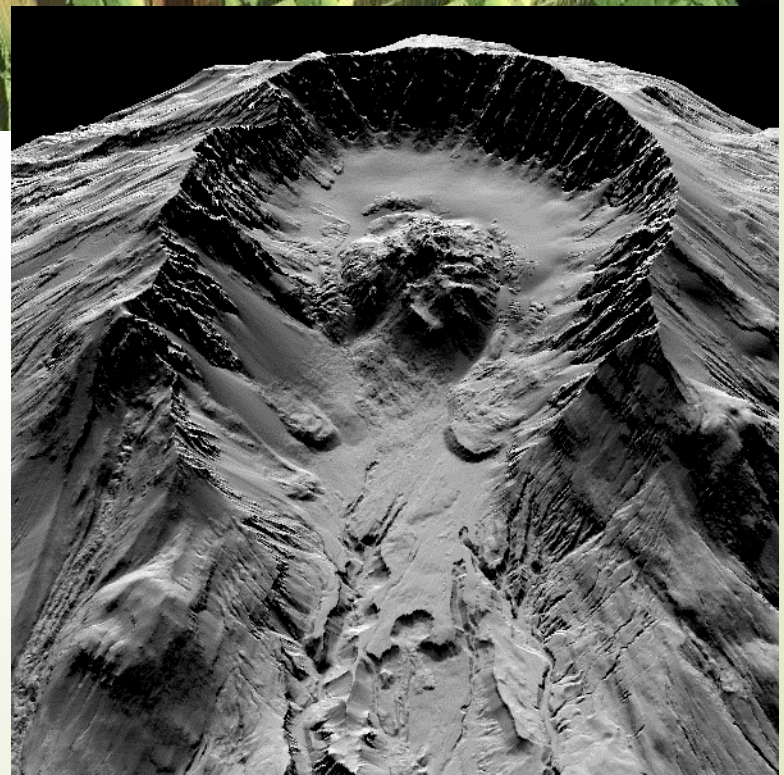
- The local R^2 ranges from 0.16 to 0.75

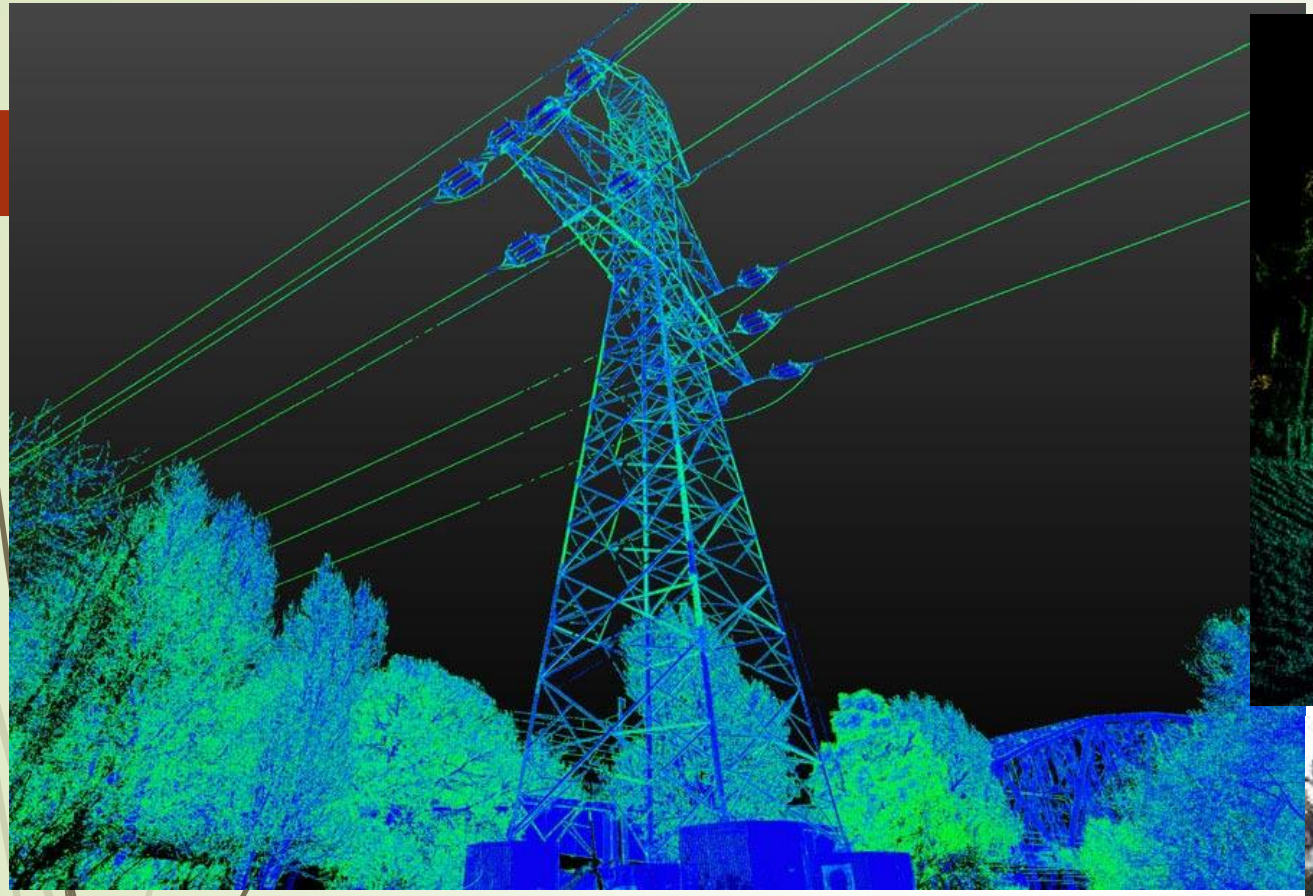


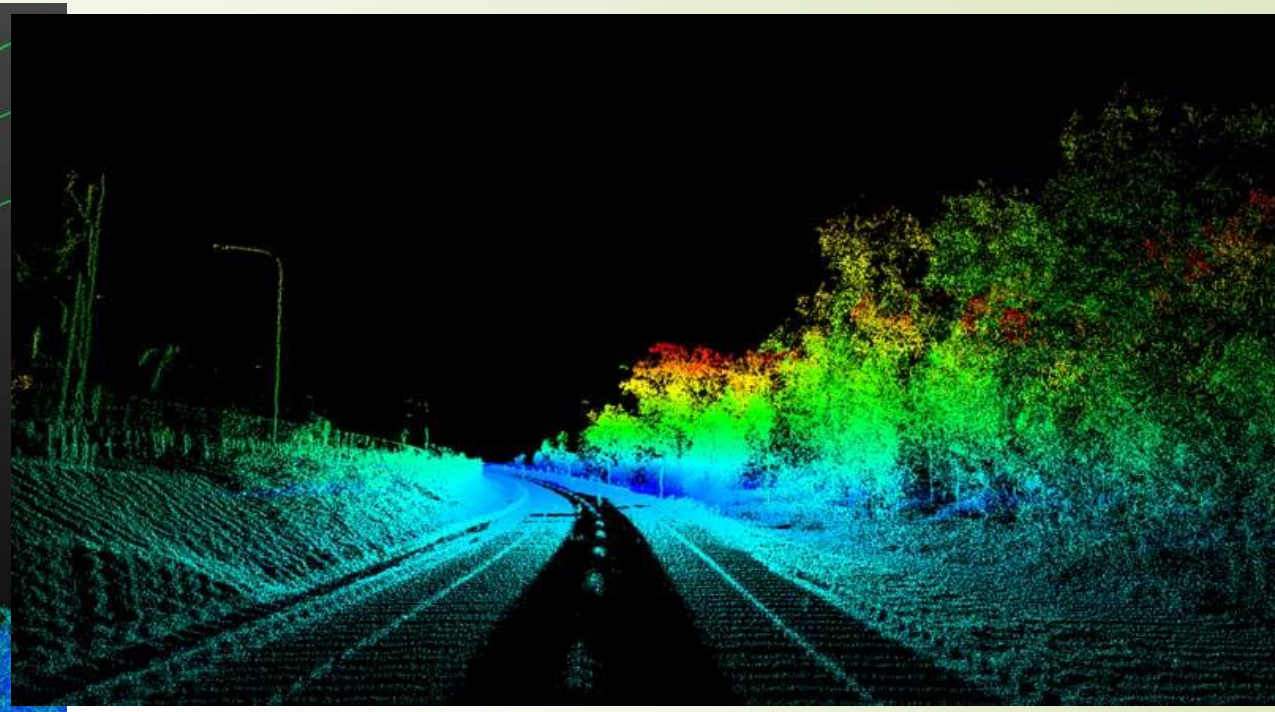
- LiDAR- 3D data



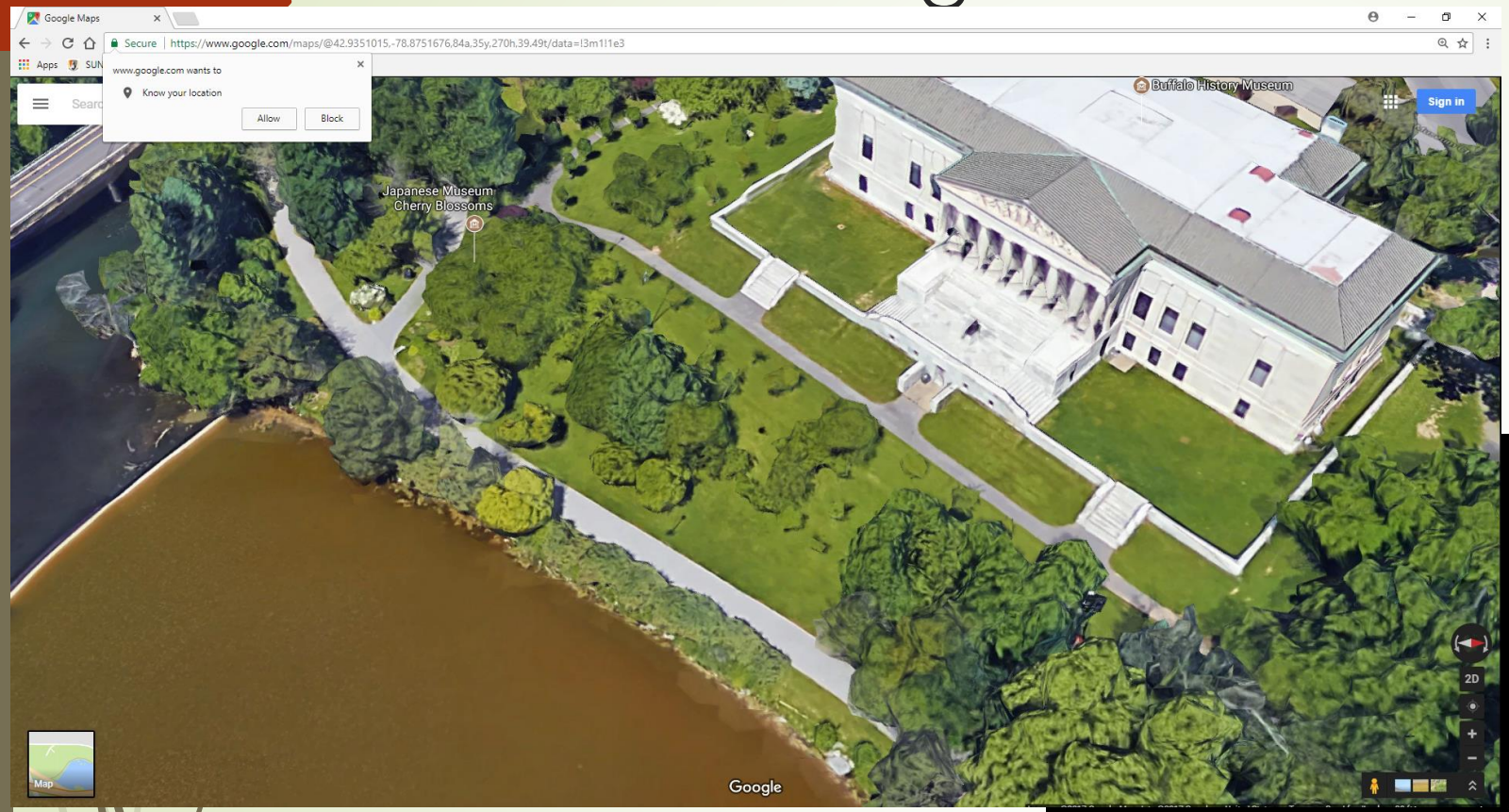


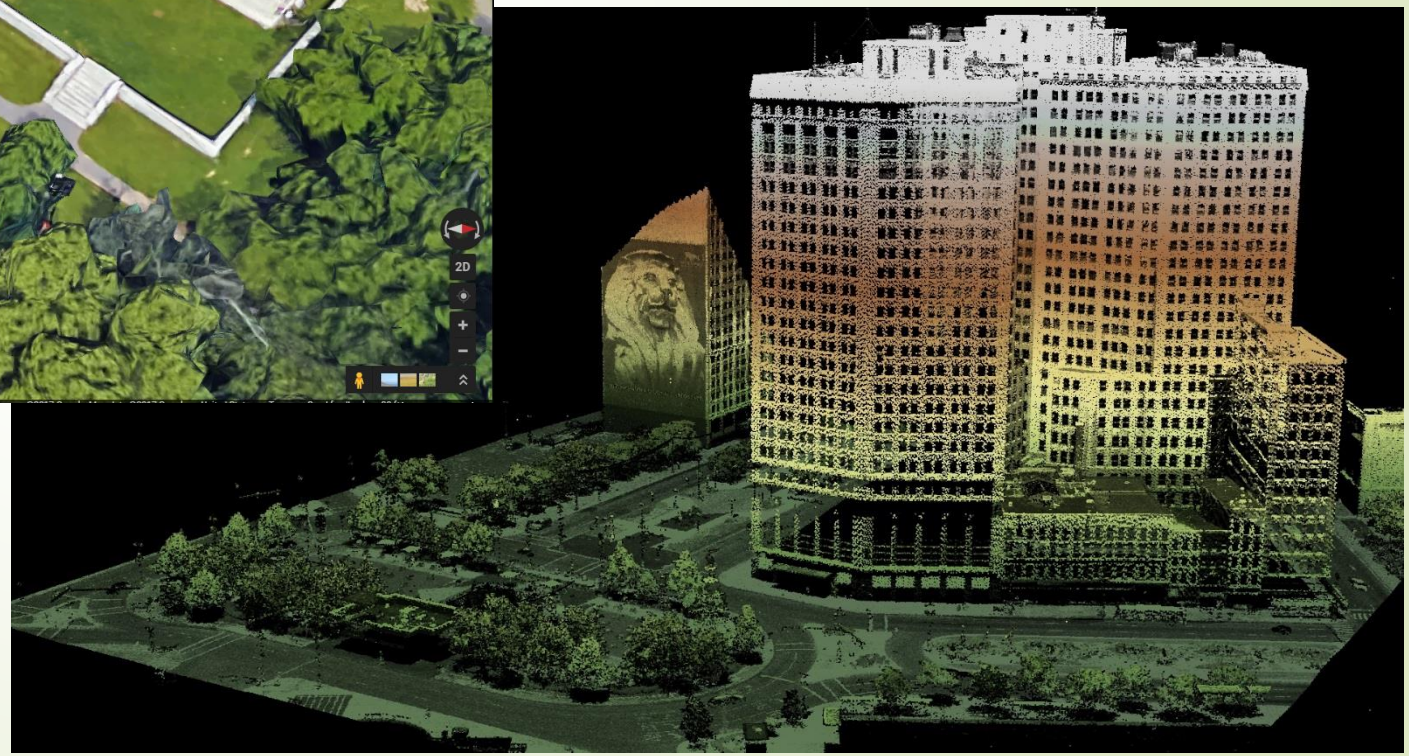


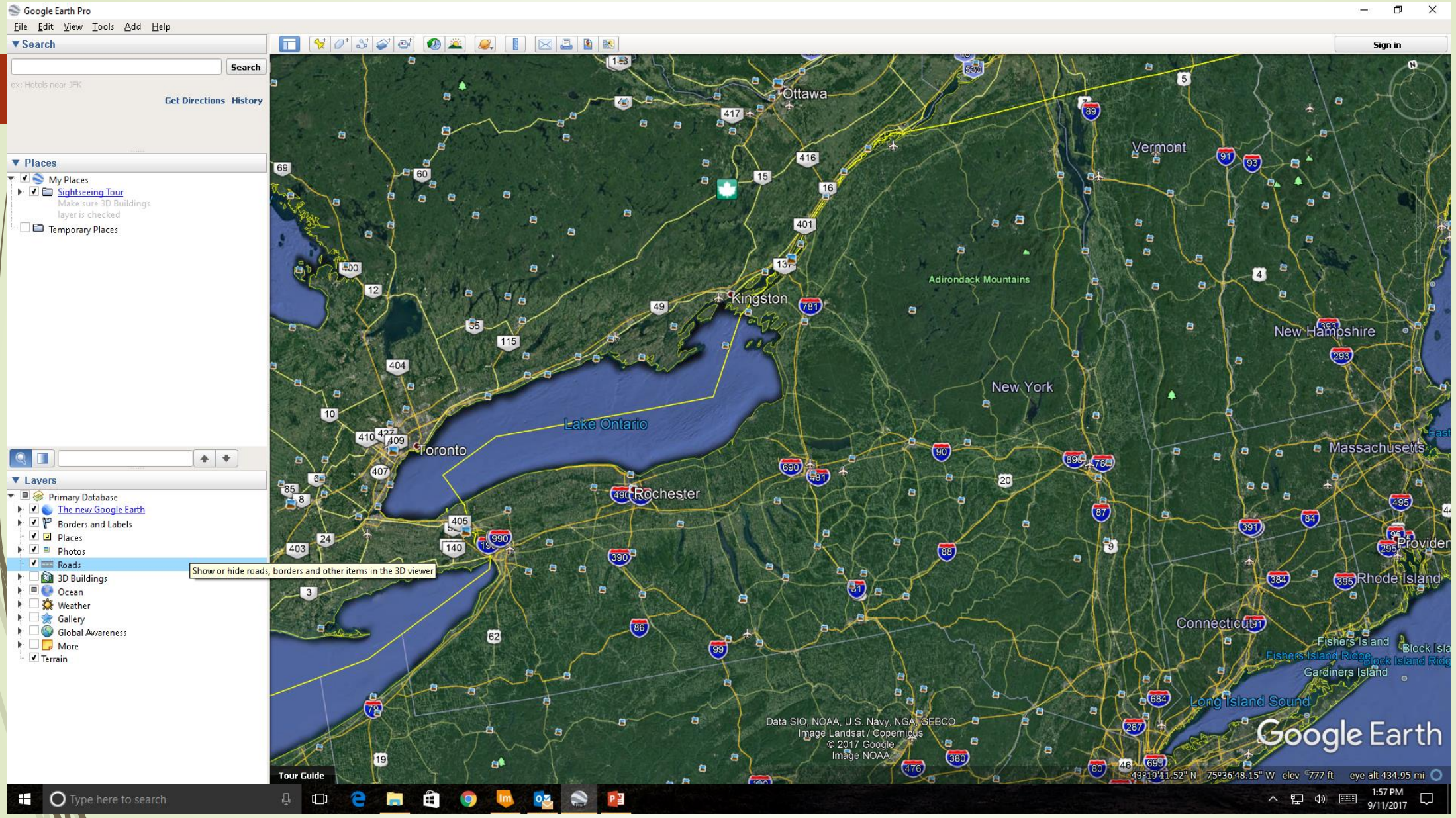




Geographic Information or Geospatial Information is significant to our everyday life






Google Earth Pro
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Sightseeing Tour
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Primary Database
The new Google Earth
Borders and Labels
Places
Photos
Roads
3D Buildings
Ocean
Weather
Gallery
Global Awareness
More
Terrain
Show or hide roads, borders and other items in the 3D viewer
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Ottawa
Kingston
Toronto
Rochester
Lake Ontario
Vermont
New York
New Hampshire
Massachusetts
Rhode Island
Connecticut
Adirondack Mountains
Long Island Sound
Fishers Island
Gardiners Island
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
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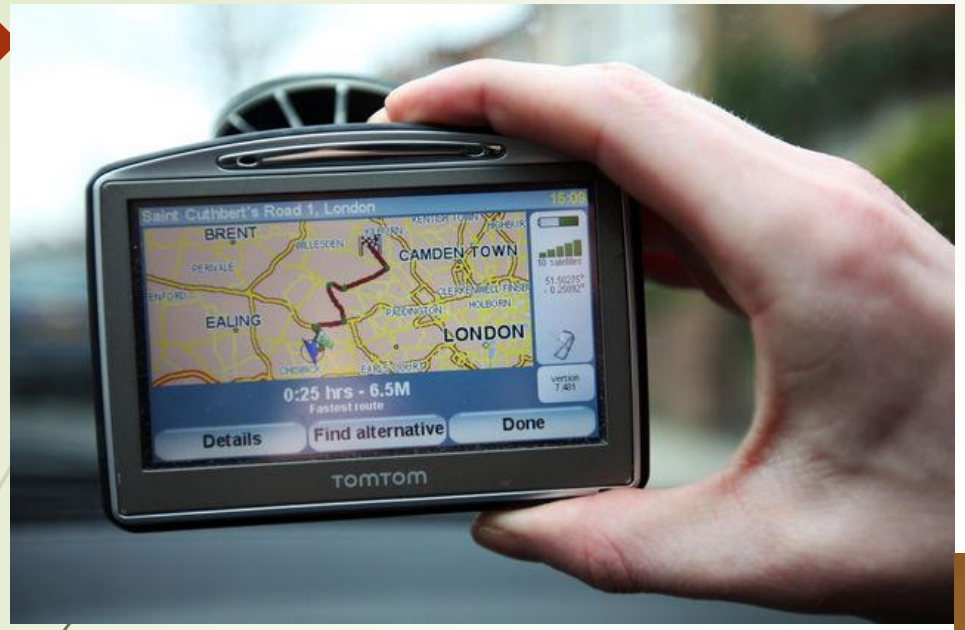
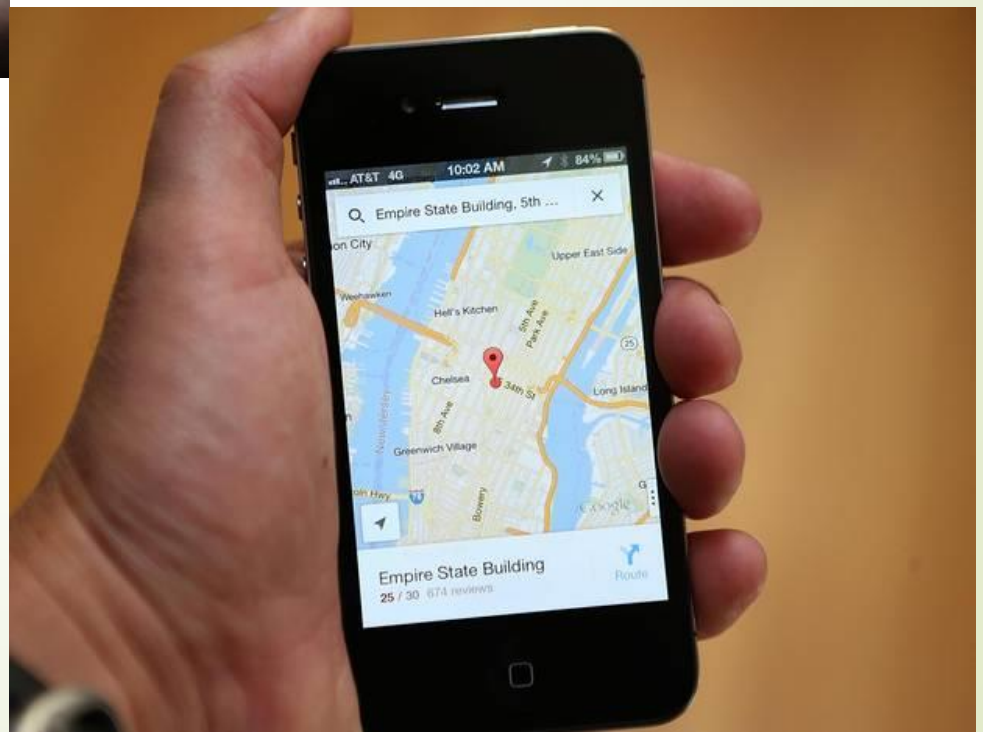
9/11/2017

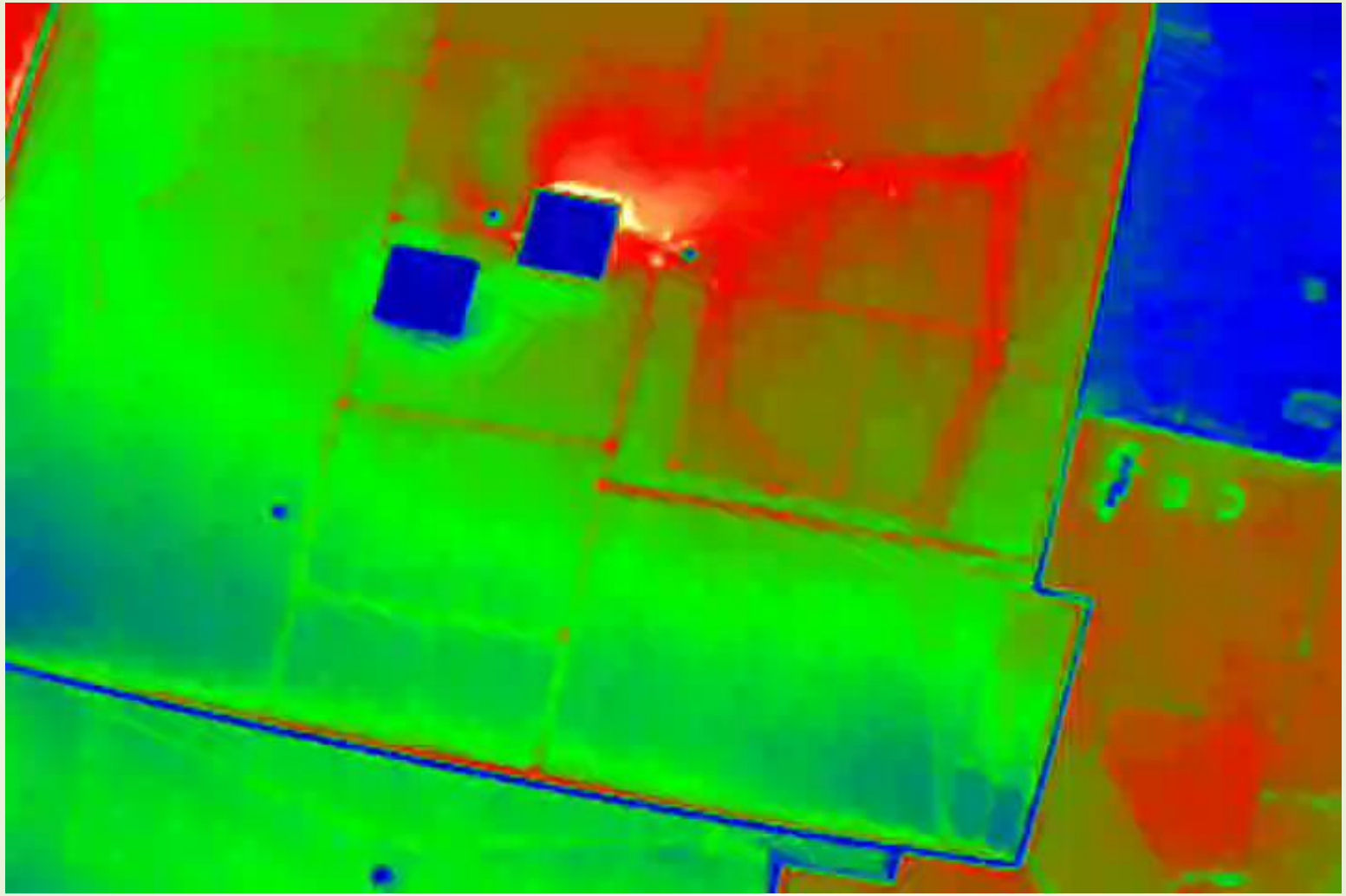
Using computer power to collect large data and model the earth's surface

- Example: Google Maps
- Backroom engine: Geoinformatics, ArcGIS, image processing software

Spatial Database applications







THANK YOU! QUESTIONS?

Flying through SUNY - Buffalo State College campus using ground LiDAR data collected by Dr. Tang. Compiled by Mr. Michael Radomski