Automating Human Geospatial Intelligence

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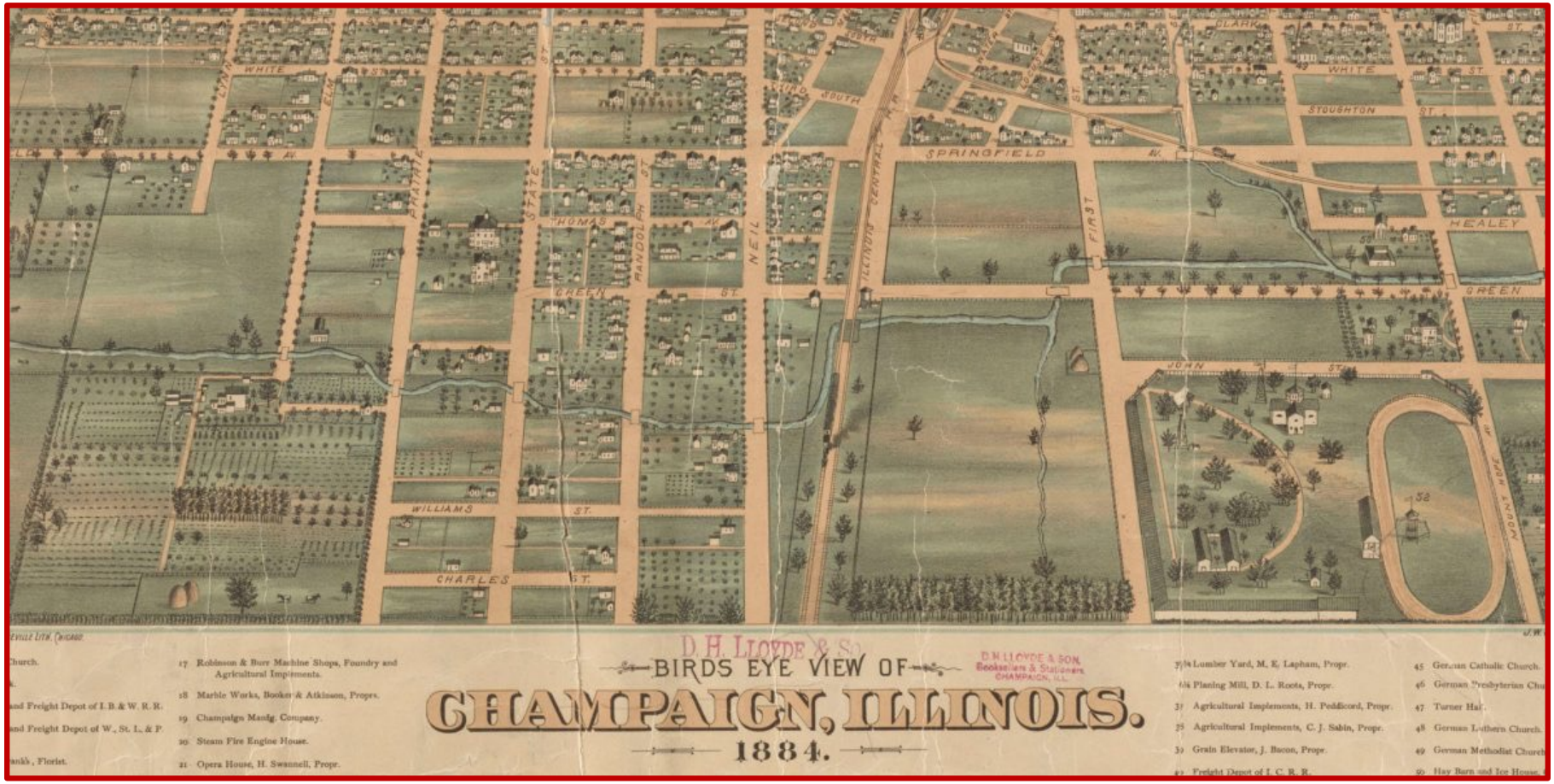
Large Scale Information Management

What about people?
Where were people? Who live there?



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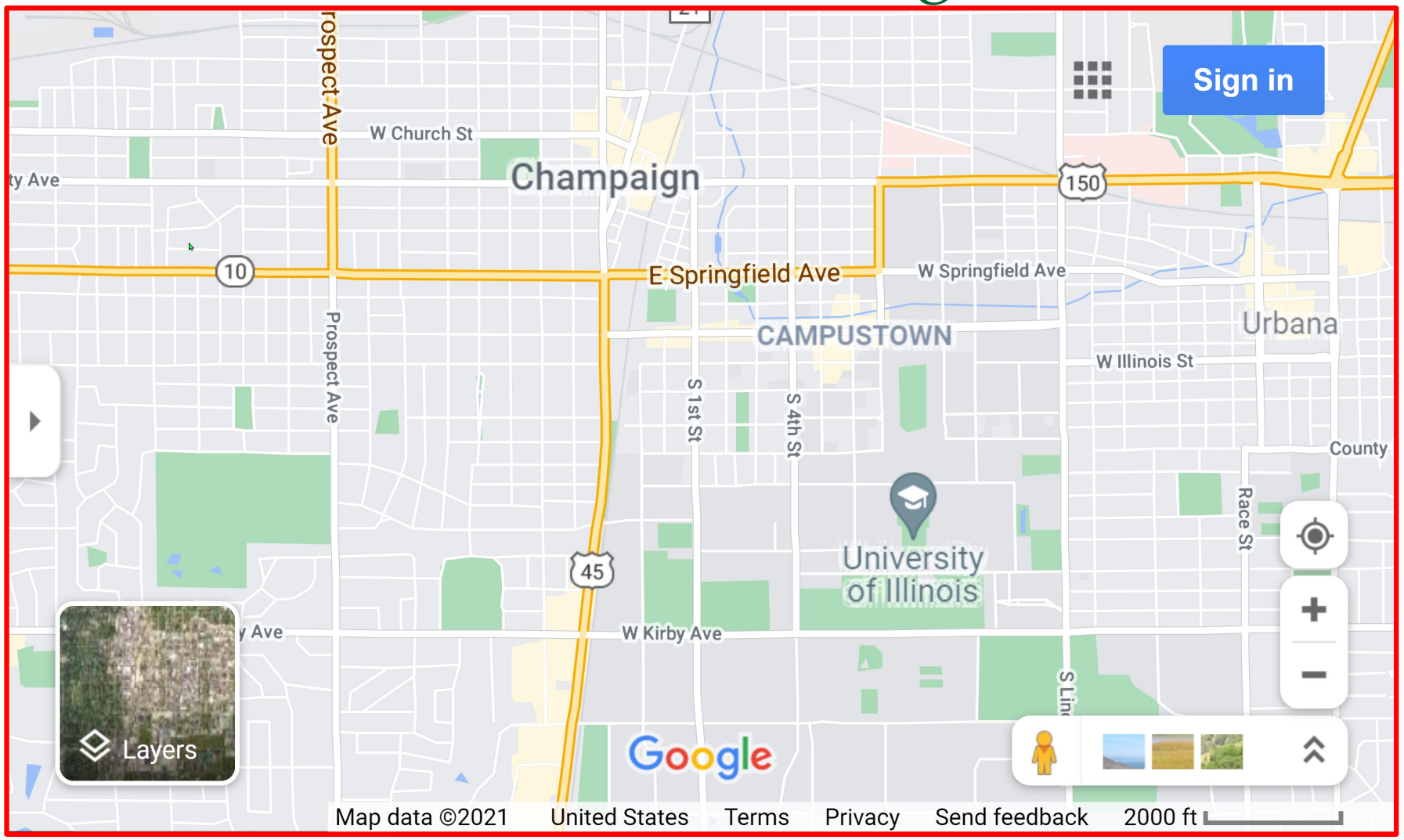
What about people?
Human GEOINT is still lacking!



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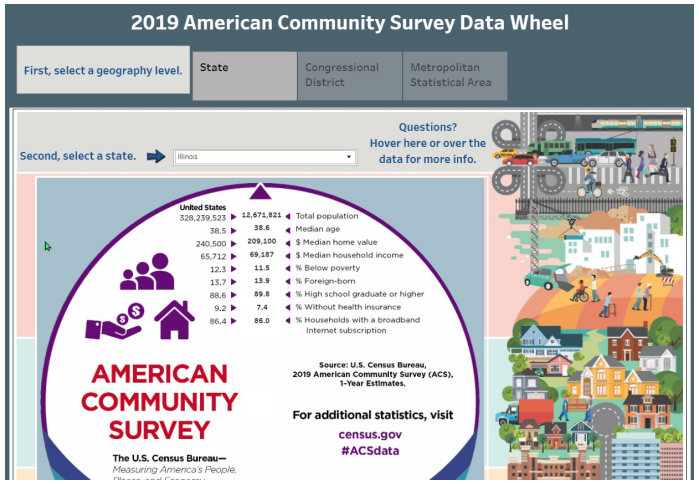
While Physical GEOINT advances, Human GEOINT is largely lagging.

- Automatic large-scale sensing makes rich and up-to-date Physical GEOINT possible.
- But human GEOINT is mostly relying on **manual, periodical survey** like census.



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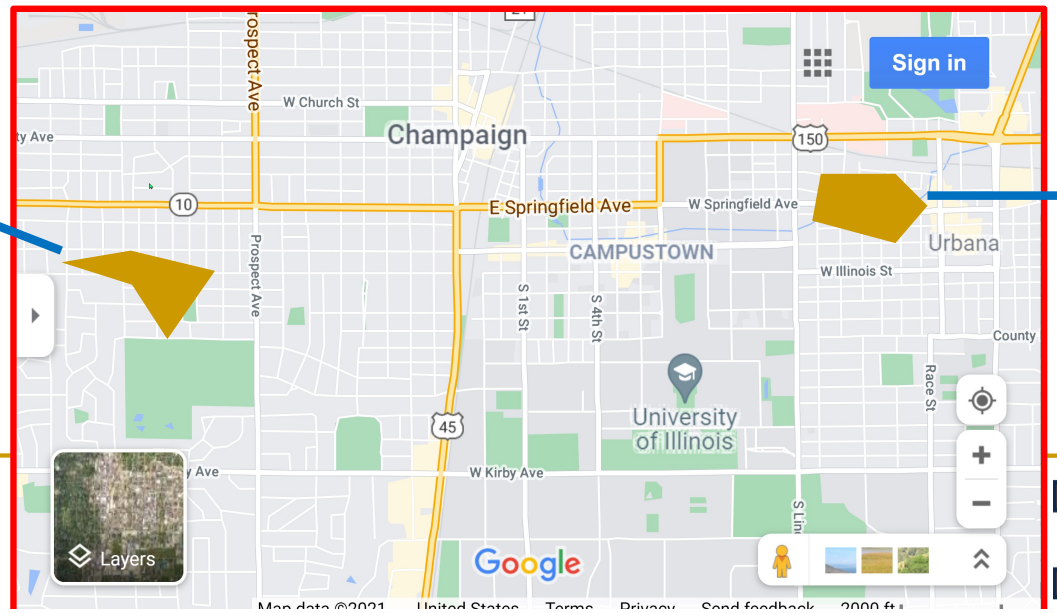
Limitations of current Human GEOINT

- **Outdated** (as soon as published)
- **Coarse-Grained** (census tract or block)
- **Static** (average/aggregate, not “this time”)
- **Passive** (relying on inhabitant corporation)

Goals: **Can we automate Human GEOINT**, to **actively** and **dynamically** acquire **fine-grained**, **up-to-date** information about humans in a place?

- **(Q1) Neighborhood Detection**: Where are various neighborhoods located in the city?

- **(Q2) Neighborhood Profiling**: What characterizes each neighborhood (e.g., race, education)?



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The time has come:
Big Data that is GEO-tagged

- Google Street View
- Microsoft Building Footprints
- Open government data- Data.Gov everywhere.
- Social media- 500m tweets per day in 2021.

Preliminary Study: The City of Chicago

- Six zip code area in Chicago.
  - Downtown, midtown, suburbs.

US Census ACS, from 2019

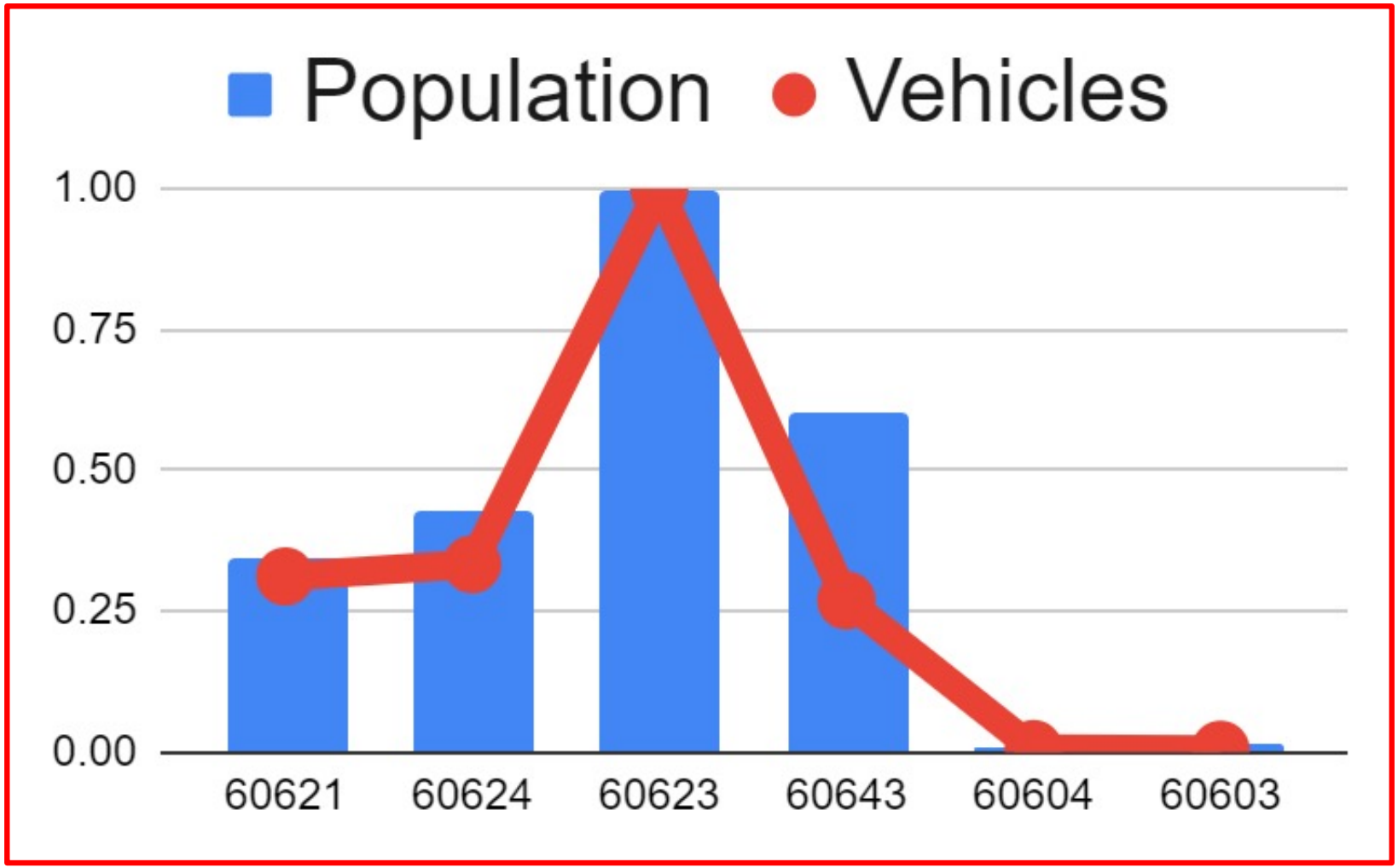
Zip Code	60621	60624	60623	60643	60604	60603
Population	28018	34829	81283	48887	823	1052
Income $	22158	23429	32460	65631	91750	146250
College %	10.2	9.5	10.3	37.3	91.9	95.2
White %	2.2	4.5	38.0	23.3	64.6	64.1
Asian %	0.2	0.2	0.1	0.3	29.2	32.7

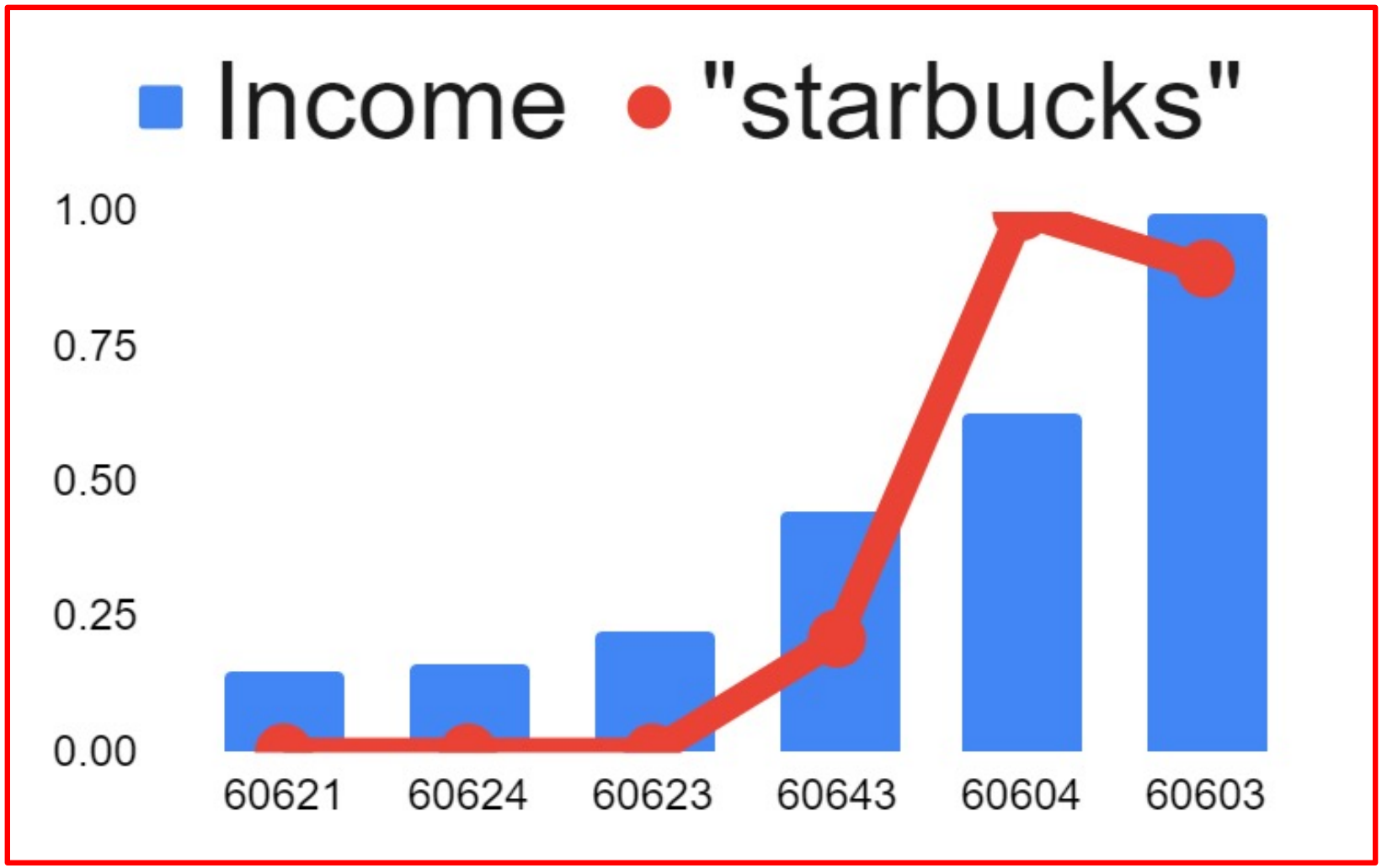
Data Collected and Processed

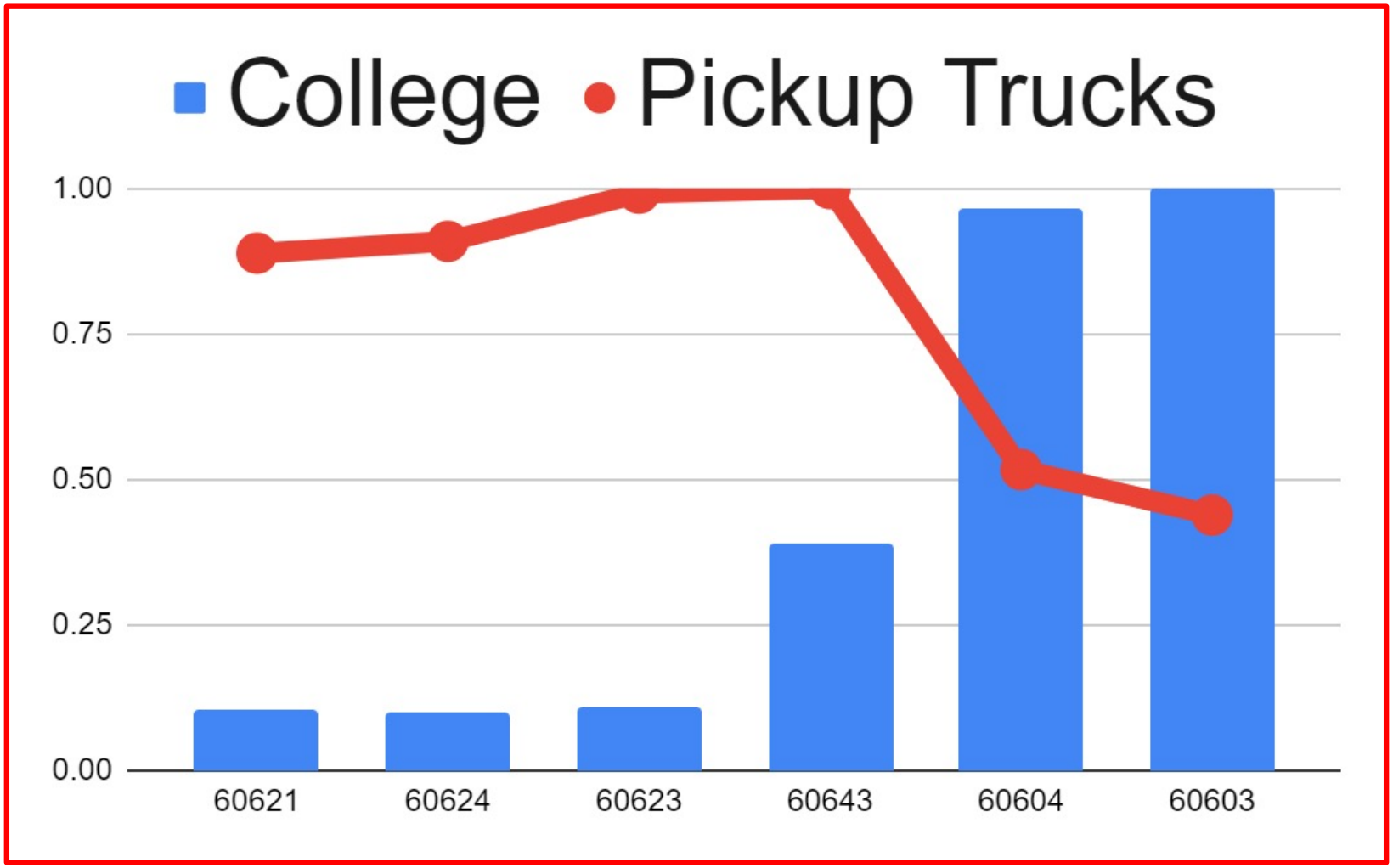
- **Steet View** images: 241K images 2021.
  - Extracted 62814 vehicles and other features.
- **Tweets:** 25K from Archive.Org 2011 – 2020.
- **Crime** incidents: 941K records 2001 – 2020.
- **Building addresses**: 40K records (OpenStreetMap).
- **Building footprints** (Microsoft)

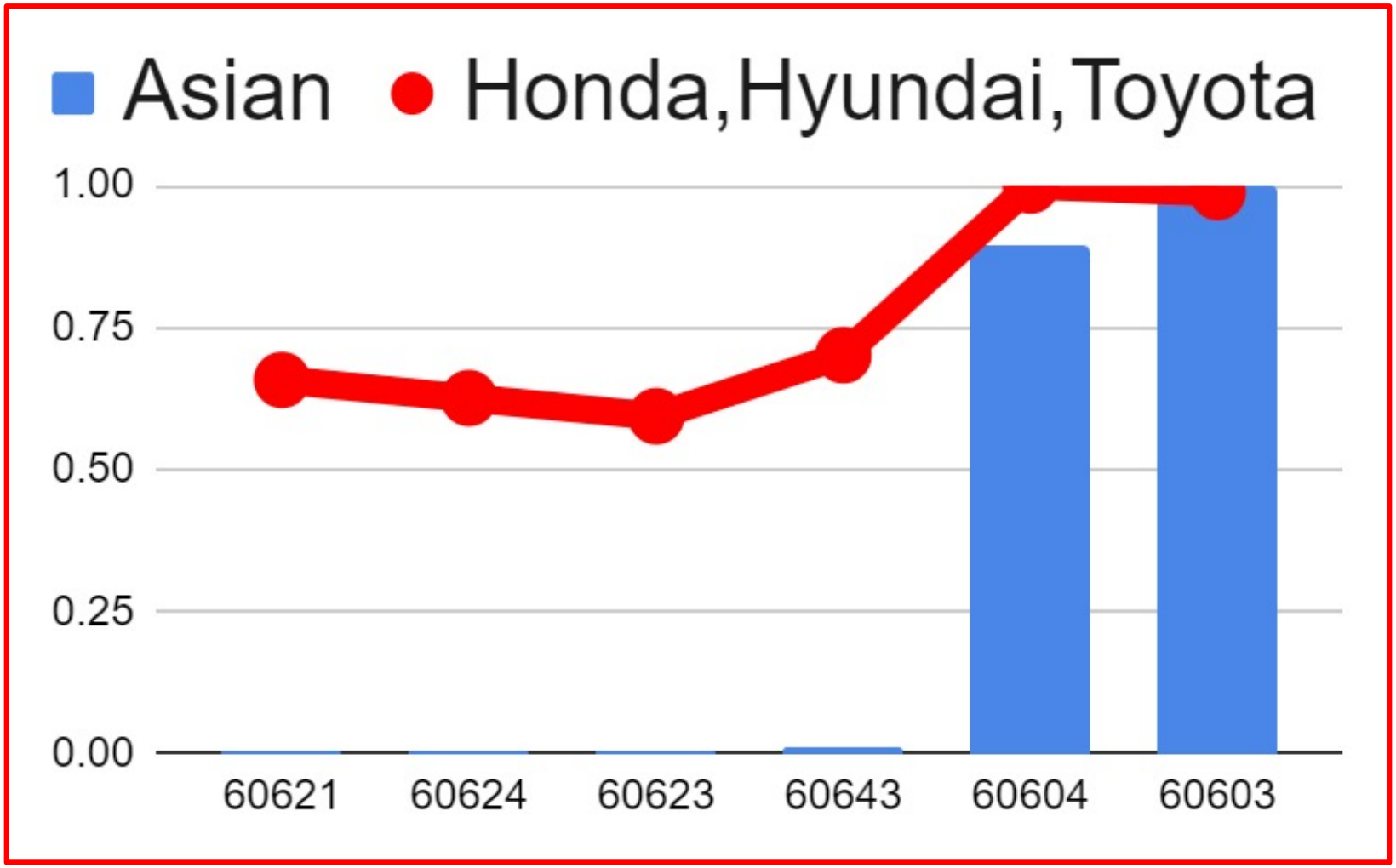
- Can data “predict” the human world?

Interestingly, we found ***strong features*** that are highly indicative for ***every*** target latent property.









So we submitted a proposal abstract.

- Task 1: Data Source Discovery
- Task 2: Geo Data Alignment
- Task 3: Feature Extraction and Integration
- Task 4: Prediction Model Construction

Mission Imperative: MI#1 Assured Positioning, Navigation, Timing, & Targeting (to extend GEOINT foundation products with automatic Human GEOINT).

Application Areas: Cross Cutting– *Foundation* (to build foundation for Human GEOINT), *Geospatial Cyber* (to use cyber data).

Title: Automating Human Geospatial Intelligence

1. BAA number: HM0476-20-BAA-0001
   Topic Number: 3
   Title: NGA Research Innovative Seedlings
2. Lead Organization: University of Illinois at Urbana-Champaign
3. Type of Organization: OTHER EDUCATIONAL
4. Other Team Members/sub-contractors: None
5. Proposal Title: Automating Human Geospatial Intelligence
6. Principle Investigator: Kevin Chen-Chuan Chang
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8. Administrative Point of Contact: Robin Beach, Director, Pre-Award, Sponsored Programs Administration, 1901 S. First Street, Suite A, Champaign, Illinois 61820-7406, Phone: (217) 333-2187, E-mail: spa@illinois.edu
9. Award Instrument Requested: grant
10. Award Type Requested: cost-contract—no fee (Grants, Cooperative Agreements)
11. Total Rough Order of Magnitude: $250,000
12. Date Abstract Submitted: August 19, 2021
13. Taxpayer Identification Number (TIN): 37-60000511
14. Data Universal Numbering System (DUNS) Number: 04-154-4081
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Thank You!