Spatially

Lowering the Barrier to GIS for Urban Planning

Spatially starts with these two engineers.

Hun Kim

Harvard University
Master in Design Engineering

Software Engineer (3+ years)

- Geospatial Engineer, Gensler
- Specializes in automating spatial analysis pipelines, geospatial modeling, and AI-assisted urban analysis

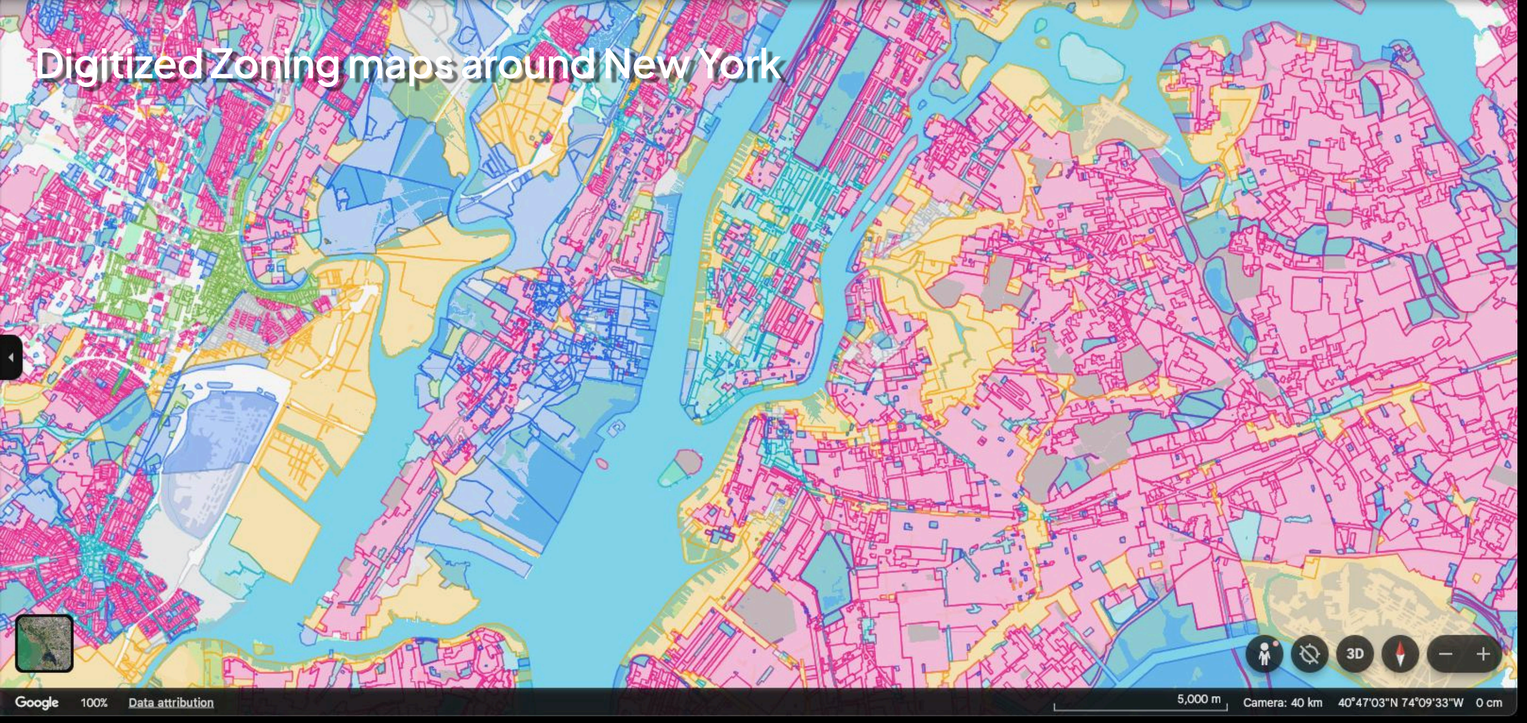
Devraj Raghuvanshi

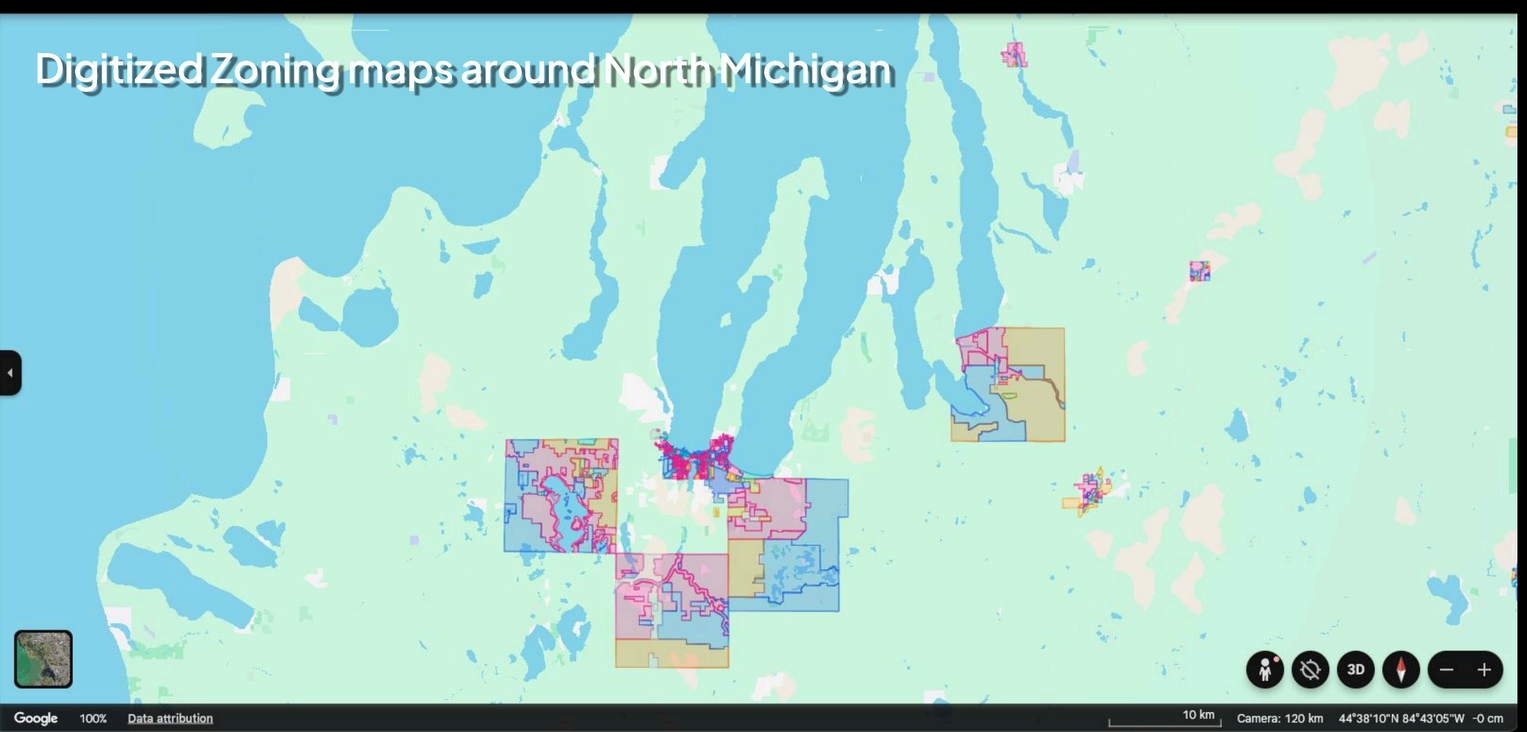
Brown University
Master in Data Science

Machine Learning Engineer (2+ years)

- Family business in India related to public infrastructure
- ML Researcher specializing in recommendation algorithms


Digital tools power most industries.
Planning decisions still depend on PDFs and paper maps.





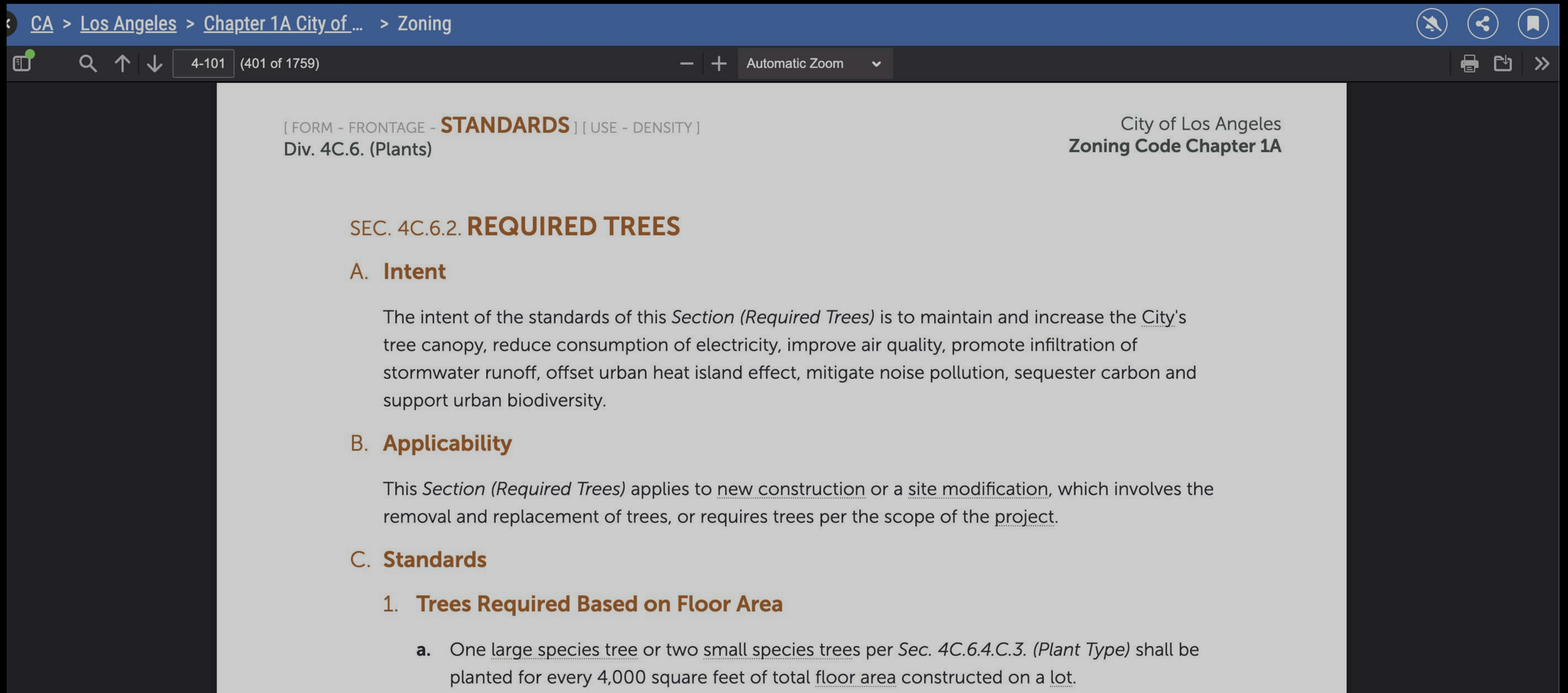
Out of 19,000 U.S. municipalities, ~40% do not have zoning maps in any digital or GIS format.

Many rely solely on PDFs or scanned, hand-marked documents.

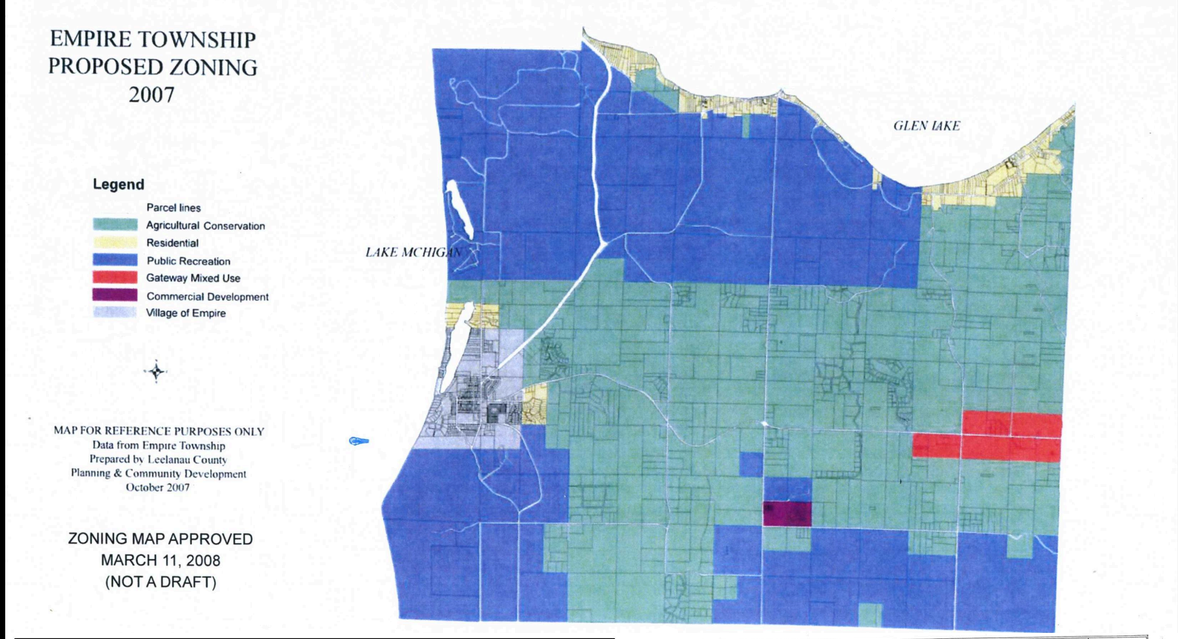
What is zoning?

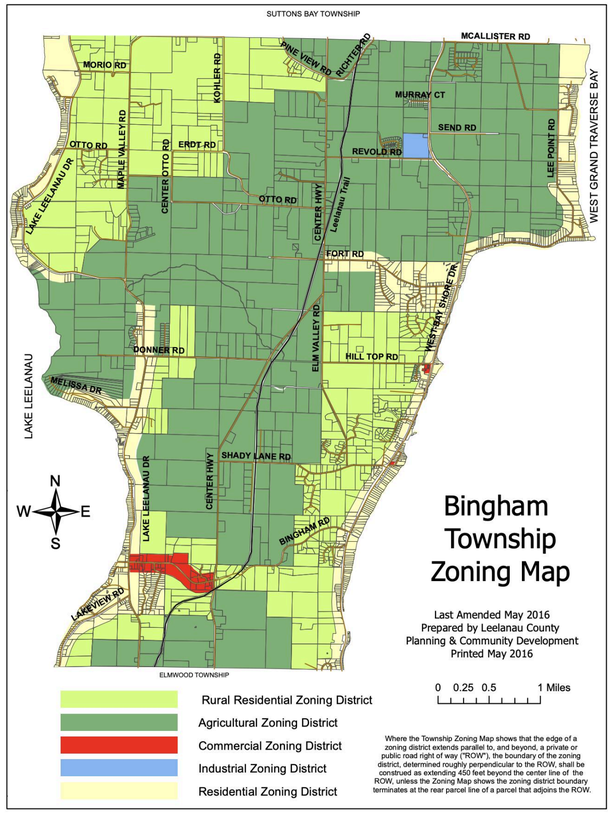
Zoning regulations are municipal laws that govern how land can be used—what can be built, how much, and in what form.

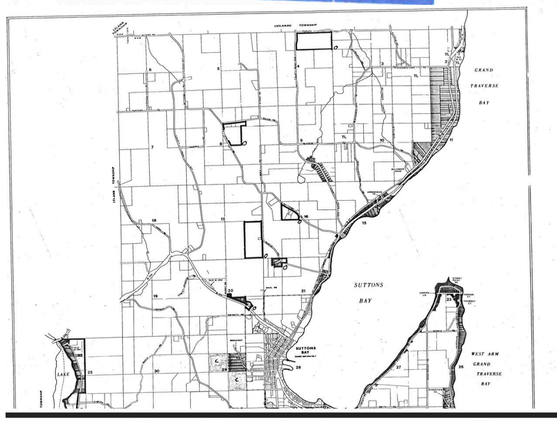
They translate community planning goals into enforceable rules that shape density, building envelopes, and urban development patterns.

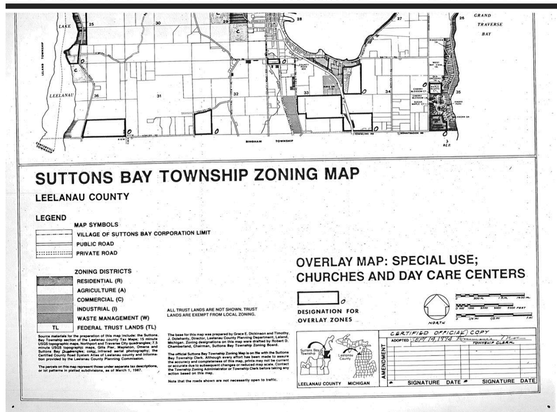


Many regional governments remain to have zoning published as paper maps due to limited technical capacity and staff to create and maintain digital GIS maps









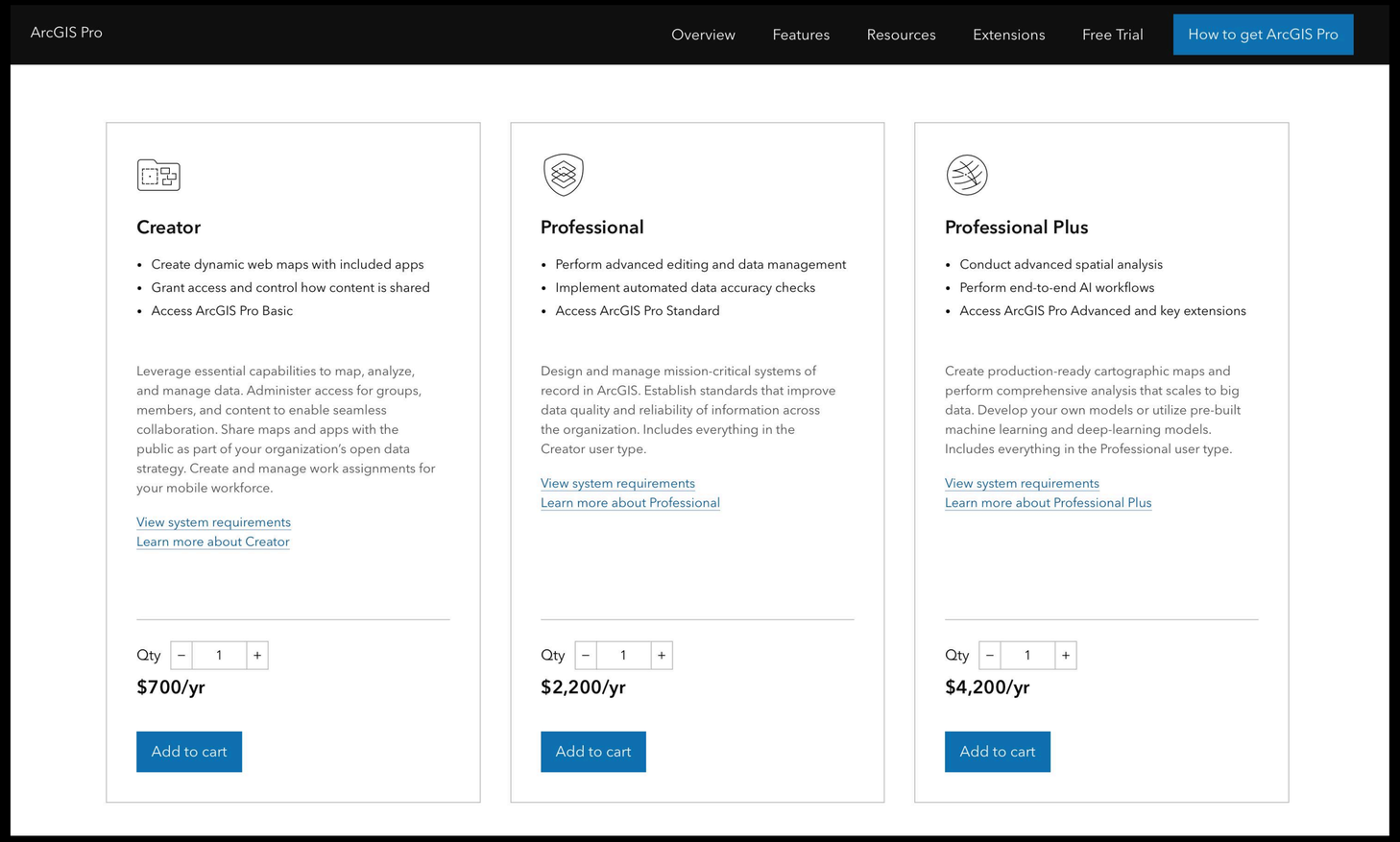
Problem

Many regional planning boards lack the staff and budget to create and maintain digital zoning maps.

As a result, zoning remains locked in PDFs and paper maps, making everyday planning tasks slow, manual, and hard to keep consistent.

Without usable digital maps, reviewing development proposals and updating regional plans becomes time-consuming and error-prone.

Why is budgeting difficult?

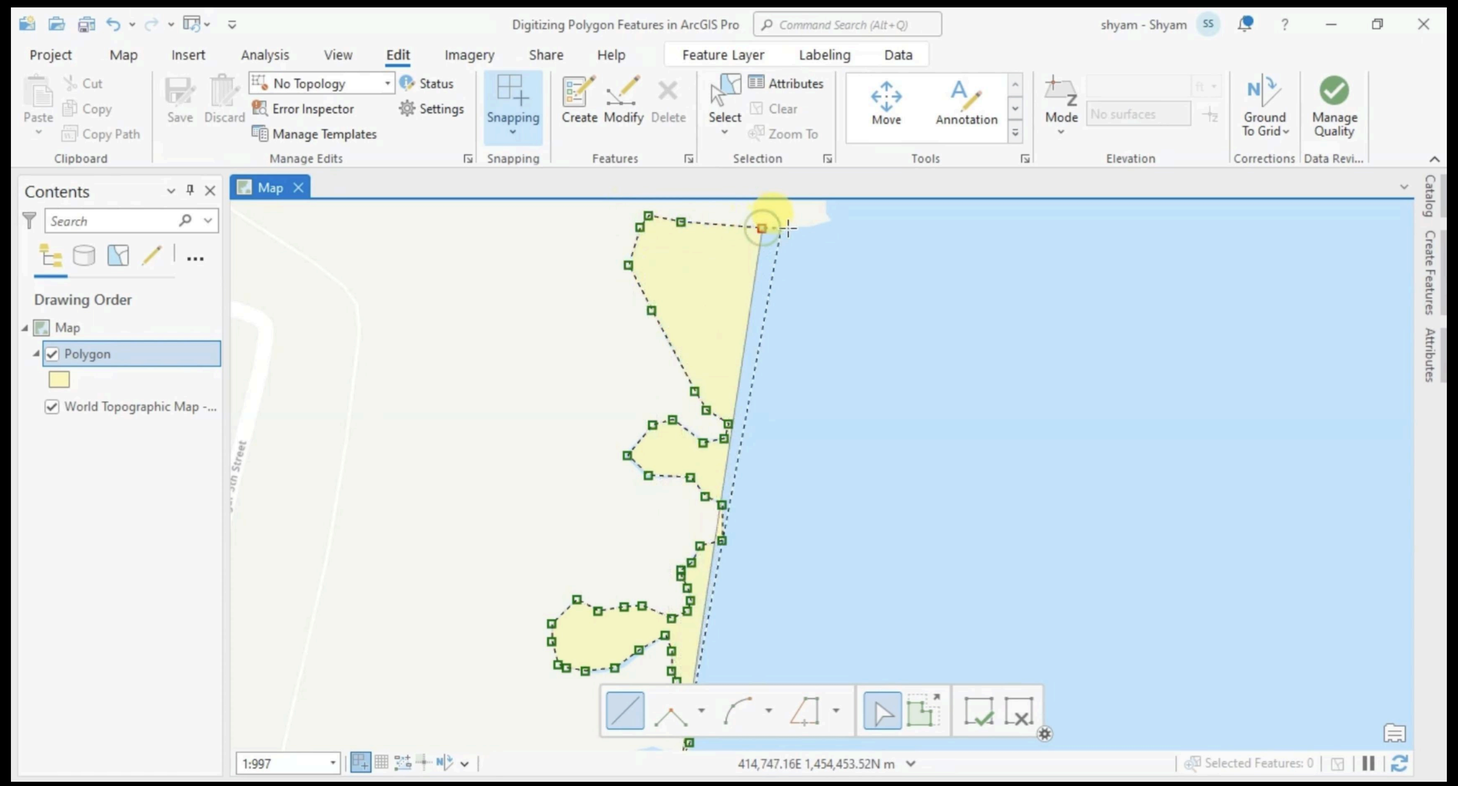


Most digital mapping in government relies on enterprise GIS software.

ArcGIS Pro is the most widely used option, but it is licensed on a per-user, subscription basis—starting at roughly **$700 per user per year**, before training or setup.

For small and regional planning boards, this cost is difficult to justify for workflows that are occasional but mandatory, such as maintaining zoning maps.

Why is staffing difficult?



Even when planning departments have access to GIS software, digitizing zoning maps remains one of the most **labor-intensive** tasks.

Creating zoning maps typically requires **manually tracing parcel boundaries** and zoning districts point-by-point on screen.

For understaffed planning boards, this work is time-consuming, specialized, and difficult to maintain alongside other planning responsibilities.

Chapter 1. The Problem

Chapter 2. Our Solution

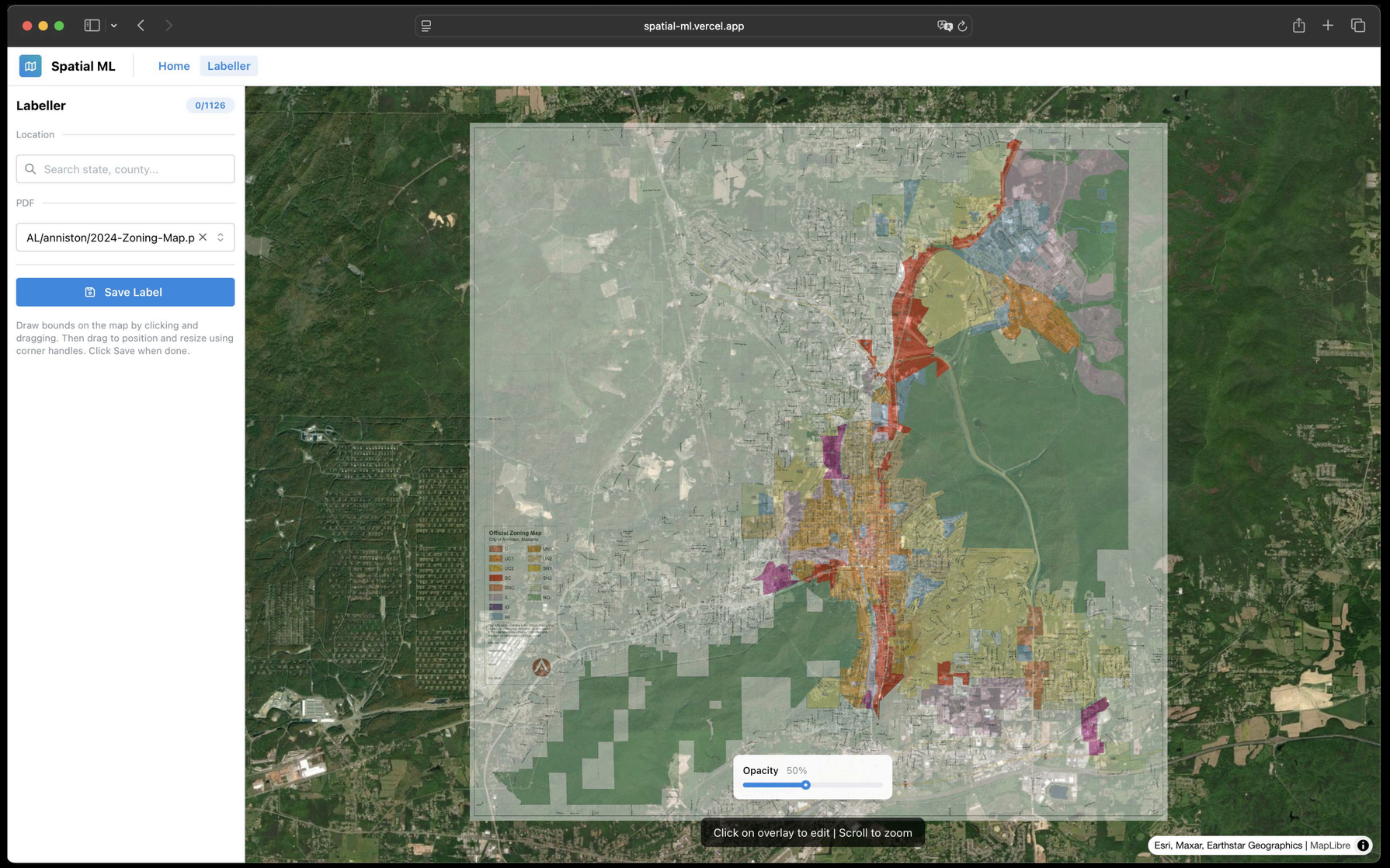
Chapter 3. Validation Through Interviews & Research

Chapter 4. Business Strategy

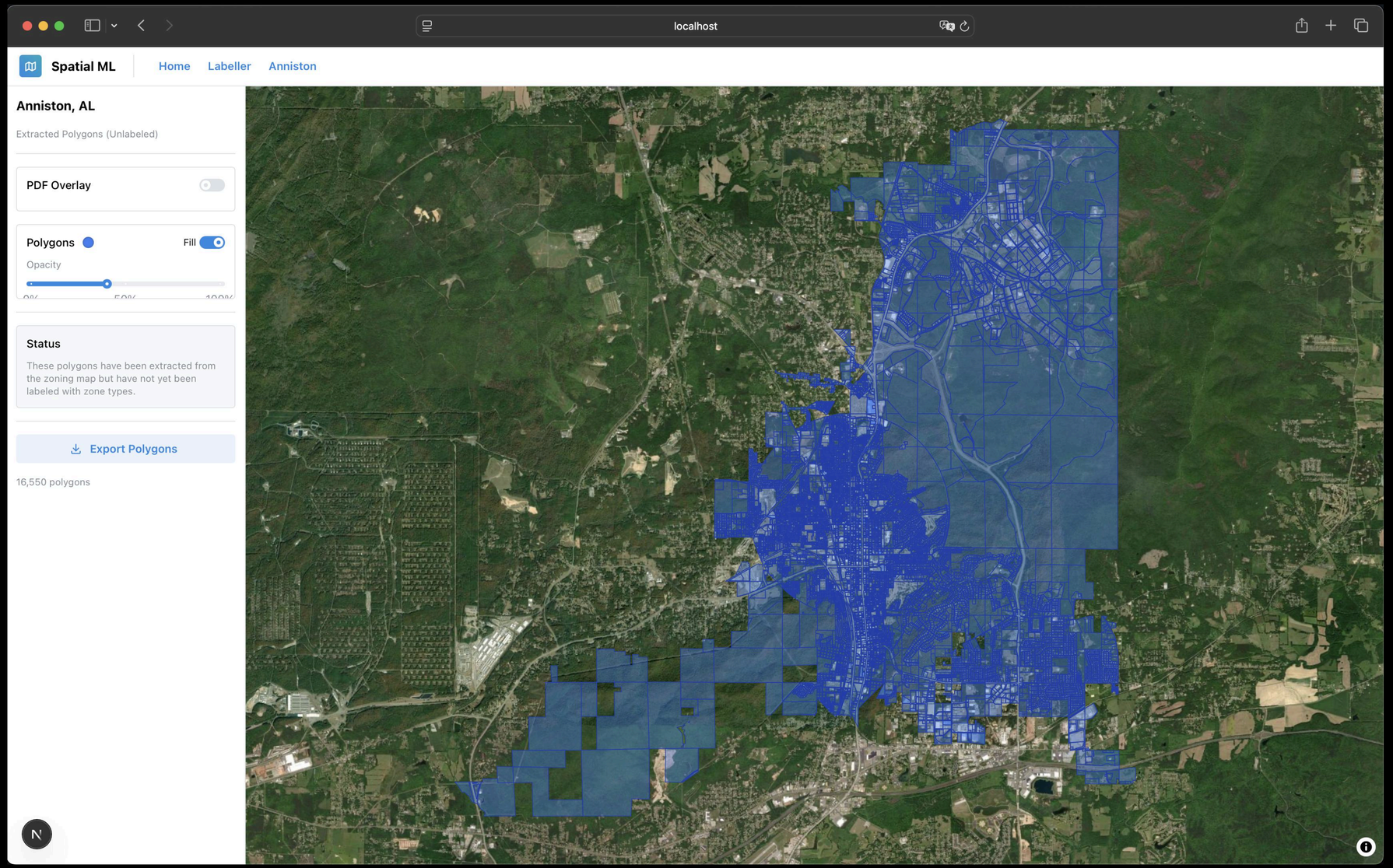
Chapter 5. What We Have Accomplished & What's Next

Mission

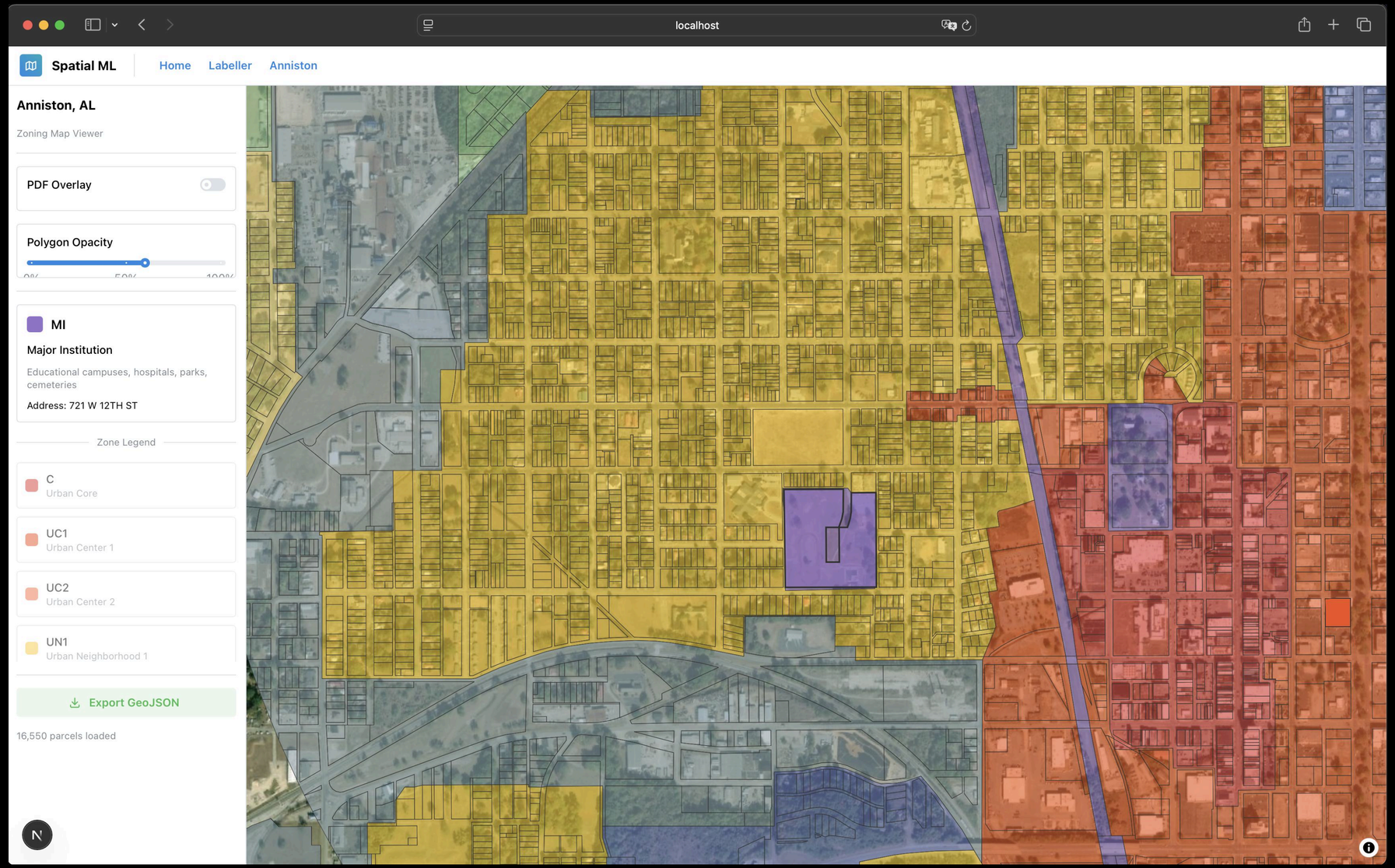
“We build tools that turn zoning PDFs and hand-drawn maps into usable digital maps, creating an on-ramp to everyday GIS use for planning boards with limited capacity.”



(Prototype) The planner uploads a zoning map PDF and aligns it with a base map to establish location and reference points.

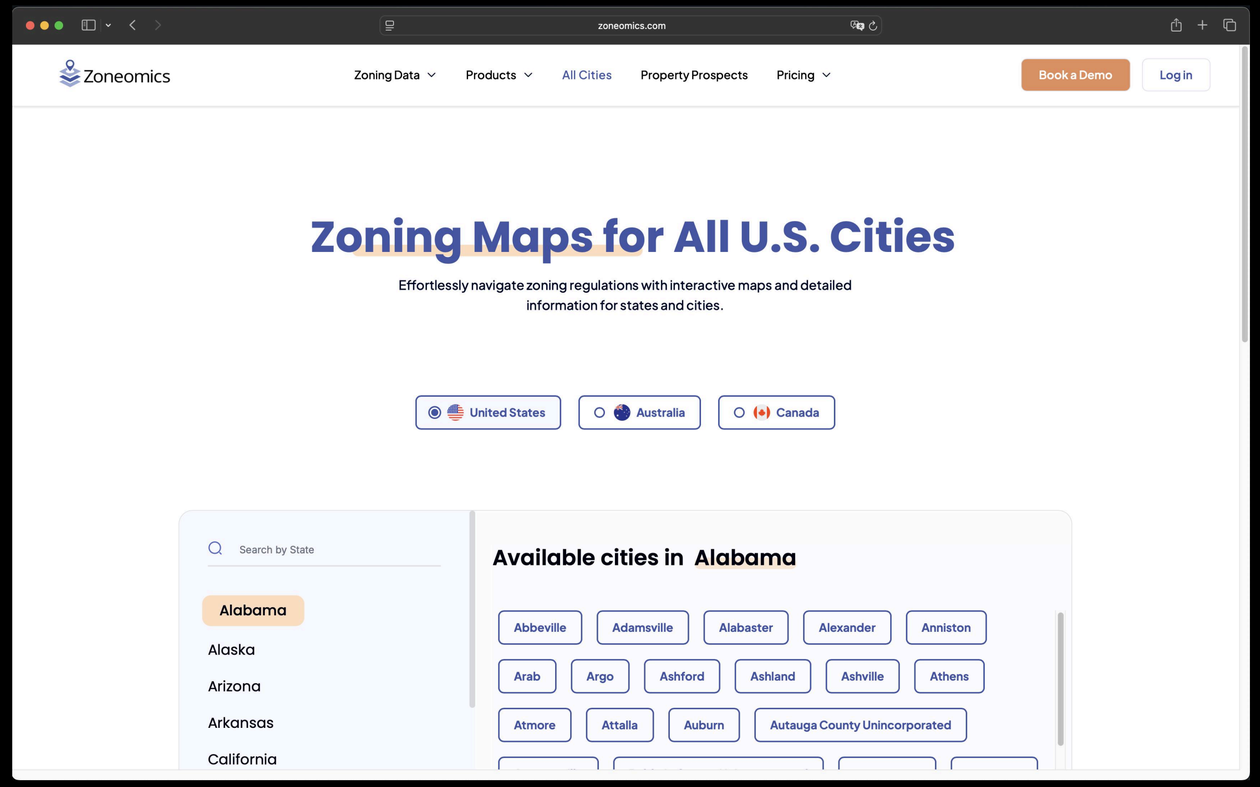


(Prototype) The tool automatically generates zoning polygons from the uploaded PDF.



(Prototype) Planners assign zoning code labels to the polygons and adjust boundaries as needed.

Differentiation from Competitors



https://www.zoneomics.com/all-cities/usa/alabama

Zoneomics is the leading private provider of zoning data, but its coverage is strongest in places that already publish GIS zoning maps. small and low-capacity municipalities—where zoning maps are not digitized—remain underserved.

Our differentiation:

1. Creates GIS zoning data where none exists (PDFs → GeoJSON).
2. Built for municipalities without GIS capacity.
3. Free for governments, encouraging rural participation.
4. Expands zoning coverage into previously unmapped regions.

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Validating the approach through interviews

Elizabeth Bowie Christoforetti

Professor at Harvard Graduate School of Design

Will Cohen

Planner at Boston Planning and Development Agency

Keith Brockhurst

Town Manager for Center, Colorado

Validating the approach through interviews

Elizabeth Bowie Christoforetti

Professor at Harvard Graduate School of Design

“When I worked in Leelanau County, the zoning information was only available as raw PDFs and old hand-marked maps. Without a usable digital format, it was extremely difficult to interpret what the regulations actually required for the site.”

Will Cohen

Planner at Boston Planning and Development Agency

Keith Brockhurst

Town Manager for Center, Colorado

Validating the approach through interviews

Elizabeth Bowie Christoforetti

Professor at Harvard Graduate School of Design

Will Cohen

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Keith Brockhurst

Town Manager for Center, Colorado

"A lot of municipalities don't even have a digitized zoning map. The real need is helping them create and maintain one, because many simply don't have the staff or technical expertise to do it."

Validating the approach through interviews

Elizabeth Bowie Christoforetti

Professor at Harvard Graduate School of Design

Will Cohen

Planner at Boston Planning and Development Agency

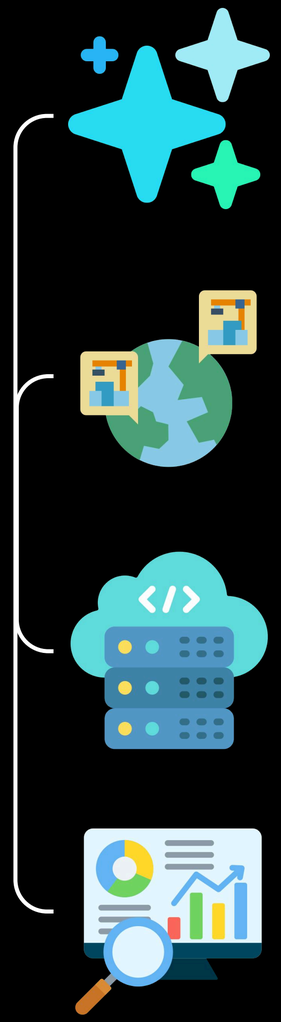
Keith Brockhurst

Town Manager for Center, Colorado

"When I was the interim town manager in Center, Colorado, I literally had to hand-draw the zoning map because no digital—or even clear printed—version existed. Many rural towns face the same issue and simply don't have the technical capacity to create GIS zoning maps."

Business Model: Free to Create, Paid to Operate

4 features of Spatially



PDF → GIS Intelligence

Basic Spatial Analaysis

Create & Manage
Free

Public-facing map hosting

Analytics for hosted website

Operate
Monthly Subscription

No cost to digitize zoning maps

Digitizing zoning maps is the first step toward everyday GIS use in planning. This step will always remain free—so limited capacity is never a barrier.

Subscription for public map hosting

Planning boards can host zoning maps for public access through a low-cost monthly subscription.Fees support reliable publishing, maintenance, and ongoing updates.

Basic analytics for planning insight

Optional analytics provide visibility into how zoning maps are used, such as view counts and district-level interactions.These features support internal planning workflows without restricting public access.

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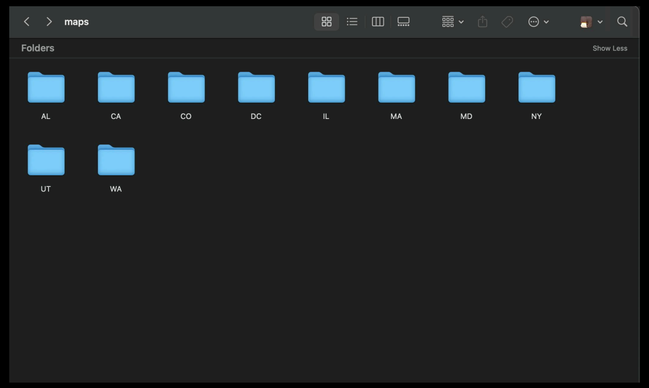
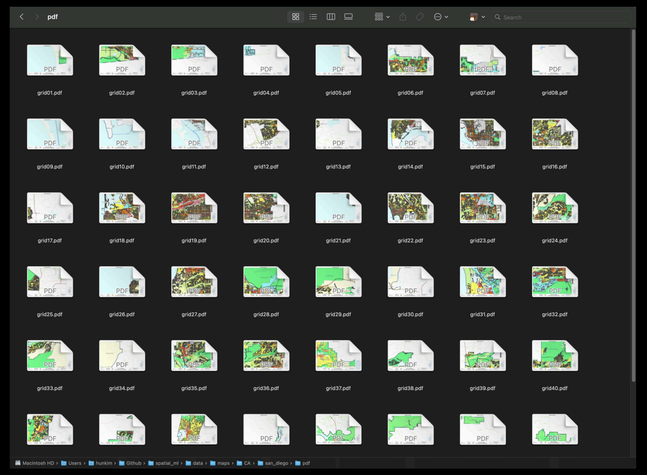
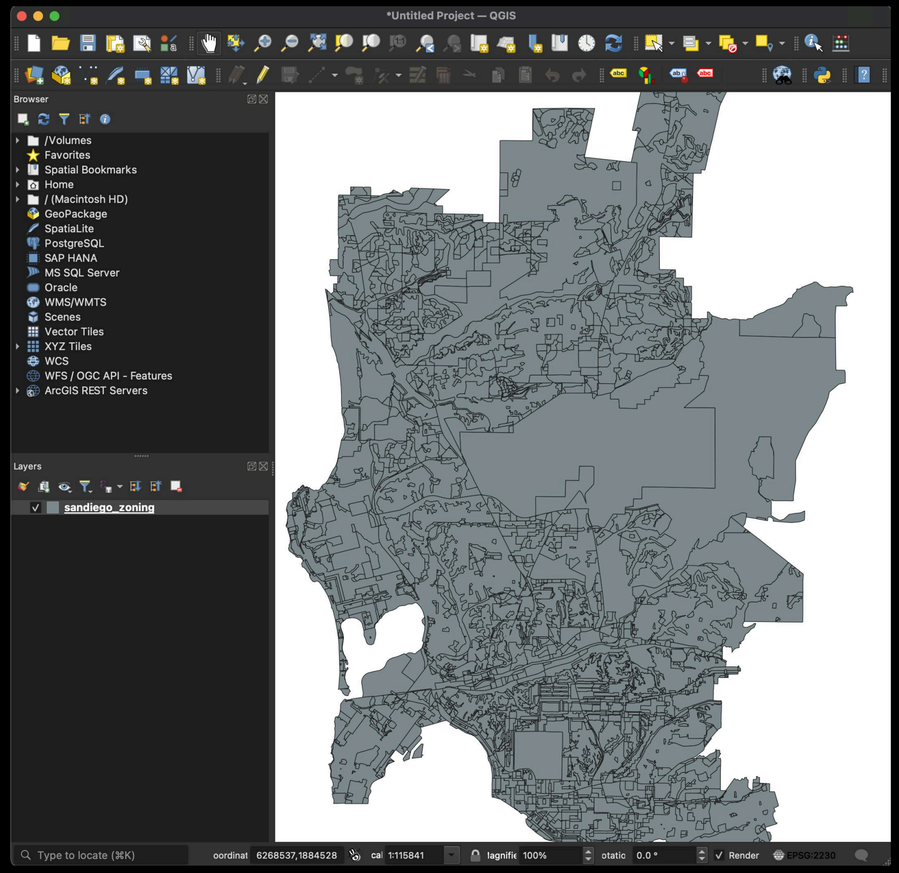
Built an initial zoning map training dataset





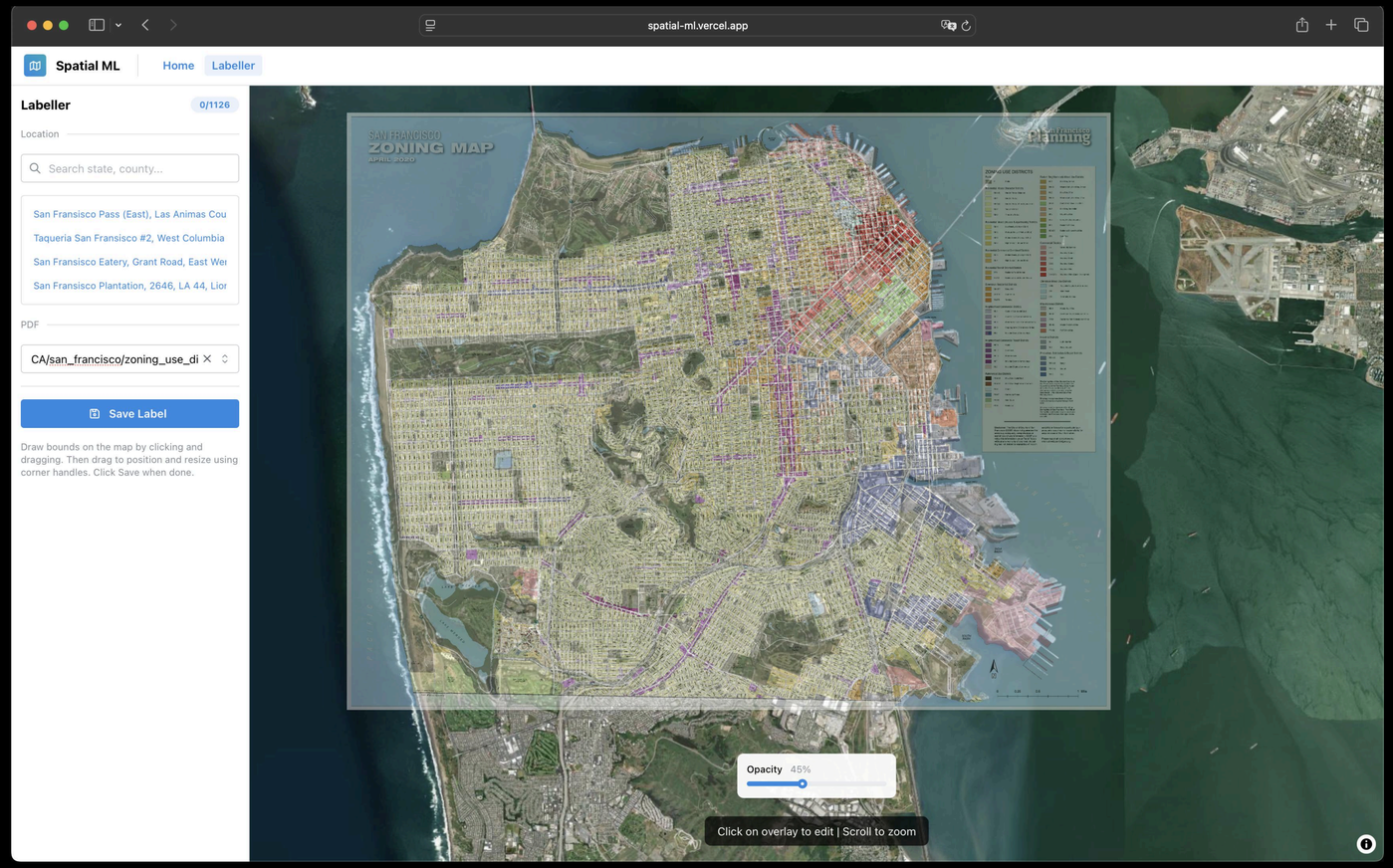


Collected ~300 paired zoning map PDFs and corresponding GIS files from U.S. municipalities.

The dataset reflects real-world variation in zoning map formats, visual quality, and annotation styles, sourced from official municipal planning documents.

Next, we are expanding the dataset to 1,000+ paired maps to support robust PDF-to-GIS model training and validation.

Built a Web-Based Editor for Georeferencing Zoning PDFs



Built a web-based editor that allows planners to align zoning map PDFs directly onto a base map.

The interface enables precise georeferencing by linking PDF map content to real-world coordinates.

This tool generates labeled spatial training data used to support PDF-to-GIS conversion.

Future plans

1. Scale PDF-to-GIS Conversion

- Expand the paired dataset of official zoning map PDFs and GIS files from urban municipalities.
- Use this dataset to train a computer vision model that converts static zoning maps into usable GIS data at scale.

2. Pilot With Rural and Underserved Municipalities

- Pilot the early tool with rural planning boards, including Keith's municipality.
- Evaluate workflow fit, usability, and the level of support required for adoption without dedicated GIS staff.
- Use feedback to simplify the tool and ensure it can be realistically maintained by small governments.

3. Launch a Production-Ready Platform

- Build a stable web platform for free zoning map creation and public-facing zoning viewers.
- Offer paid municipal services for publishing, hosting, updates, and basic usage analytics.
- Establish a sustainable, public-first model aligned with routine digital infrastructure costs.

Thank you

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