Visualizer for Data-centric Modeling of Gainesville Businesses

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Project Overview

- We introduce *Visual DGLIM*
  - Uses the SAGE2 platform
  - Derivative of the Data-centric Gainesville business LIfecycle Modeling (DGLIM) project [PRAGMA35]
- Visual DGLIM serves as a decision support system that operates on datasets of geographic data
  - Users can upload datasets to a shared online workspace
  - Juxtaposes large amounts of geographic data
  - Emphasizes the discovery of relationships across datasets

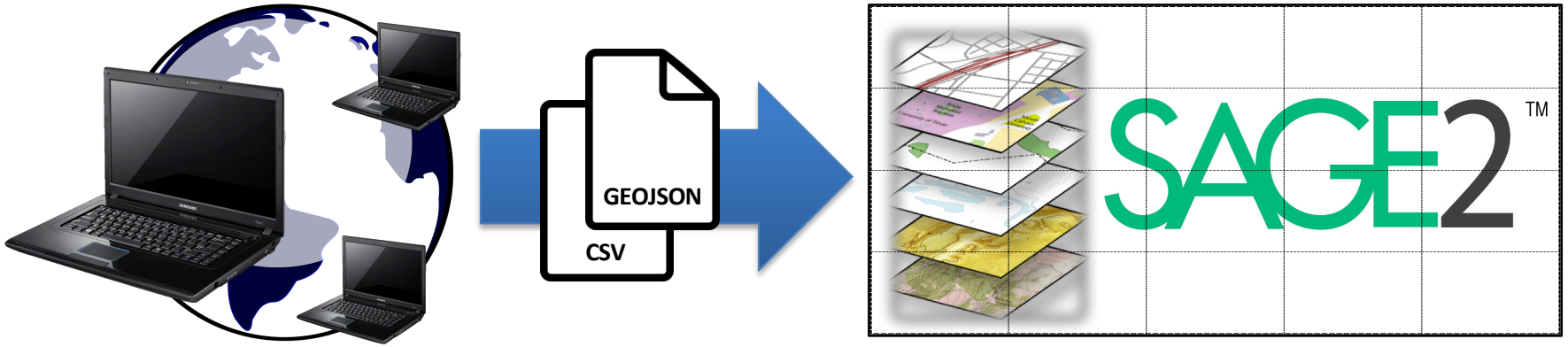
Background

- In the original DGLIM project, we analyzed datasets provided by the City of Gainesville to extract economic and business health indicators
  - Data correlations and visualizations were painstakingly assembled by hand
  - It took months of work to clean, join, and visualize our data
- We wanted to make a tool to automate the process of visual and numerical data analysis
- We wanted to introduce a collaborative element to data analysis

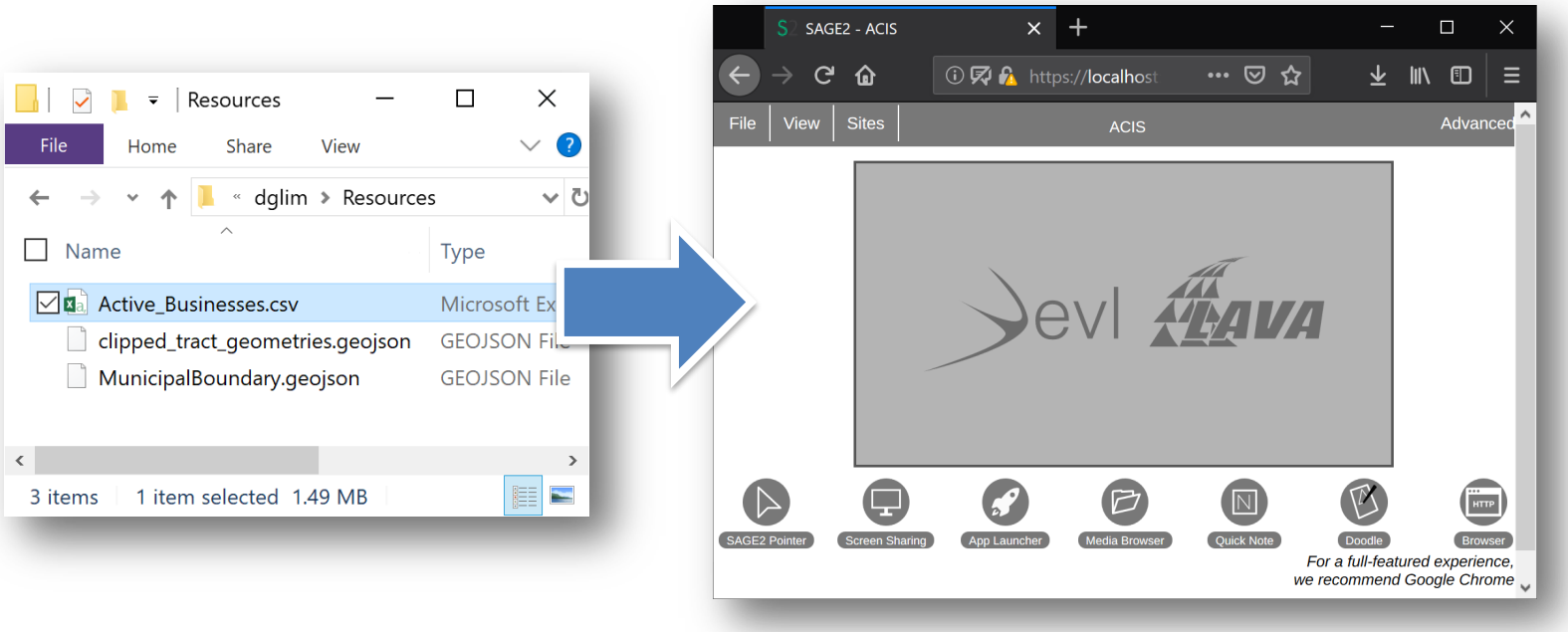
Project Tasks: Overview

- Build a SAGE2 app that:

1. Allows users to upload data to a shared workspace
2. Visualizes data geographically (when possible)
3. Highlights relationships across data



Task 1: Uploading Data



- SAGE2 inherently allows users to drag and drop data from their desktops into SAGE2
- Our app then parses the data to prepare it for visualization and analysis

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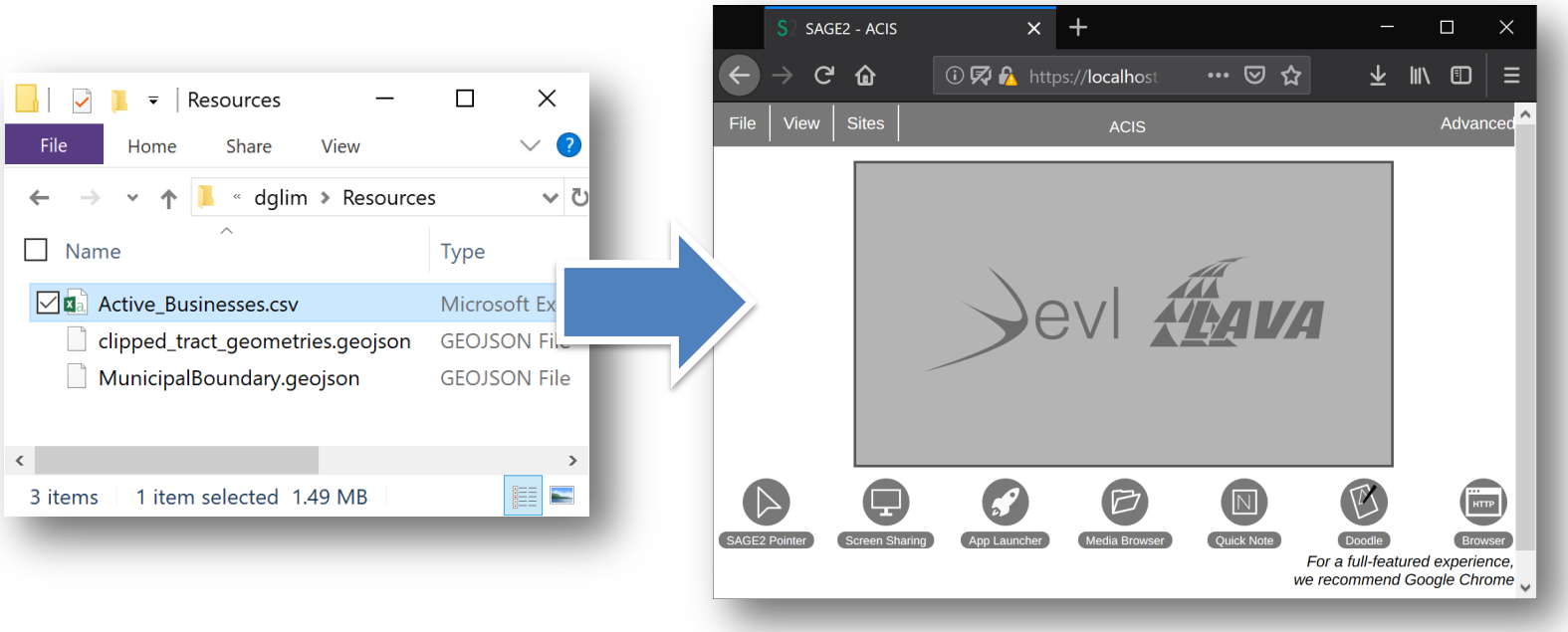
Task 1: Uploading Data



- File contents are parsed into *Google Maps API*, *Turf.js*, and *Dataframe.js* data structures
- We currently support the GEOJSON and CSV file formats

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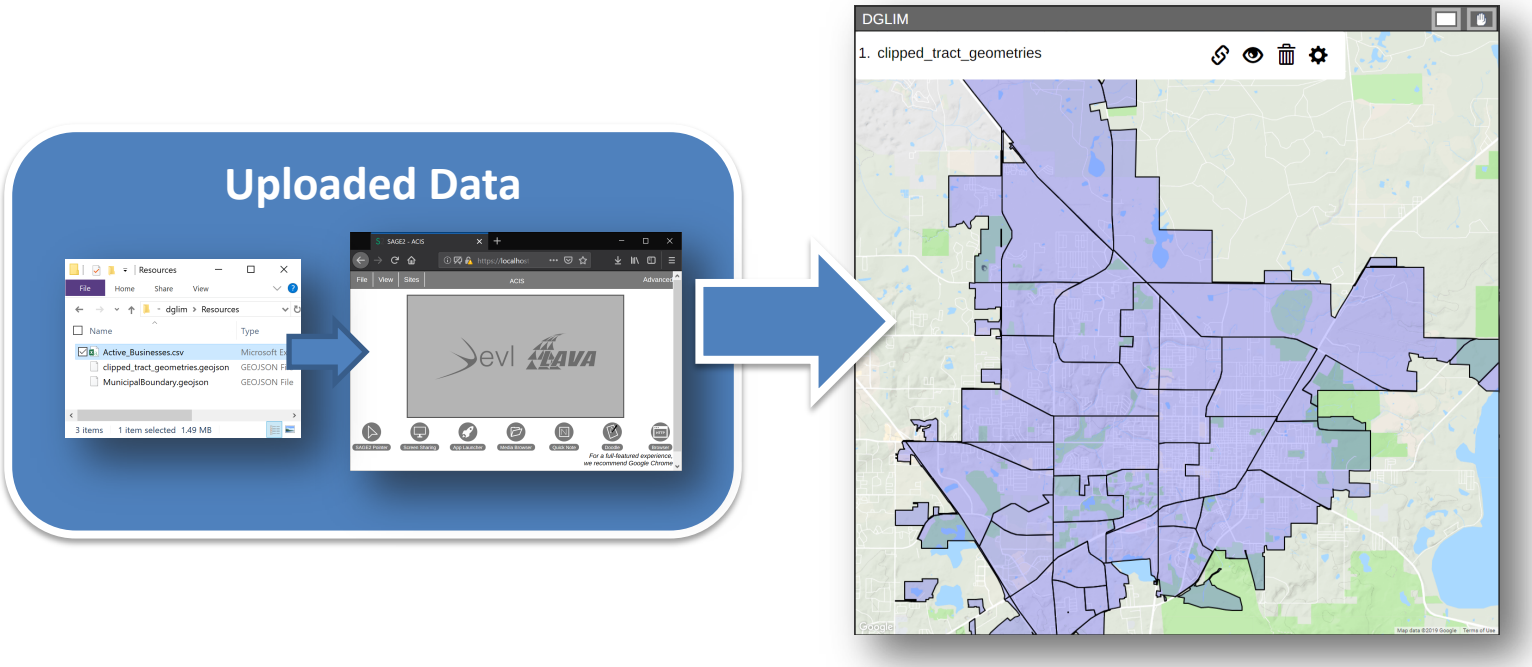
Task 2: Visualizing Data



- We use the Google Maps API to visualize **shape data** and **point data** in the shared *Visual DGLIM* workspace
- A styling interface allows users to adjust visualization options (e.g. colors, opacities, markers, heat maps)

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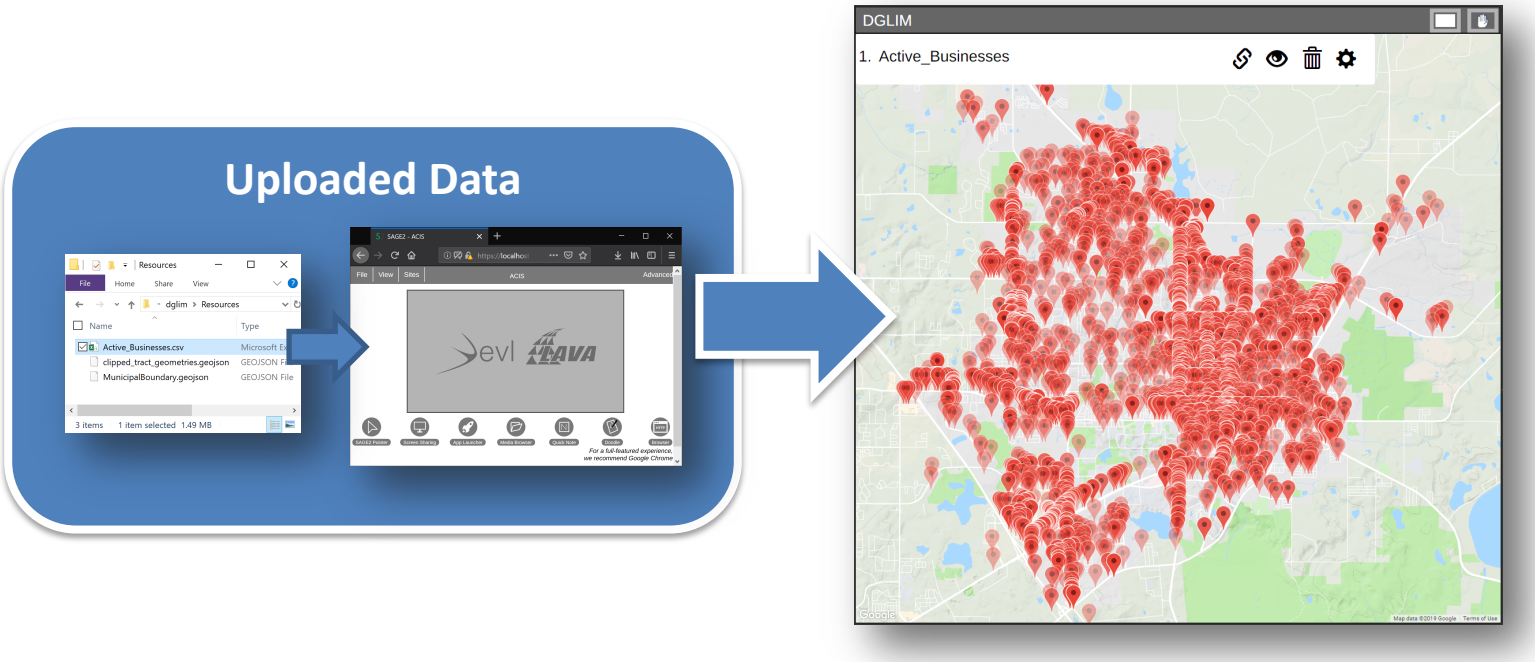
Task 2: Visualizing Data



- We use the Google Maps API to visualize **shape data** and **point data** in the shared *Visual DGLIM* workspace
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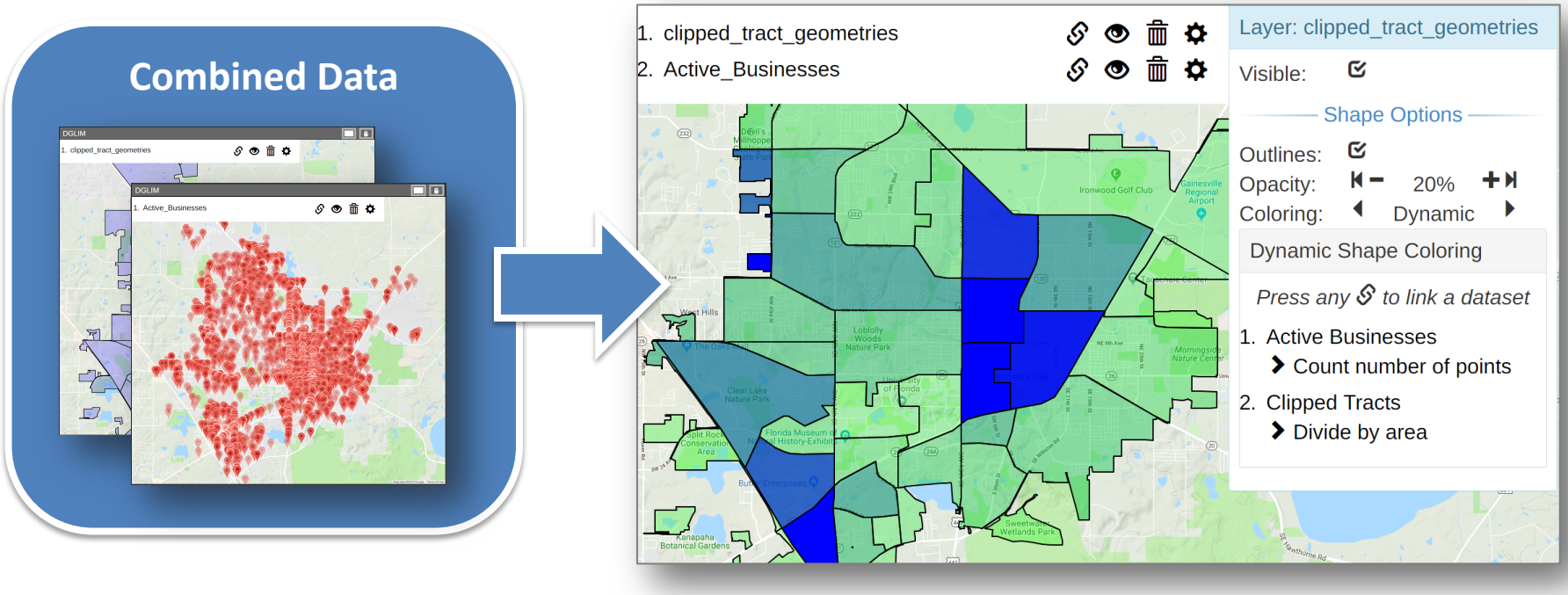
Task 3: Data Relationships



- We use *Turf.js* to relate geographic datasets
  - Shown above: we count the number of points the lie within each shape, then divide by the shape's area
- Relations are used to stylize the *Google Maps* visuals
  - Shown above: point density ranges from low (green) to high (blue)

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Limitations and Challenges

- By design, SAGE2 apps perform all of their computations in the display client; this is **bad** for computationally-intensive tasks and large datasets
  - Computation could be offloaded to a single backend server
- SAGE2 is a young platform and not yet well-suited for complicated user interfaces (e.g. drop-down menus, sliders)
  - We are participating in the testing and development of support for native HTML interaction in SAGE2
- Data parsing is hardcoded
  - Data meanings are only understood when they adhere to a strict set of formatting rules; this could be relaxed using machine learning techniques

Ongoing and future work

- Join datasets by common keys
  - E.g. associate geographic shapes with data that describes them
- Intelligent discovery of the meanings of imported data
  - Geographic coordinates, classifiers identifiers, anecdotes
- Support for live data
  - Link to URLs pointing to online datasets
- Automatic recognition of relationships across datasets
- Filtering of visualized data based on conditions
  - E.g. only show business locations with “type=restaurant”
- Share data files across remote visualization walls
- Use a more powerful backend computation system, such as ArcGIS

For more information, stop by our poster tomorrow or attend our demo on Friday.

Thank you!

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