BOE Sidewalk Monitoring System

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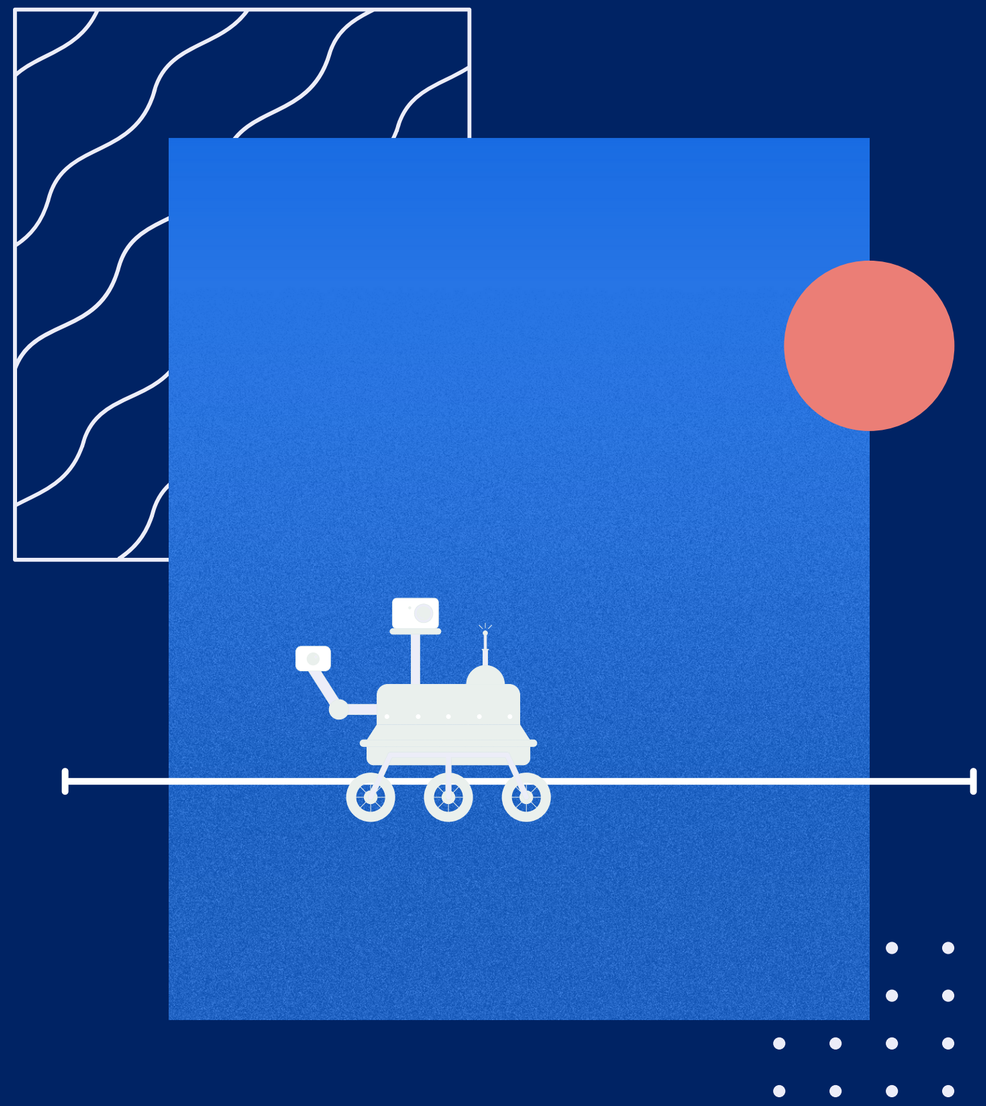
Advisor: Jungsoo (Soo) Lim
Team: Aquil Alam, Alejandro Chanocua, Omar Eclicerio, Ernesto Garcia, Francisco Gastelum, Henry Gonzales, Gui He, Perla Ramirez, Rishi Shah, Daniel Zeng



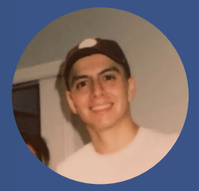
Teams

UI


Perla


Francisco

ROVER UI


Alejandro


Ernesto

DATABASE


Gui

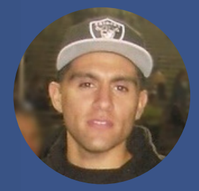

Rishi

DENOISING

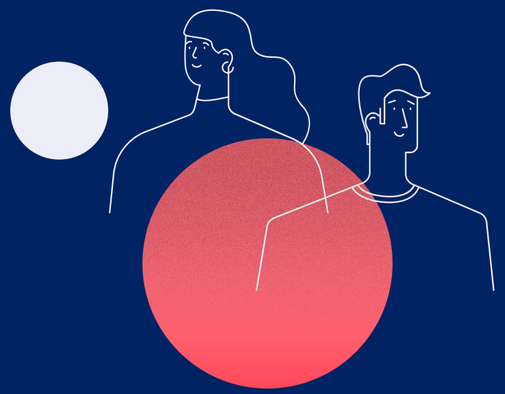

Omar


Daniel

NAV LA


Henry


Aquil



Rover in Action

- Rover is driven by a user with the Rover UI.
- The rover collects data of a sidewalk segment:
  - GPS
  - Slope
  - Time signature
  - Sidewalk ID
- This data is processed/stored by the DB and Denoising team's algorithms to be used as an index for severity of sidewalk segments in Los Angeles.

UI Contribution

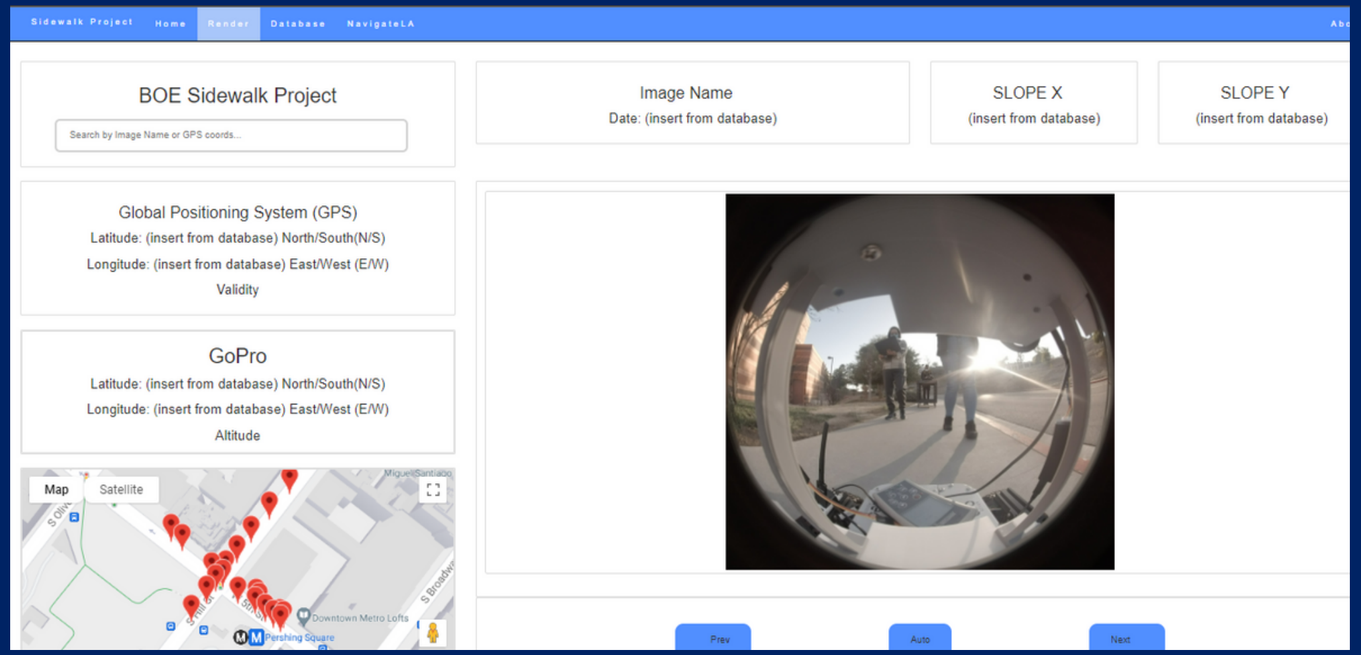
PERLA

- Collected rover data
  - Includes both slope data and GoPro-camera images
- Extracted GoPro image metadata
- Created a csv file for single images
- Main source of communication with the BOE team

FRANCISCO

- Collected rover data with team
- Choose platform to create/update map rover data on web app
- Created algorithms
  - Extract data from Azure Storage Blobs and SQL database

Web App & GoPro Metadata



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UI Future Goals

- Combine all backend with the front-end
- Make the Web App Interactive
- Collect more data

Rover UI Contribution

ALEJANDRO

- Created new version of Rover UI
- Created more modern look
- Temporarily worked with the DB.
- Role as Team Lead

ERNESTO

- Revised Old and Stock UI code to start changing functions.
- Added start/stop/setID buttons
- Moved Joystick to the center.
- Changed the CSS library to Bootflat

Rover UI Future Goals

- Add cruise control functionality.
- Make a smoother and more responsive UI.
- Update existing components of the Rover UI to make them more intuitive for the user.
- Continue working on updating the visual look of the Rover UI.

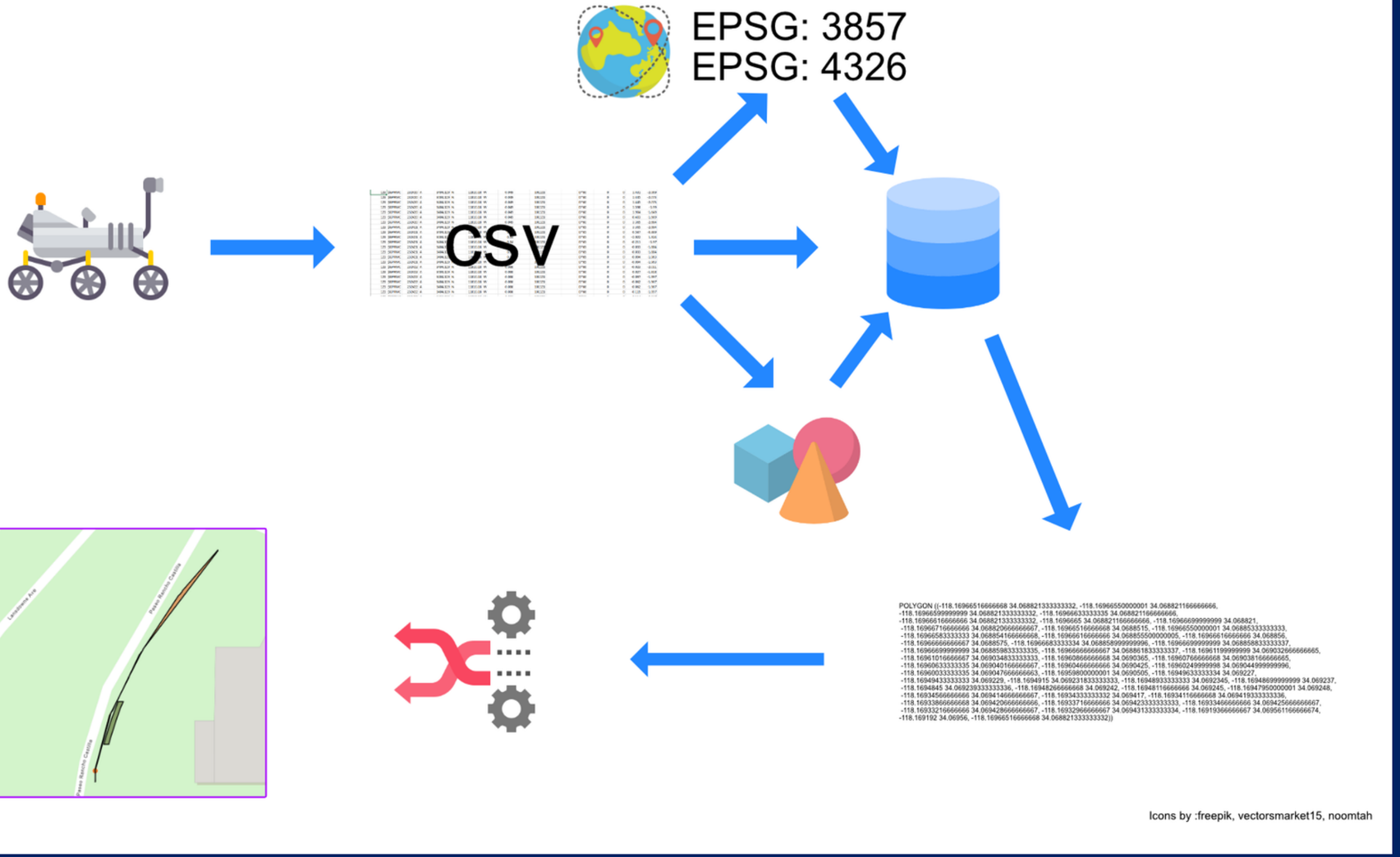
DB/Backend Contribution

RISHI SHAH

- ArcGIS ST_Geometry type
- SQL functions for shapes
- Get GPS data from the polygon
- Collected rover and GoPro images data
- Uploaded data to the database
- Web Mercator and Lat/Lon GPS

GUI HE

- Designed and drafted new tables
- Implemented code to allow:
  - rover data upload
  - multiple GPS spatial references
  - processing of collected GPS data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Icons by :freepik, vectorsmarket15, noomtah

DB/Backend Future Goals

- Develop an algorithm to improve collected GPS accuracy
- Spatial reference for sidewalk data
  - Based on geographic area
  - Store data for future use
- Collect more field data for further testing

Denoising Contribution

OMAR

- Filter out data
  - Kalman Filter
  - Minimum Mean Square Filter
- Tableau for visualizing data
- Python for our code
- Python Libraries
  - Pandas
  - NumPy

DANIEL

- Data cleaning libraries:
  - Missingno, datacleaner, Matplotlib
- Using Pandas with GoPro csv files
- Techniques for data cleaning with Pandas

Denoising Future Goals

- Get more field data to be able to make good comparisons
- Create a good algorithm
- Make reading files more user friendly

Navigate LA Contribution

AQUIL ALAM

- Implemented code to allow rover data to be uploaded to database.
- Processed GoPro data onto ArcGIS.
- ArcGIS setup, python libraries for data integration.
- Collected data on field.
- Researched ArcGIS API for future automation

HENRY GONZALES

- Learn ArcGIS API for Automation
- Create map layers using ArcGIS Pro
- Collected rover data on the field
- Found RTK solution for accurate GPS
- Processed & packaged GPS data for NavigateLA

NavigateLA - Processing

- GPS Module: GPRMC format conversion for map projection.
- Accommodate ArcGIS Pro to create the map layer projections.
- Give names to map layer attributes.

Sample of Data:

Raw Data

E	G
3404.12928	11810.17991
3404.12928	11810.17991
3404.12928	11810.17991
3404.12928	11810.17991
3404.12928	11810.17991
3404.12928	11810.17991
3404.12928	11810.17991
3404.12927	11810.17993
3404.12927	11810.17993
3404.12927	11810.17993

Added Names

Conversion

Degrees, Minutes, Seconds (DMS) Format

Decimal, Degrees (DD) Format

Processed Data

C	D
Converted_Latitude	Converted_Longitude
34.0688213	-118.1696652
34.0688213	-118.1696652
34.0688213	-118.1696652
34.0688213	-118.1696652
34.0688213	-118.1696652
34.0688213	-118.1696652
34.0688213	-118.1696652
34.0688212	-118.1696655
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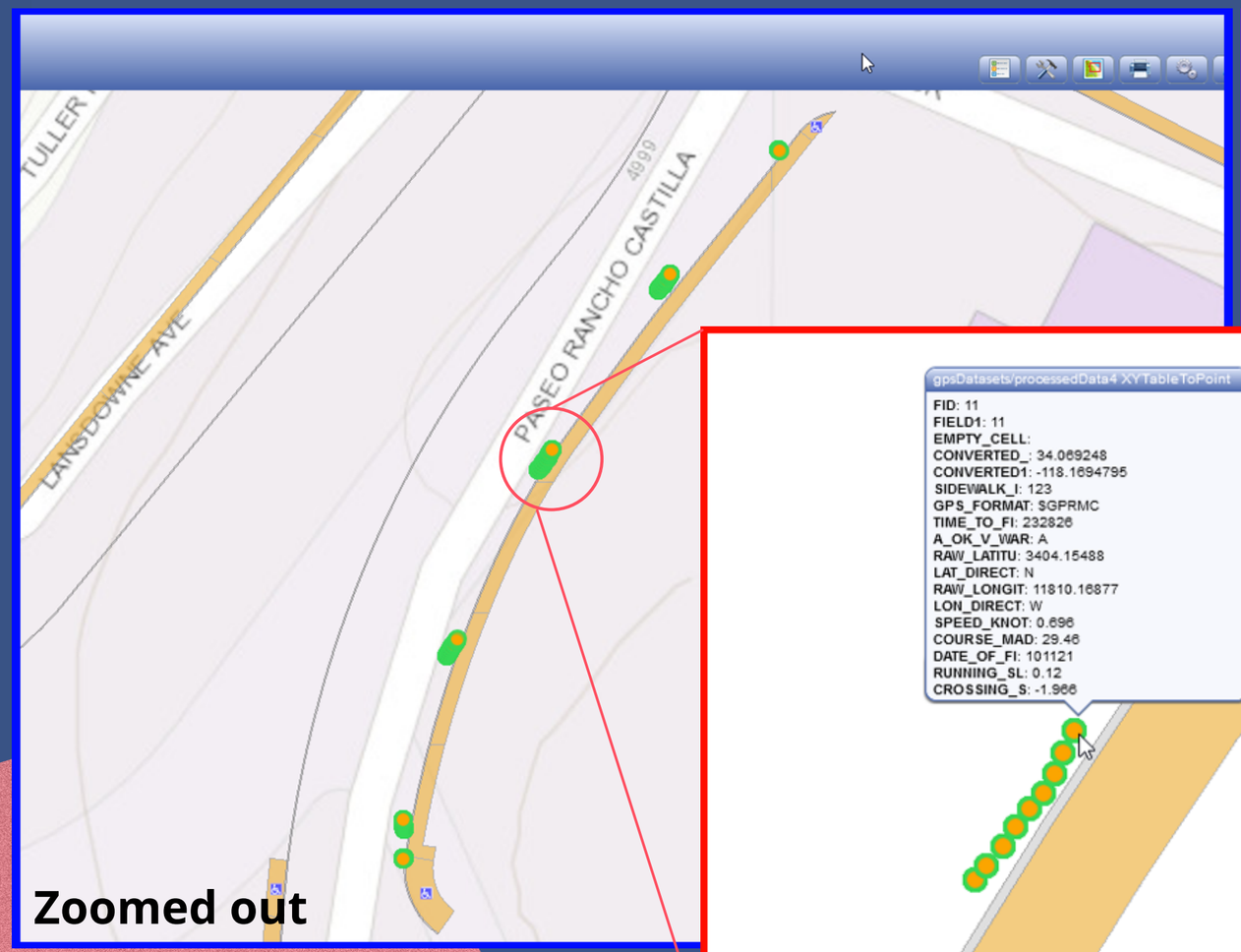
34.0688212	-118.1696655

NavigateLA - Map Layer

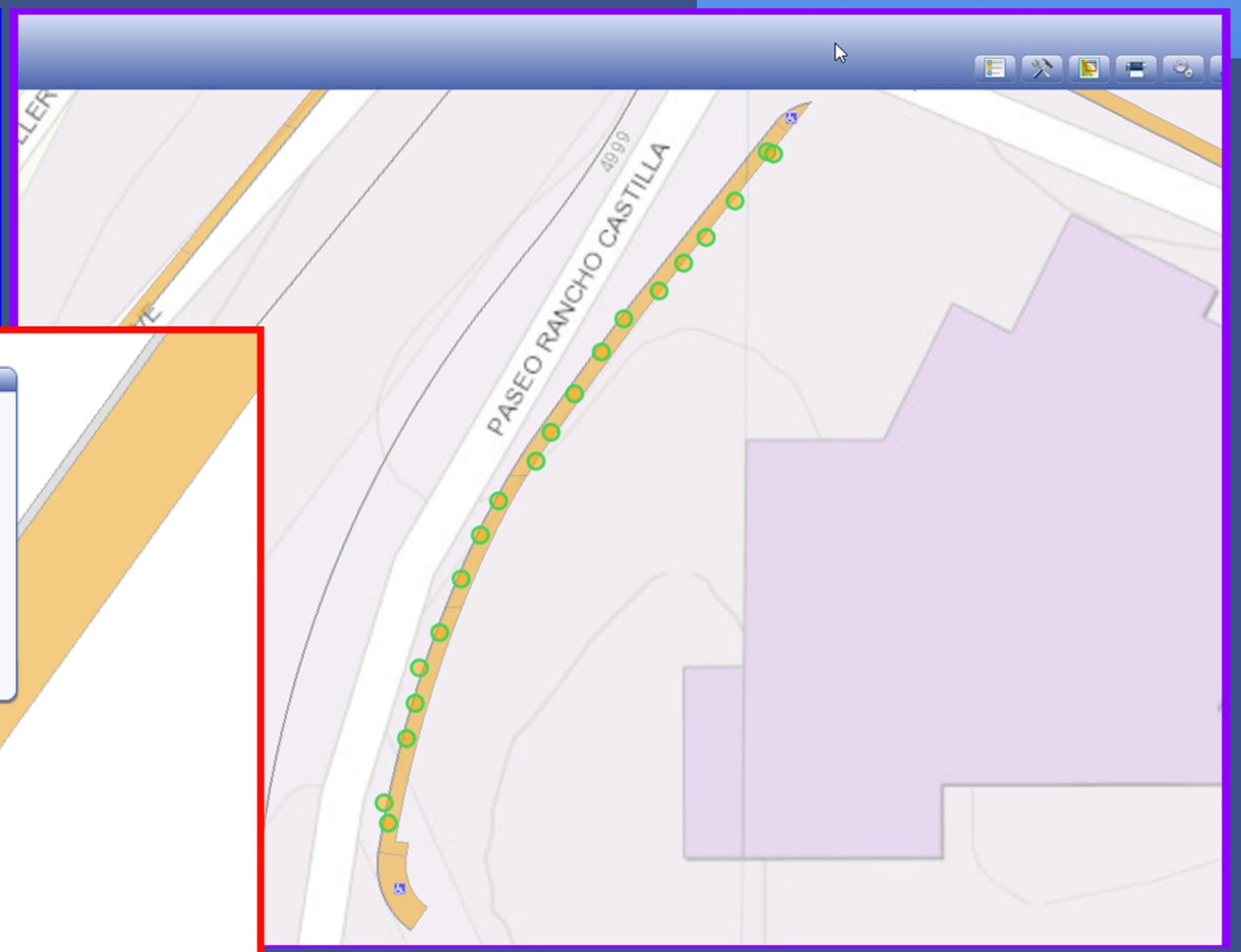
Raspberry Pi GPS data

GoPro camera GPS data . . . .



Zoomed out

Zoomed In



NavigateLA Future Goals

- Correct/Tweak Raspberry Pi data collection to correct data gaps.
- Implement bulk GPS data processing for NavigateLA
- Use ArcGIS Pro & ArcGIS API to automate feature layer creation

Team Goals

- Continue working on partitioned workload.
- Be able to have accurate data that will be used to prioritize segments of sidewalks that have higher severity for repair.