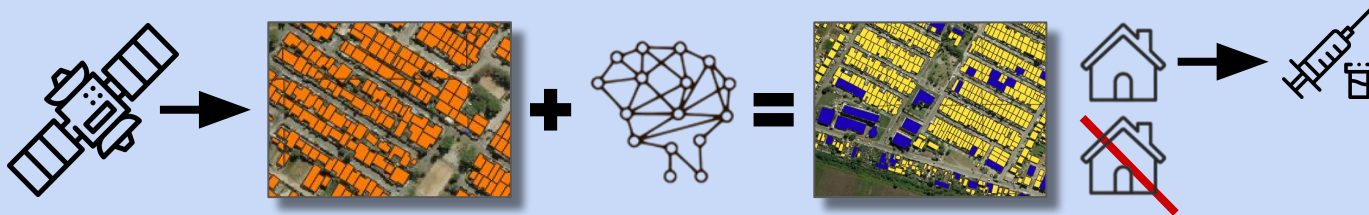




# Sat-Trac

How do we **improve immunisation** rates by **predicting** where vaccines are **needed** the most?

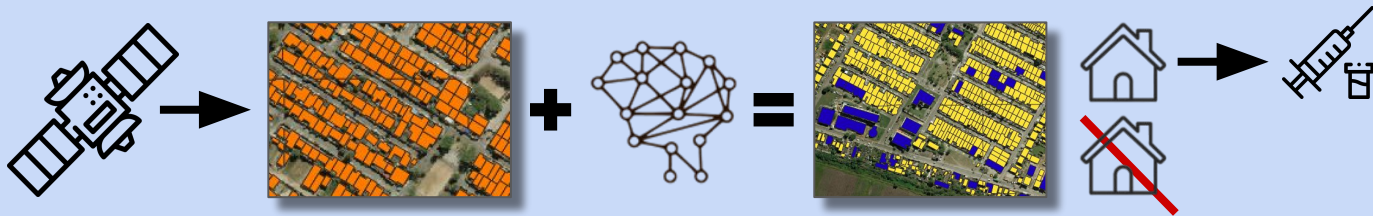


# The Challenge

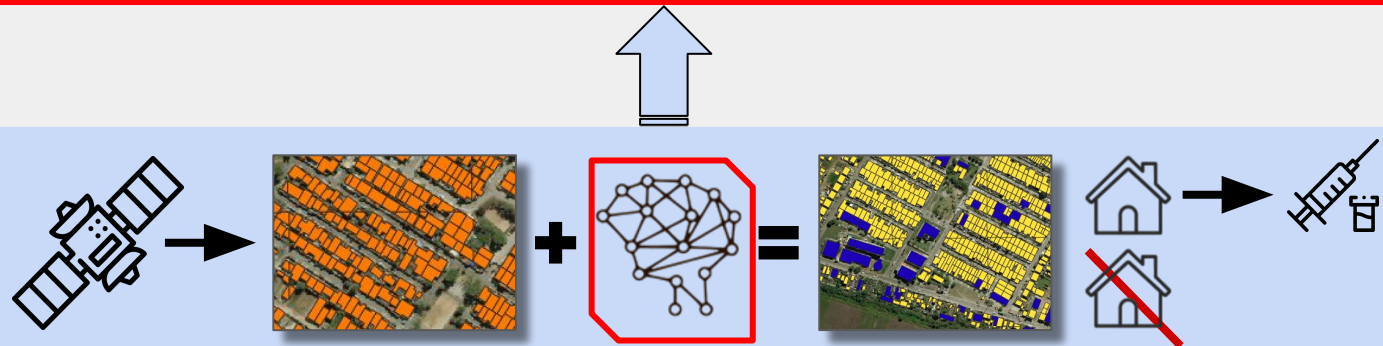
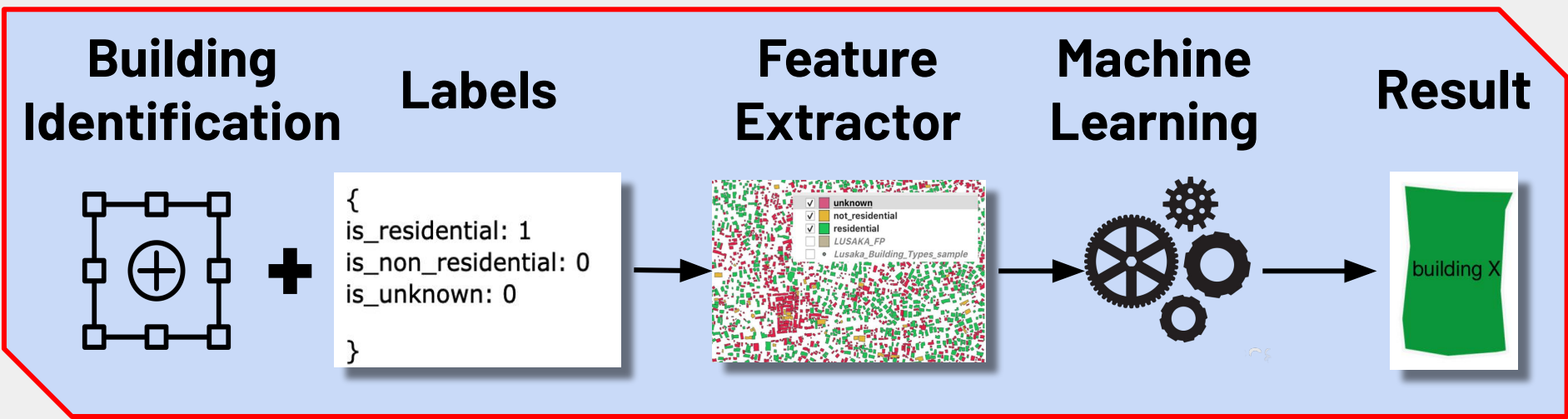


To **improve population estimates** through **automating building classification** by type

- A critical step in achieving immunisation
- Targeting Zambia for development
- Using **open source** software and **available datasets**
- Developing a **tool** that is transferable across applications & regions



# Our Solution



# Tech demo!



# Next Steps



- Data refinement and model improvement
- Volumetric estimations of residential buildings
- Road quality mapping
- Enhanced spatial population prediction
- Enabling the equitable access of infrastructure
- Predicting healthcare facility locations



# Thanks to our Sponsor!



## **WHO GIS group - Advisors**

- Ravi Shankar, Daniel Obare, Adam McKay, Prashant Hedao and team

## **CDC - Satellite image data**

- Brian Kaplan

## **Gates Foundation - Advisors**

- Rhiannan Price, Chris Minkar and Sessie Burns

# Classification with a boosted tree

Features extracted from each individual footprint

- Footprint of the Building (area)
- Number of Neighbors (30 metre radius)
- Average Area of Neighbors (30 metre radius)
- Length of Building
- 'Squareness' (via Convex Hull)

# Business Roadmap



**Funding & Supports**



**Governmental  
healthcare providers**



**Non-Governmental  
Organizations (NGOs)**



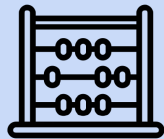
**Service  
provider**



**SAT-TRAC**



**Applications  
(End Users)**



**Population  
Counts**



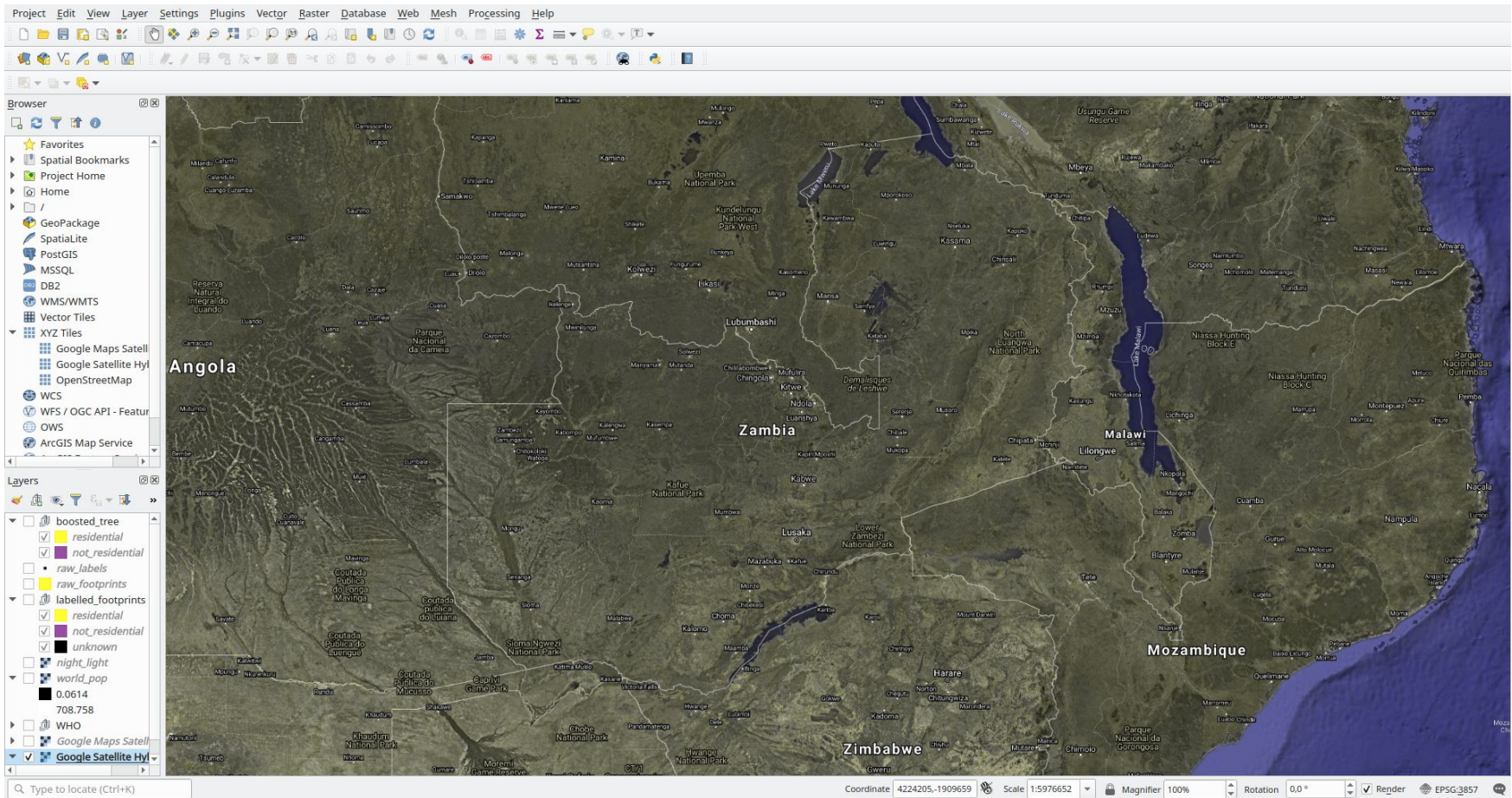
**Vaccine  
Distribution**



**AID Delivery**



# Zambia





# Lusaka



The screenshot displays the QGIS desktop application. The main map area shows a satellite view of Lusaka, Zambia. On the left, the 'Browser' panel lists data sources including Favorites, Spatial Bookmarks, Project Home, Home, /, GeoPackage, Spatialite, PostGIS, MSSQL, DB2, WMS/WMTS, Vector Tiles, XYZ Tiles (Google Maps Satellite, Google Satellite Hy, OpenStreetMap), WCS, WFS / OGC API - Featur, OWS, and ArcGIS Map Service. Below the Browser panel is the 'Layers' panel, which shows a list of layers: boosted\_tree, residential (checked), not\_residential (checked), raw\_labels, raw\_footprints, labelled\_footprints (checked), residential (checked), not\_residential (checked), unknown (checked), night\_light, world\_pop (checked), 0.0614, 708.758, WHO, Google Maps Satell, and Google Satellite Hy. The bottom status bar shows the coordinate 3156689, -1726225, scale 1:186770, magnifier 100%, rotation 0.0°, and render status.



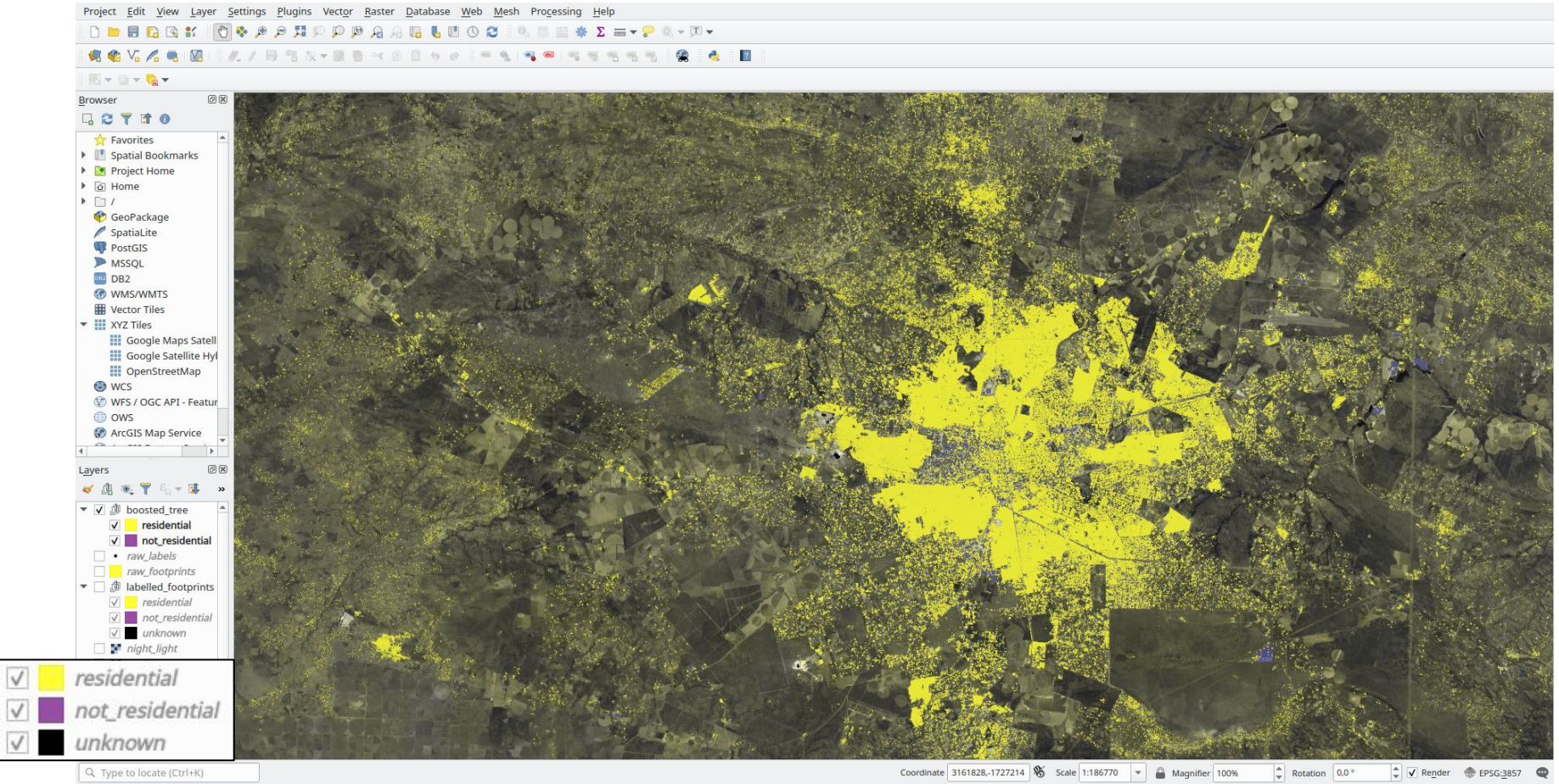
# Lusaka (raw)



The screenshot displays the QGIS desktop environment. The main map area shows a satellite image of Lusaka, Zambia, with a yellow polygon highlighting a specific urban area. The left sidebar contains the 'Browser' and 'Layers' panels. The 'Layers' panel lists several layers, including 'boosted\_tree', 'residential', 'not\_residential', 'raw\_labels', 'raw\_footprints', 'labelled\_footprints', and 'night\_light'. A legend at the bottom left identifies the colors: yellow for 'residential', purple for 'not\_residential', and black for 'unknown'. The top menu bar includes options like Project, Edit, View, Layer, Settings, Plugins, Vector, Raster, Database, Web, Mesh, Processing, and Help. The bottom status bar shows the coordinate (3173540, -1747870), scale (1:186770), magnifier (100%), rotation (0.0°), and render status.



# Lusaka (BDT)





# Lusaka



Project Edit View Layer Settings Plugins Vector Raster Database Web Mesh Processing Help

Browser

- ★ Favorites
- ▶ Spatial Bookmarks
- ▶ Project Home
- ▶ Home
- ▶ /
- ▶ GeoPackage
- ▶ Spatialite
- ▶ PostGIS
- ▶ MSSQL
- ▶ DB2
- ▶ WMS/WMTS
- ▶ Vector Tiles
- ▶ XYZ Tiles
  - Google Maps Satellite
  - Google Satellite Hy
  - OpenStreetMap
- ▶ WCS
- ▶ WFS / OGC API - Featur
- ▶ OWS
- ▶ ArcGIS Map Service

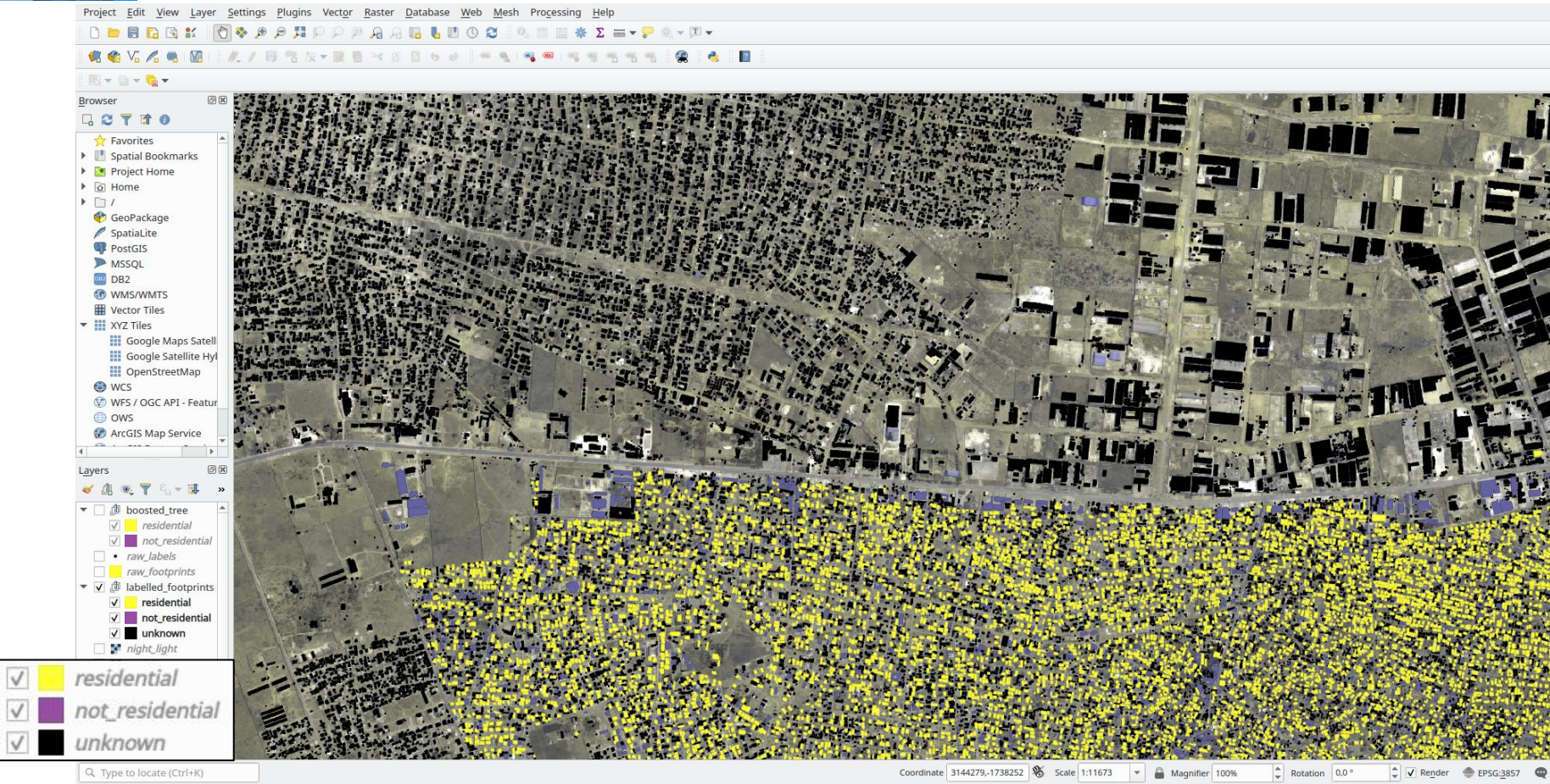
Layers

- ☐ boosted\_tree
- ☒ residential
- ☒ not\_residential
- ☐ raw\_labels
- ☐ raw\_footprints
- ☐ labelled\_footprints
  - ☒ residential
  - ☒ not\_residential
  - ☒ unknown
- ☐ night\_light
- ☐ world\_pop
  - 0.0614
  - 708.758
- ☒ WHO
- ▶ Google Maps Satell
- ▶ Google Satellite Hy

Coordinate 3143170,-1737168 Scale 1:11673 Magnifier 100% Rotation 0,0 ° Render EPSG\_3857



# Lusaka (raw, zoomed)





# Lusaka (BDT, zoomed)



The screenshot displays the QGIS desktop environment. The main canvas shows a satellite image of Lusaka with numerous yellow and blue polygons representing building footprints. The yellow polygons are labeled 'residential' and the blue polygons are labeled 'not\_residential' in the legend. The Browser panel on the left shows a list of data sources, including Google Maps Satellite, Google Satellite HyL, and OpenStreetMap. The Layers panel on the left shows a list of layers, including 'boosted\_tree', 'residential', 'not\_residential', 'raw\_labels', 'raw\_footprints', 'labelled\_footprints', 'residential', 'not\_residential', 'unknown', and 'night\_light'. The legend at the bottom left shows a yellow square for 'residential', a blue square for 'not\_residential', and a black square for 'unknown'. The status bar at the bottom shows the coordinate 3143522, -1737149, a scale of 1:11673, a magnifier of 100%, a rotation of 0.0°, and a render status of EPSG:3857.



# Tech demo!





# Tech demo!



**Truth data  
labels**





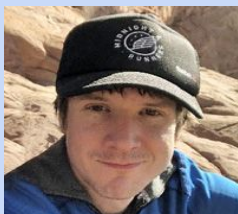
## Unknown

# Thanks for Listening! Questions?



**Chaitanya Tejaswi**

Electronics Engineer



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Machine Learning  
Engineer



**Anastasia Langer**

Senior Analyst



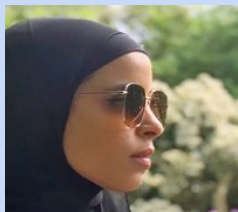
**Branko Popovic**

RF Engineer



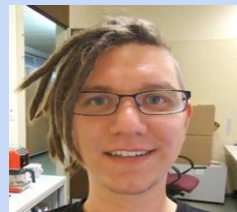
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