

Stage 7: Spatial Visualization Stage

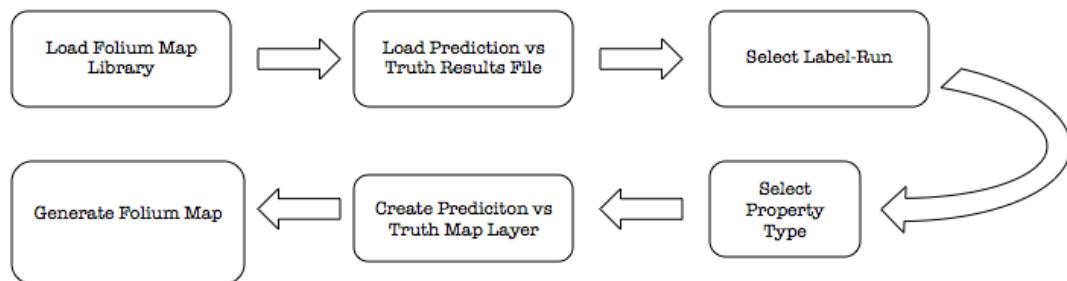


Fig 7.1 – Workflow Overview

7.1 Overview

- Apply Spatial Context to the CNN Classification Results
- Workflow tool for facilitating Ground Truth Verification using Google Street View and Maps functionality
- Exploring interface ideas for a London wide digital property cadaster
- Exploring Novel and Engaging ways of Visualizing the Urban Image Classification data

7.3 Ground Truth vs. Prediction “Bulls Eye” Verification Tool

An Interactive 'Ground Truth vs CNN Prediction' Building Inspection Tool:



A map tool was built to visualize predicted and ground truth labels and for assisting in the anomaly inspection and verification process. Harnessing Google Street View and Maps API is used for geo reference verification and image to building instance matching.

- Red dots identify predictions, and Blue dots identify ground truth.
- Links to the Google Street View were embedded into the Map Plots to allow inspection of geo-references and the visual image of the building instance.

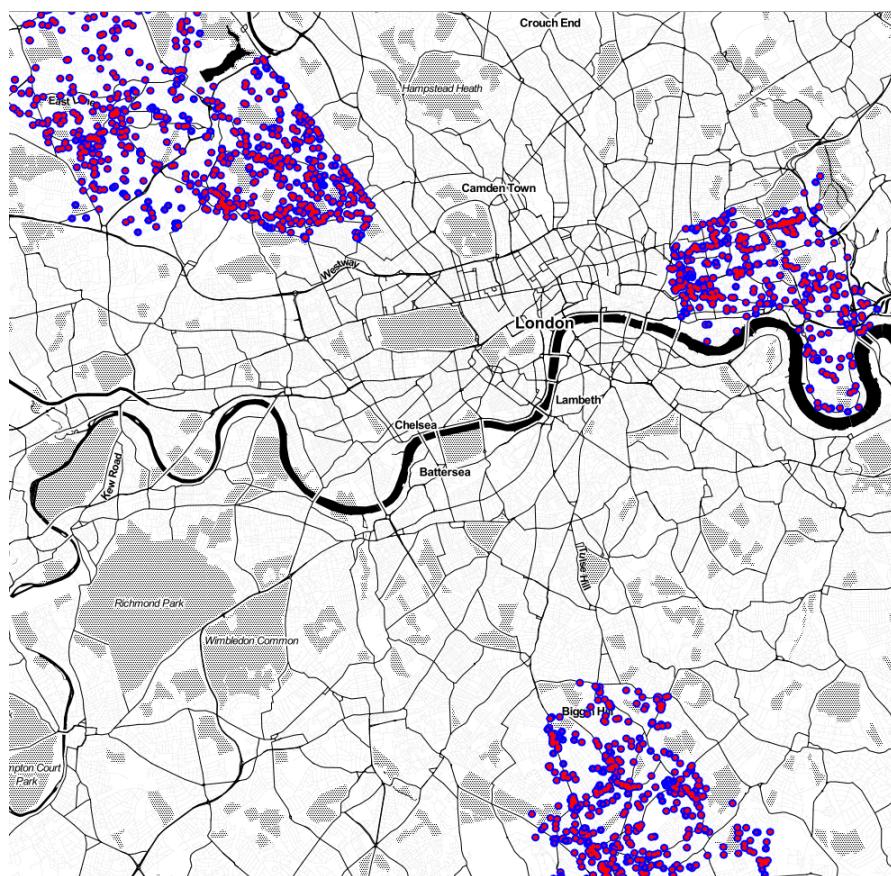


Fig 7.3 – Classification run for Brent, Croydon and Tower Hamlets

Leaflet and OSM

7.2 Folium Maps:

Folium



Python data, leaflet.js maps

`folium` builds on the data wrangling strengths of the Python ecosystem and the mapping strengths of the `leaflet.js` library. Manipulate your data in Python, then visualize it on a Leaflet map via `folium`.

Concepts

`folium` makes it easy to visualize data that's been manipulated in Python on an interactive leaflet map. It enables both the binding of data to a map for choropleth visualizations as well as passing rich vector/raster/HTML visualizations as markers on the map.

The library has a number of built-in tilesets from OpenStreetMap, Mapbox, and Stamen, and supports custom tilesets with Mapbox or Cloudmade API keys. `folium` supports both Image, Video, GeoJSON and TopoJSON overlays.

Fig 7.2 – Flowers Benchmark Accuracy and Loss Curves

Leaflet is designed with *simplicity, performance and usability* in mind. It works efficiently across all major desktop and mobile platforms, can be extended with lots of [plugins](#), has a beautiful, easy to use and [well-documented API](#) and a simple, readable [source code](#) that is a joy to [contribute](#) to.

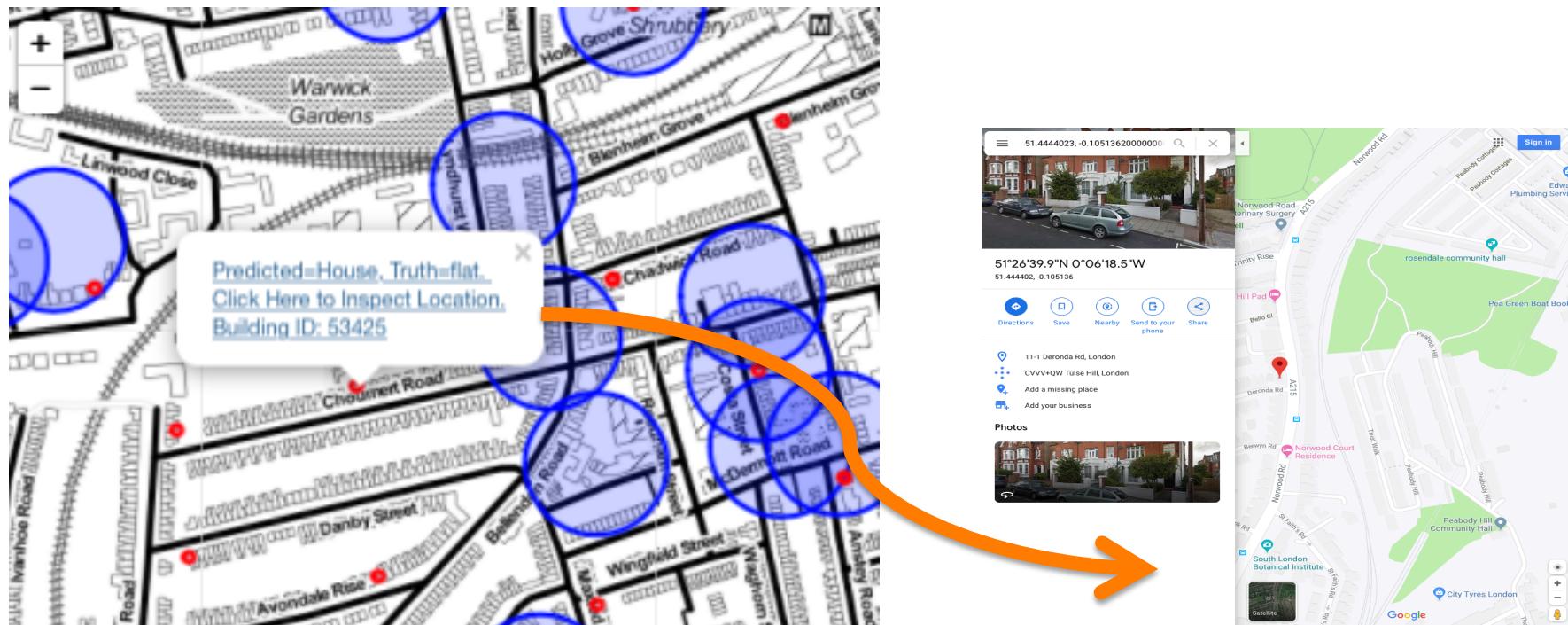


Fig 7.4 – Hover and Click to Inspect Building Location Details with Google Maps API. This enables us to quickly check the validity of our building record by cross referencing its joined geo and LDD data, its physical image and the actual location. This way we can explore and understand the misclassified images returned by the CNN Run.

7.4 Map Gallery

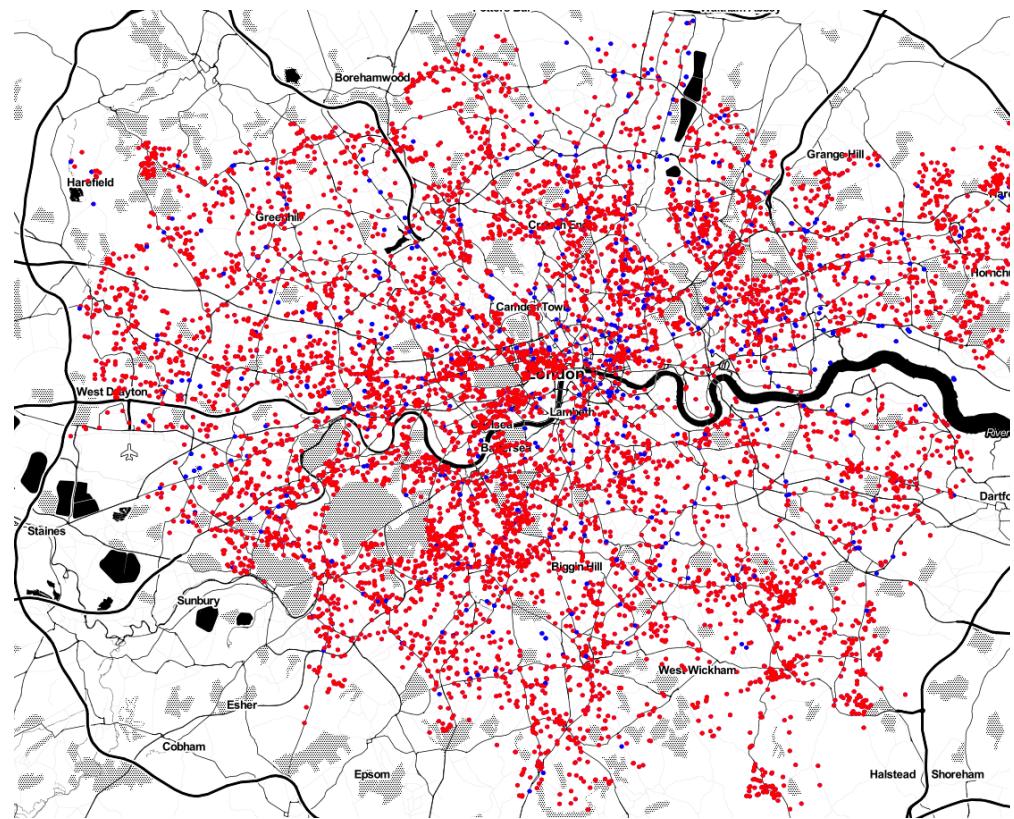
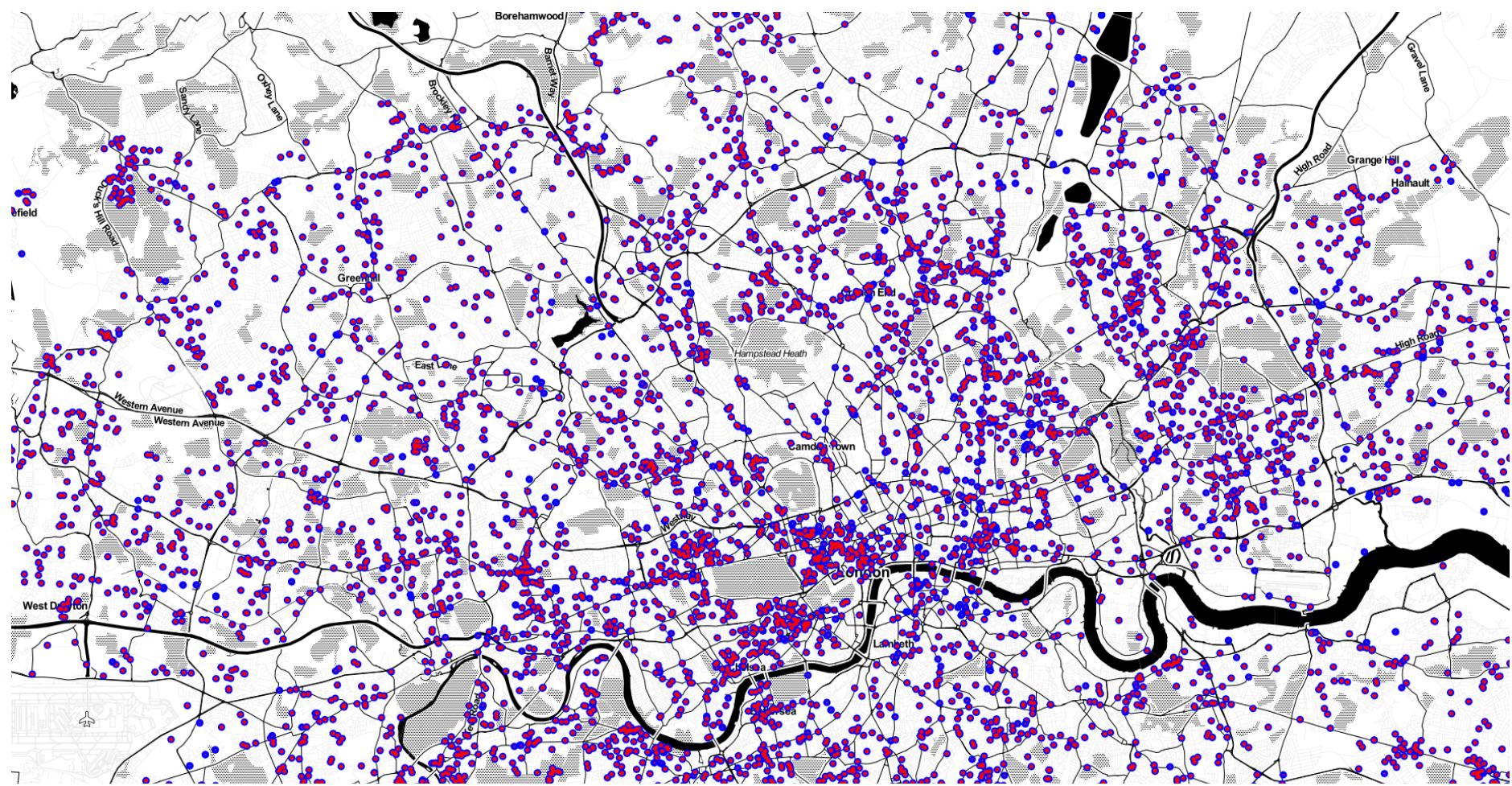


Fig 7.5 – London wide Classification

At this Scale the red dots overwhelm the ground truth markers. But appears more clearly when we drill down. 2 views below are for all property types



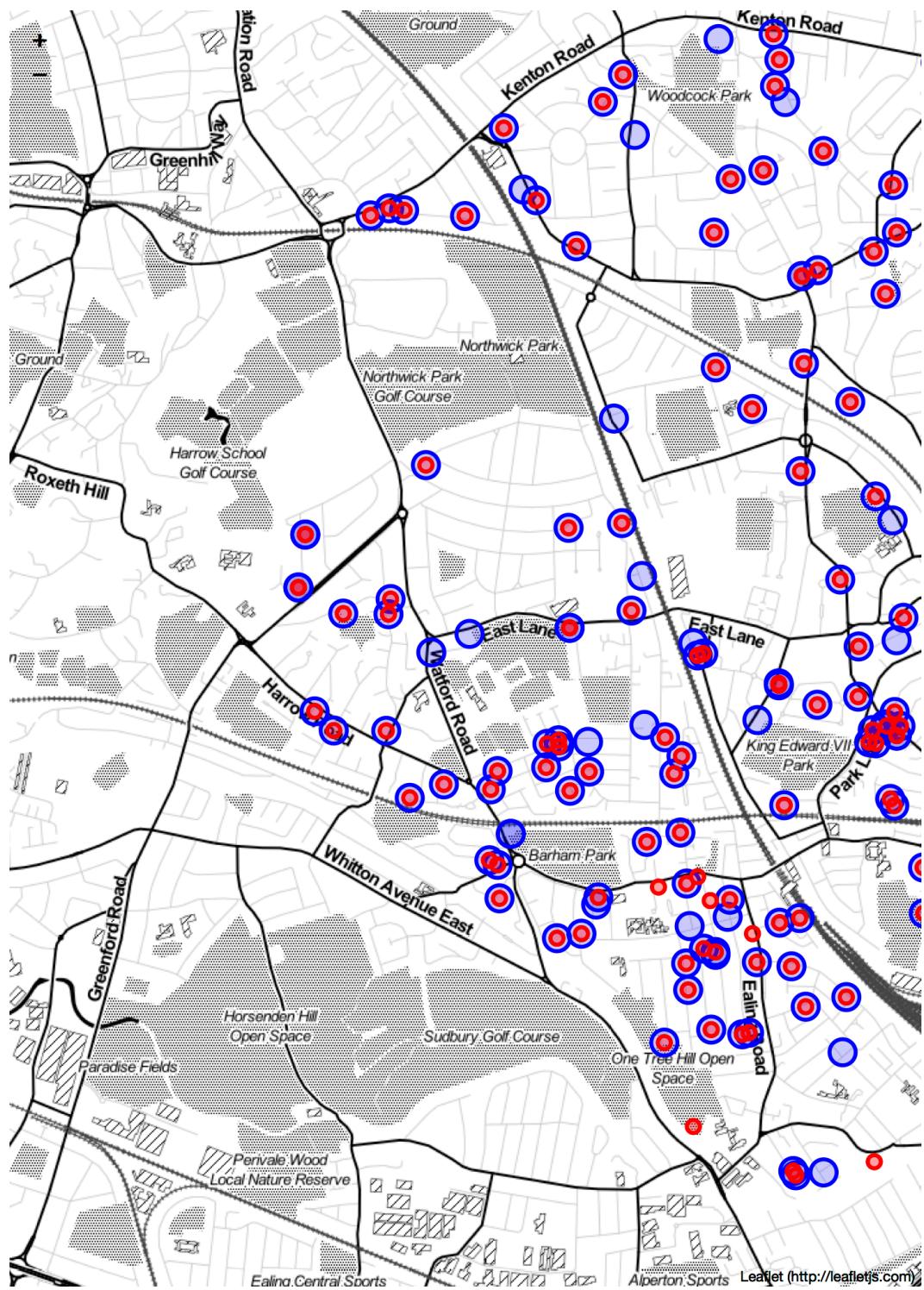


Fig 7.7 – House Type Predictions and Ground Truth for Brent. Here an in several of the other map screenshots we note the lack of building footprint later data available.

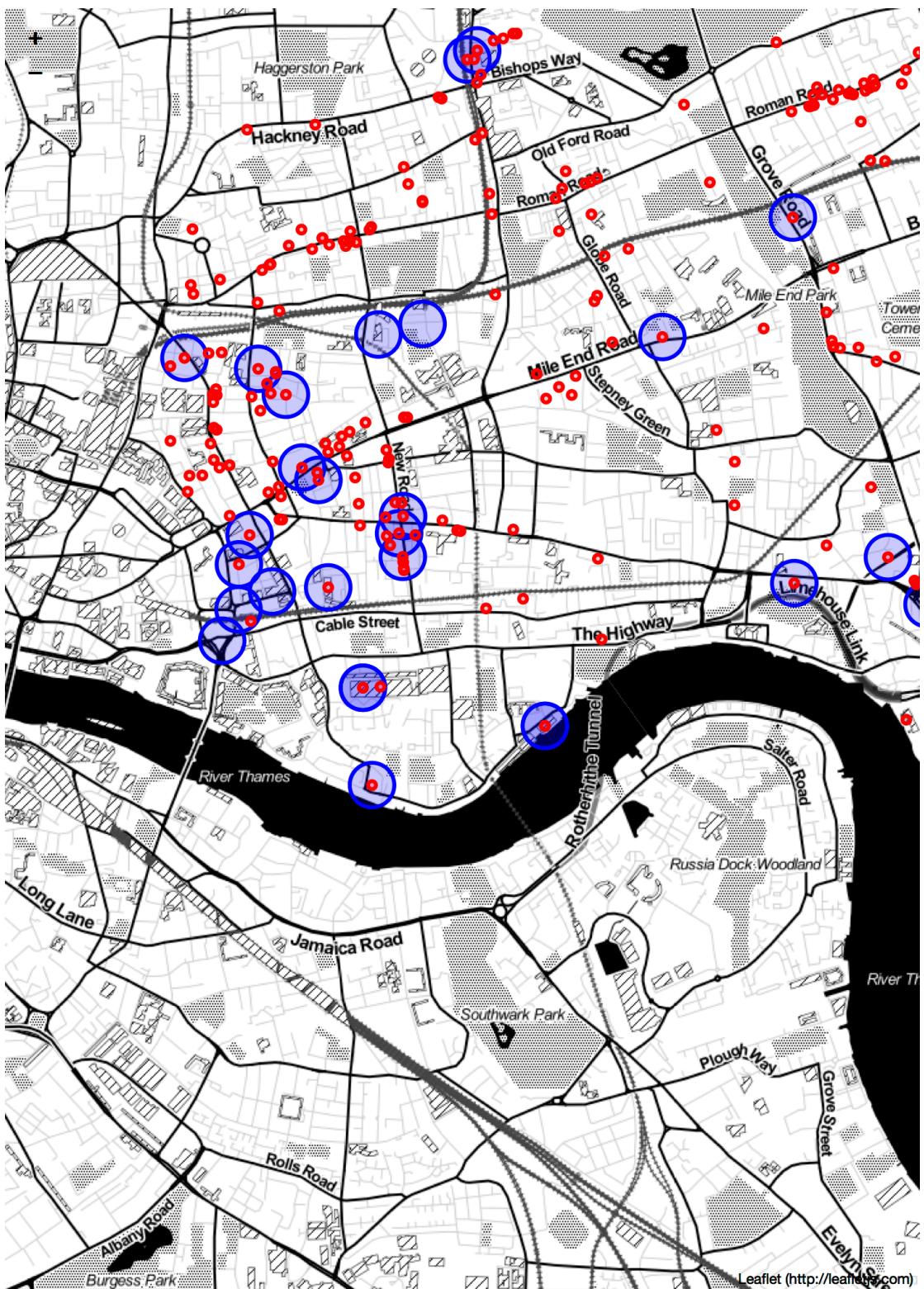


Fig 7.8 – Office Only Predictions and Ground Truth for Tower Hamlets



Fig 7.9 – Retail Only Predictions and Ground Truth for Croydon

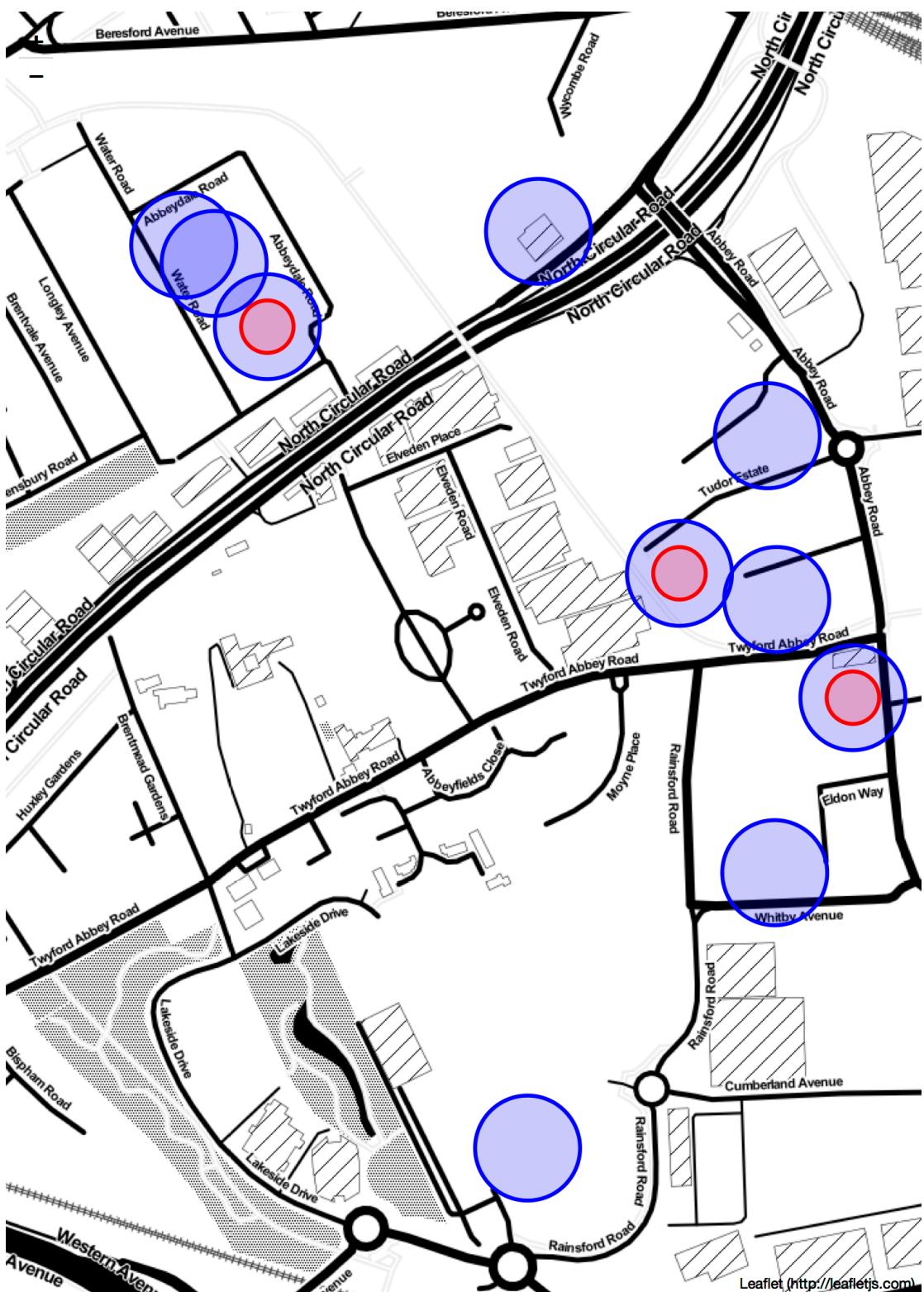


Fig 7.10 – Industrial Only Predictions and Ground Truth