

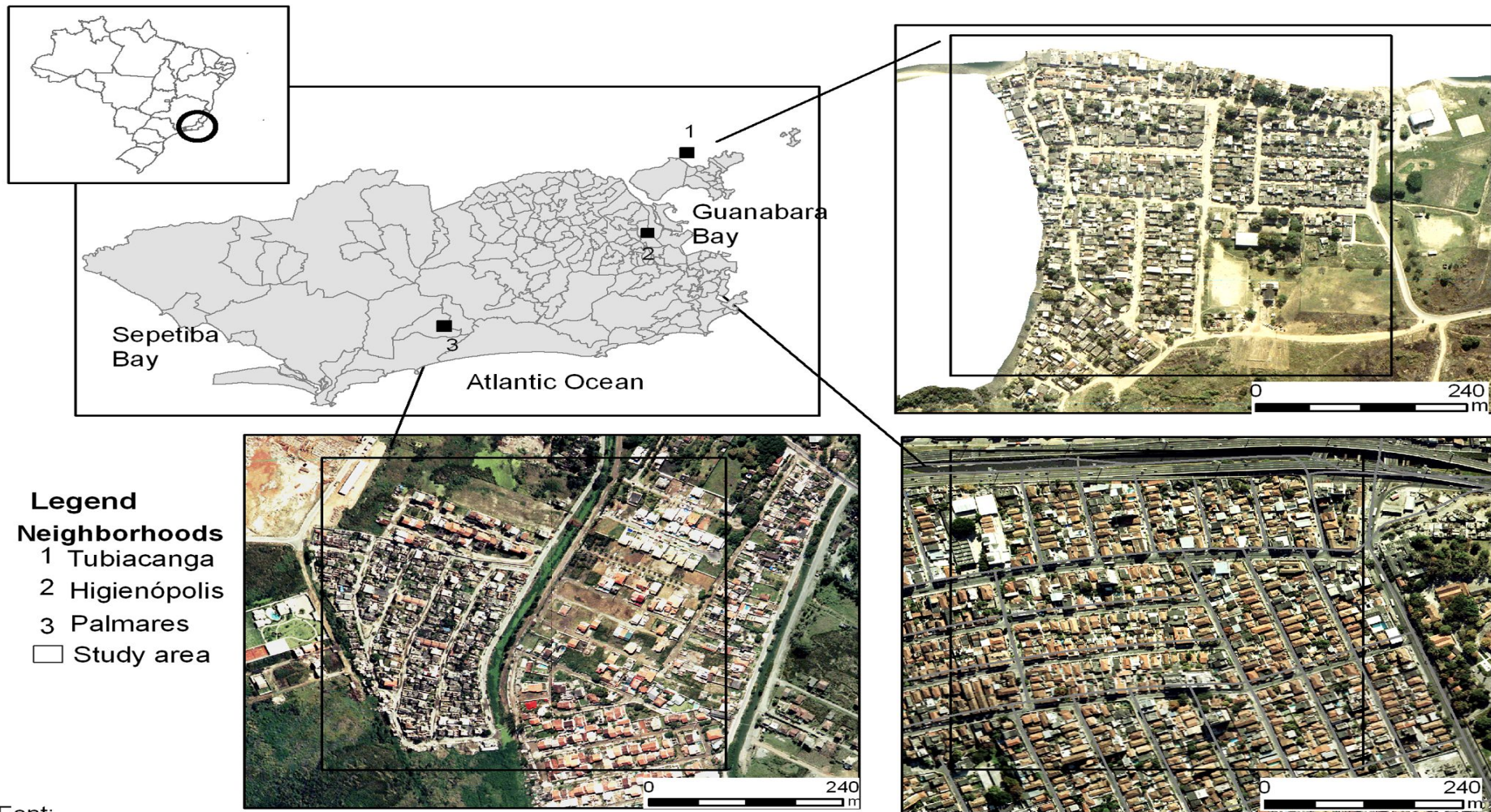
# Slum Identification

Via Real Estate Data and Satellite Imagery

A dark blue diagonal gradient bar that starts from the bottom left and extends towards the top right, covering the lower half of the slide.

# Real Estate Data Acquisition

- Webscrape real estate (RE) listings
  - Selenium / Webdriver for Chrome
- Cities Chennai, Hyderabad, Mumbai, New Delhi, India, and Rio de Janeiro, Brazil



Font:

Ortophoto: PortalGeo - IPP - Rio de Janeiro

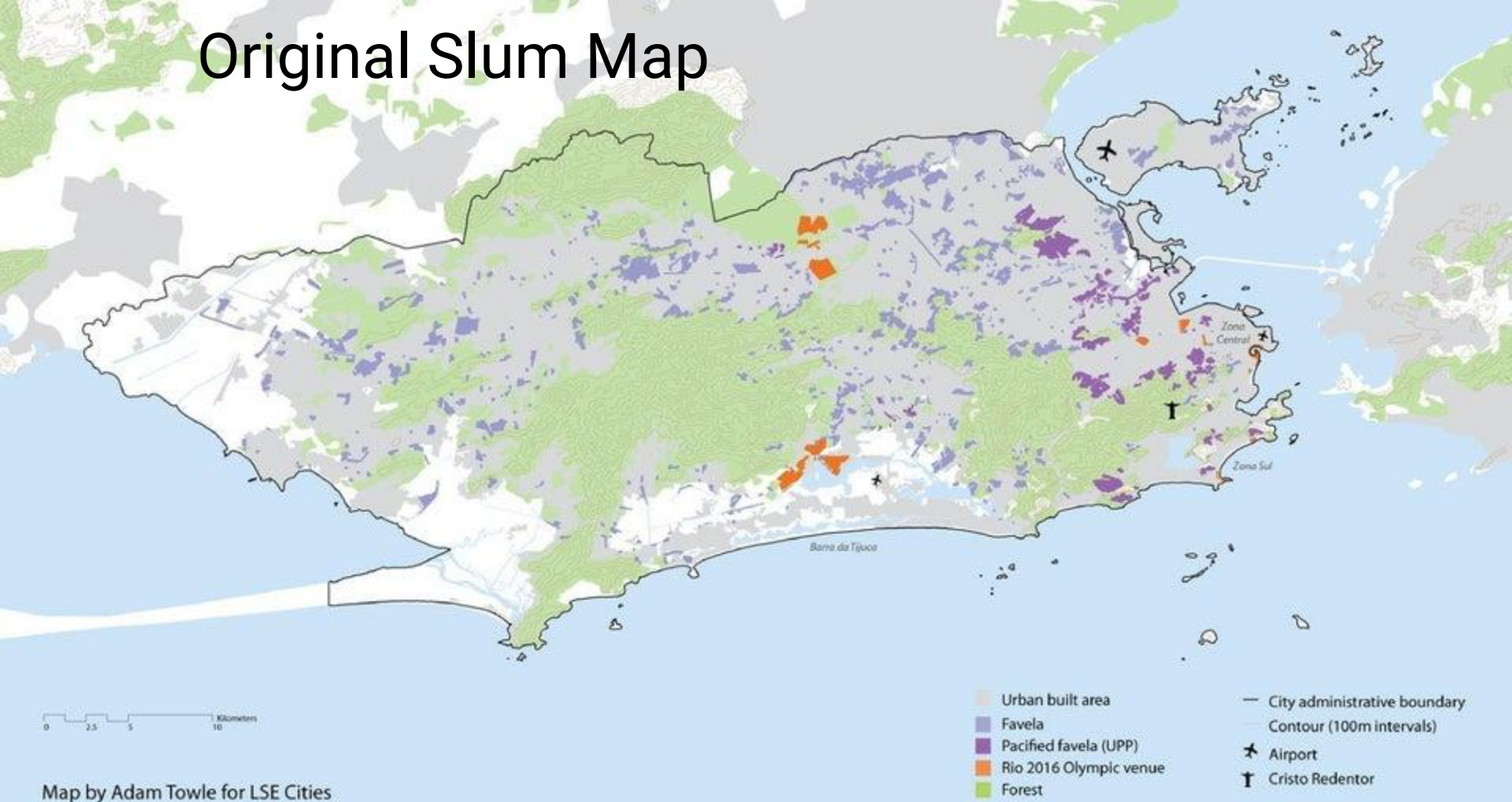
Digital map: Geoprocessing Laboratory - ICICT/ Fiocruz

# Extracting Coordinates from Slum Maps

- Public Slum Maps Don't Have Coordinates
- Reference Points
- Making Grayscale Maps



# Original Slum Map

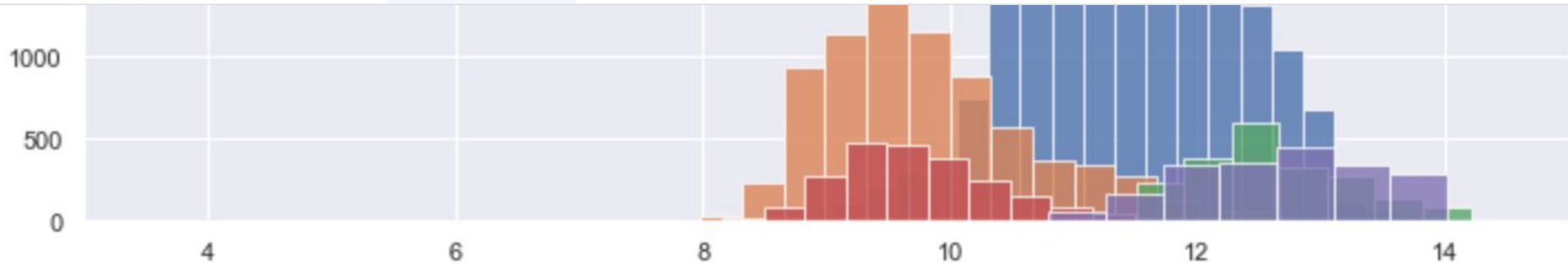


# Grayscale Slum Map



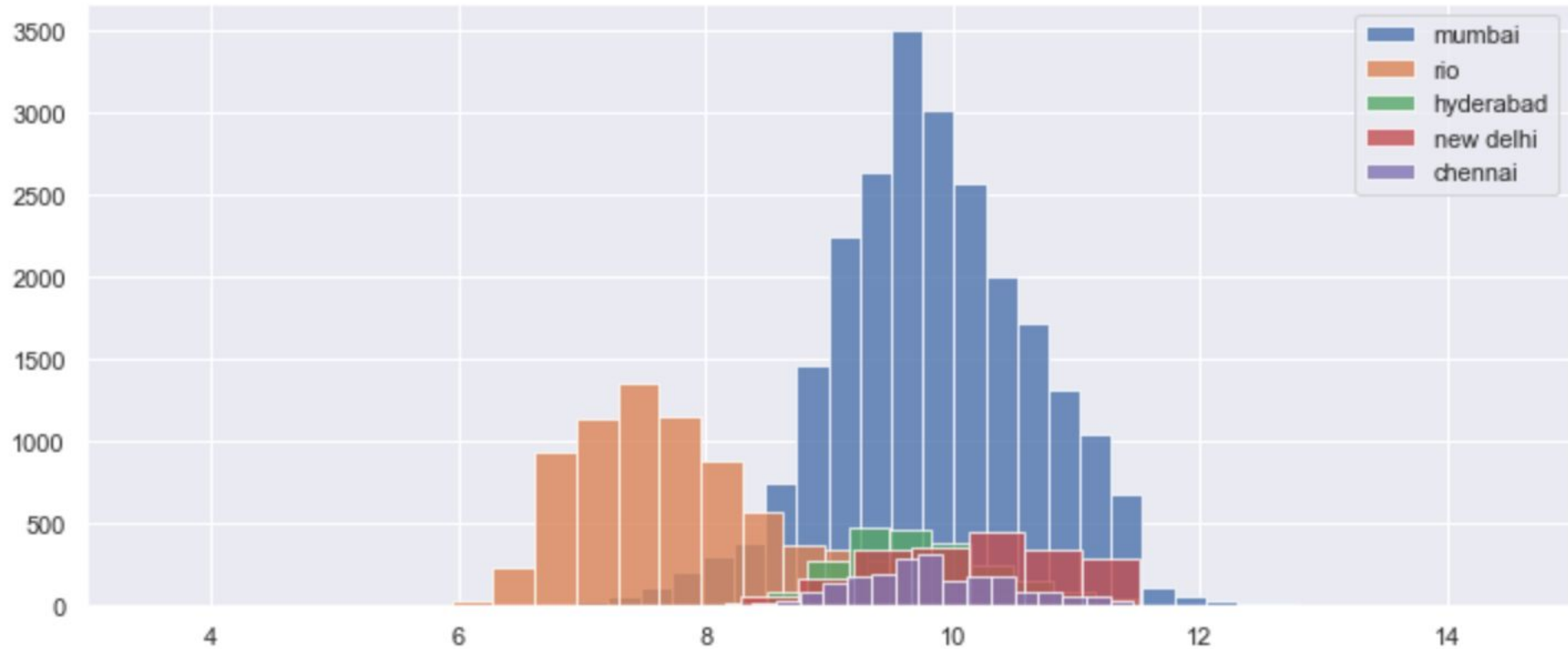
# Real Estate Data Modeling

Rank	City	Cost of Living Index	Rent Index	Cost of Living Plus Rent Index	Groceries Index	Restaurant Price Index	Local Purchasing Power Index
1	Basel, Switzerland	123.16	45.28	85.85	121.76	119.44	120.24
2	Zurich, Switzerland	123.13	60.66	93.20	119.26	121.26	126.95
3	Lausanne, Switzerland	121.79	50.02	87.40	125.41	113.78	105.29
4	Geneva, Switzerland	115.83	66.18	92.04	110.10	115.76	111.82
5	Bern, Switzerland	111.18	40.16	77.15	100.28	109.64	133.46
6	New York, NY, United States	100.00	100.00	100.00	100.00	100.00	100.00
7	Oslo, Norway	96.21	41.79	70.14	84.22	105.11	86.42
8	Reykjavik, Iceland	96.06	47.64	72.86	80.37	114.82	78.93
9	Stavanger, Norway	95.40	33.89	65.93	84.42	103.43	86.93
10	Bergen, Norway	94.27	33.02	64.92	82.24	102.81	94.02



# Real Estate Data Modeling

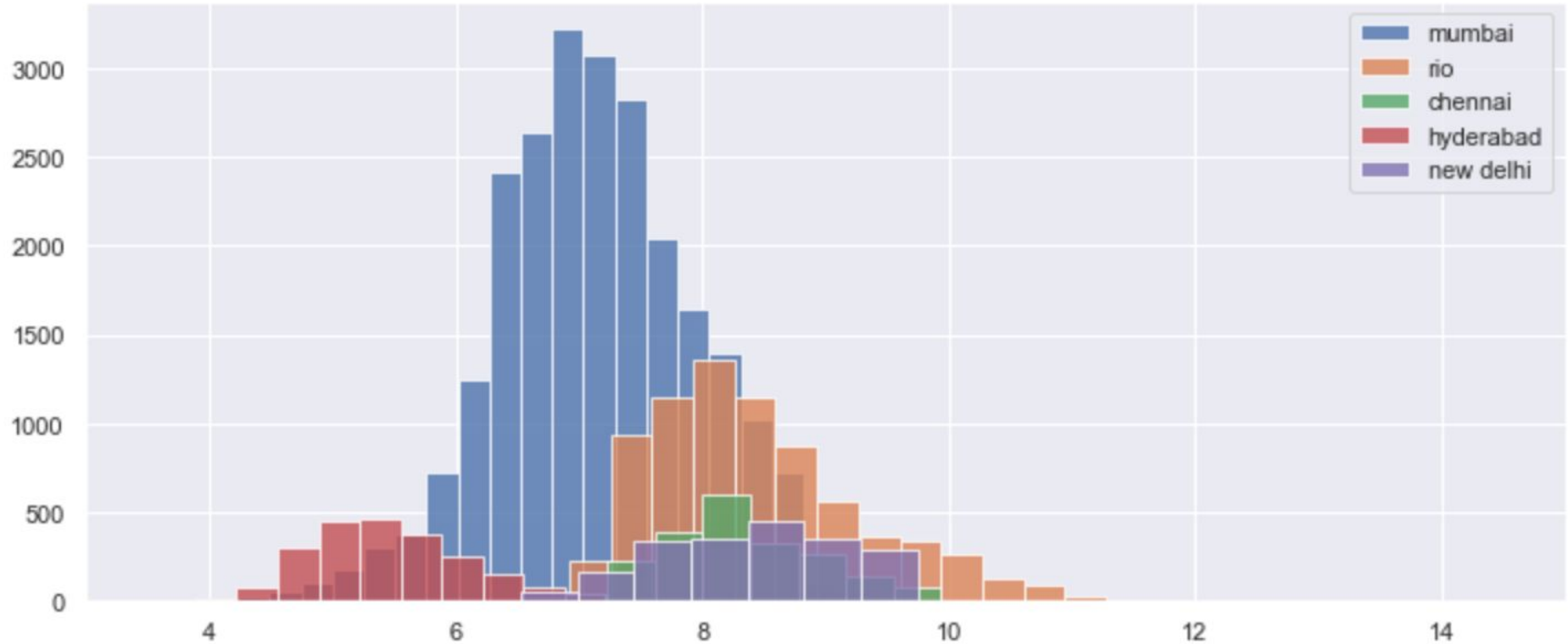
$100 / \{\text{City Rent Index}\} * [\text{prices}]$

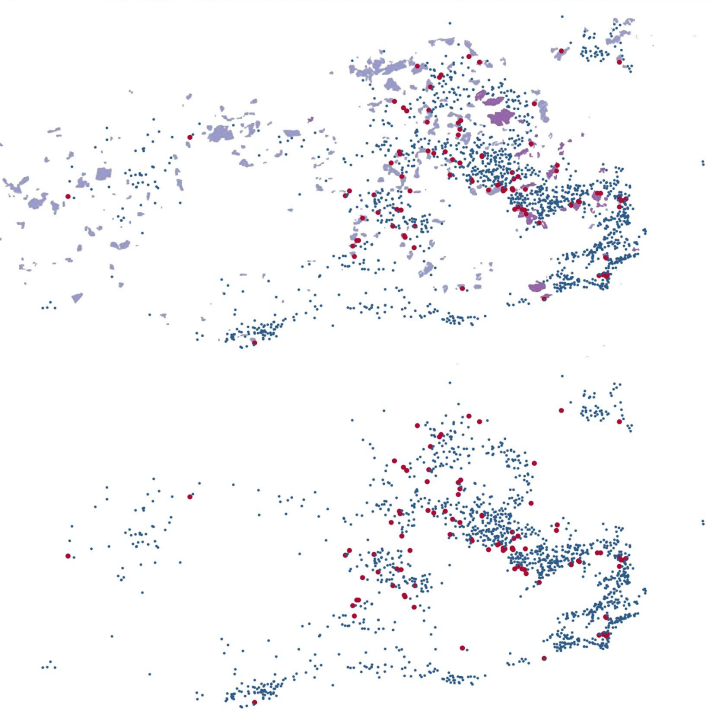
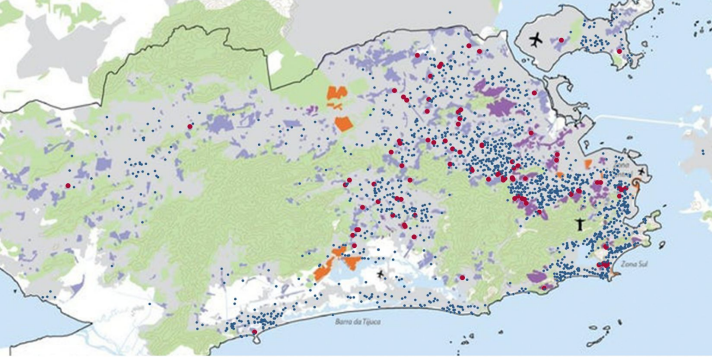




# Real Estate Data Modeling

cc = CurrencyConverter

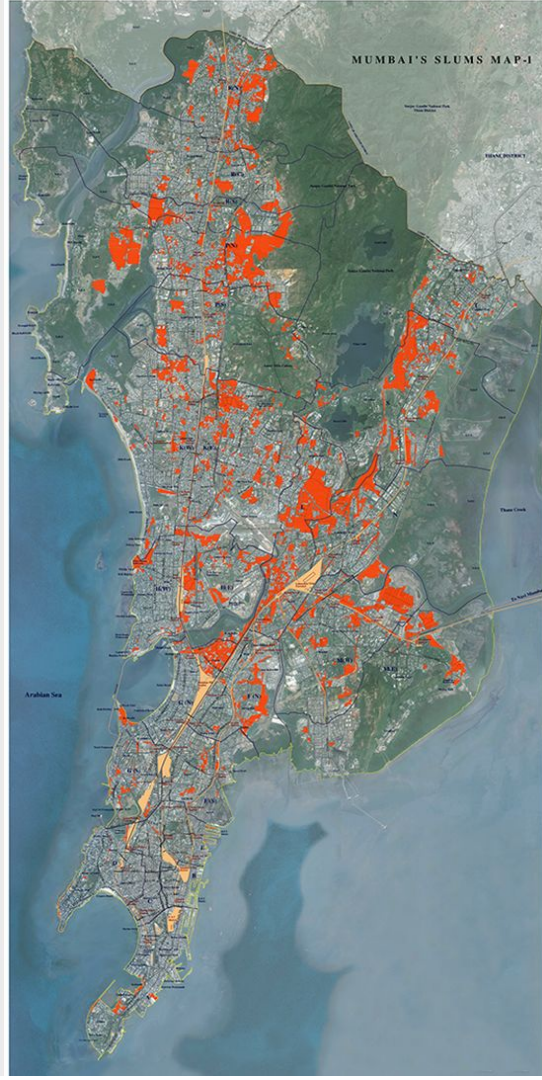
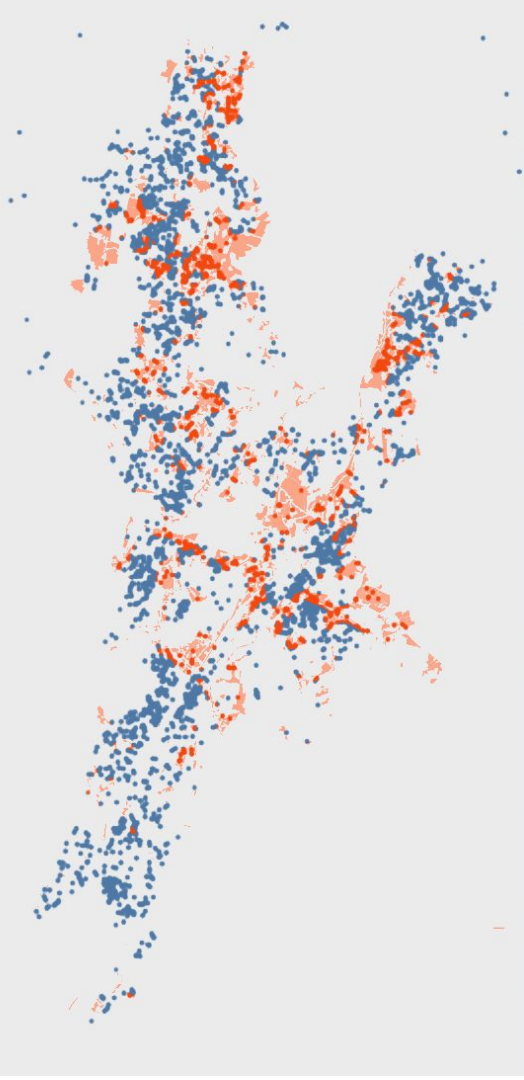
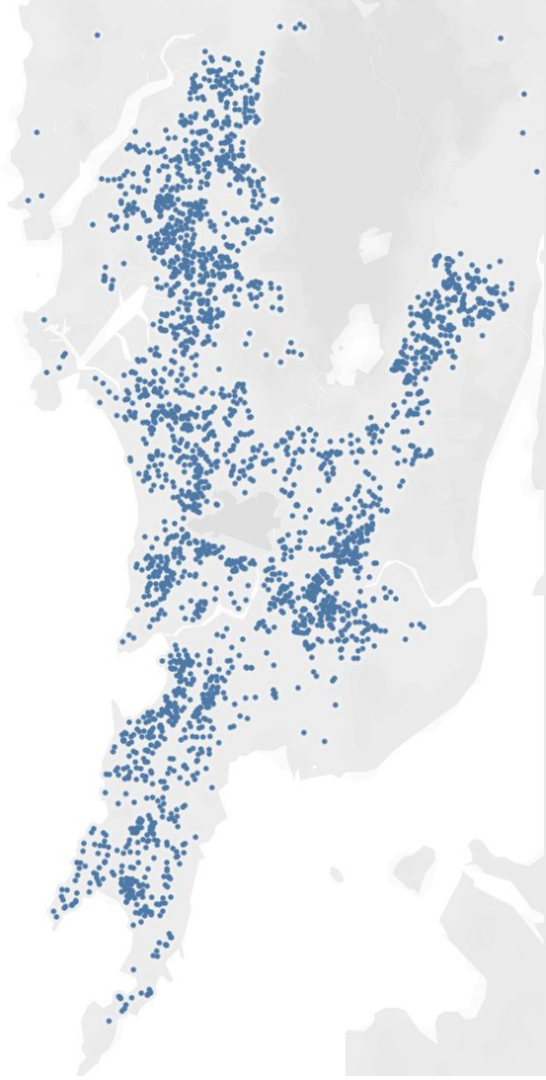




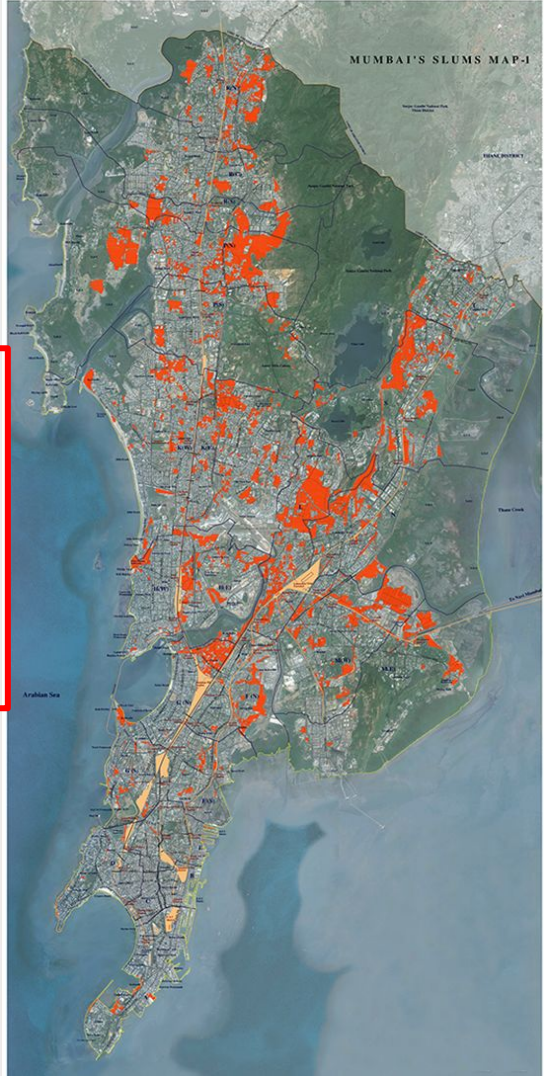
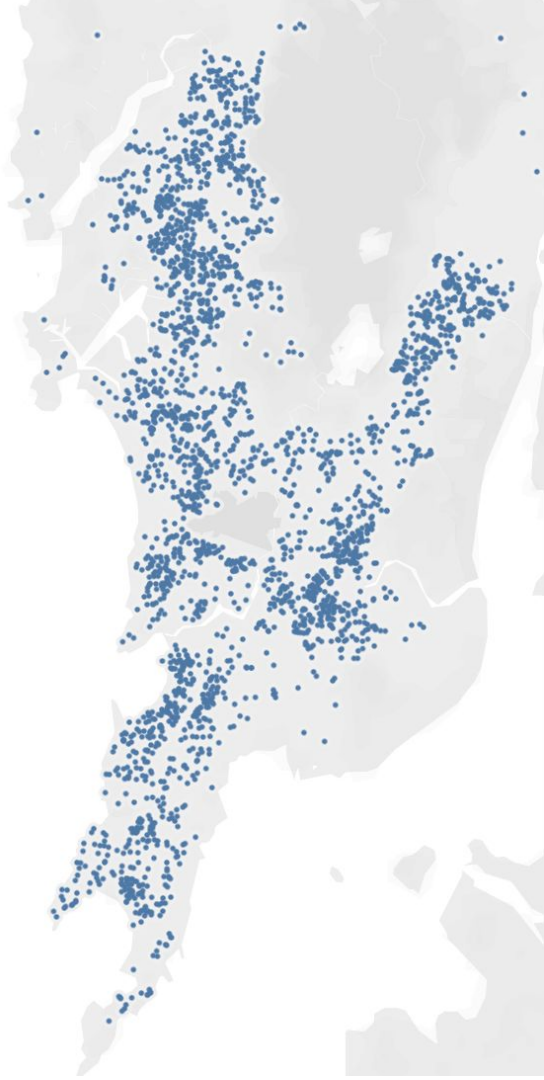
## X-City Testing

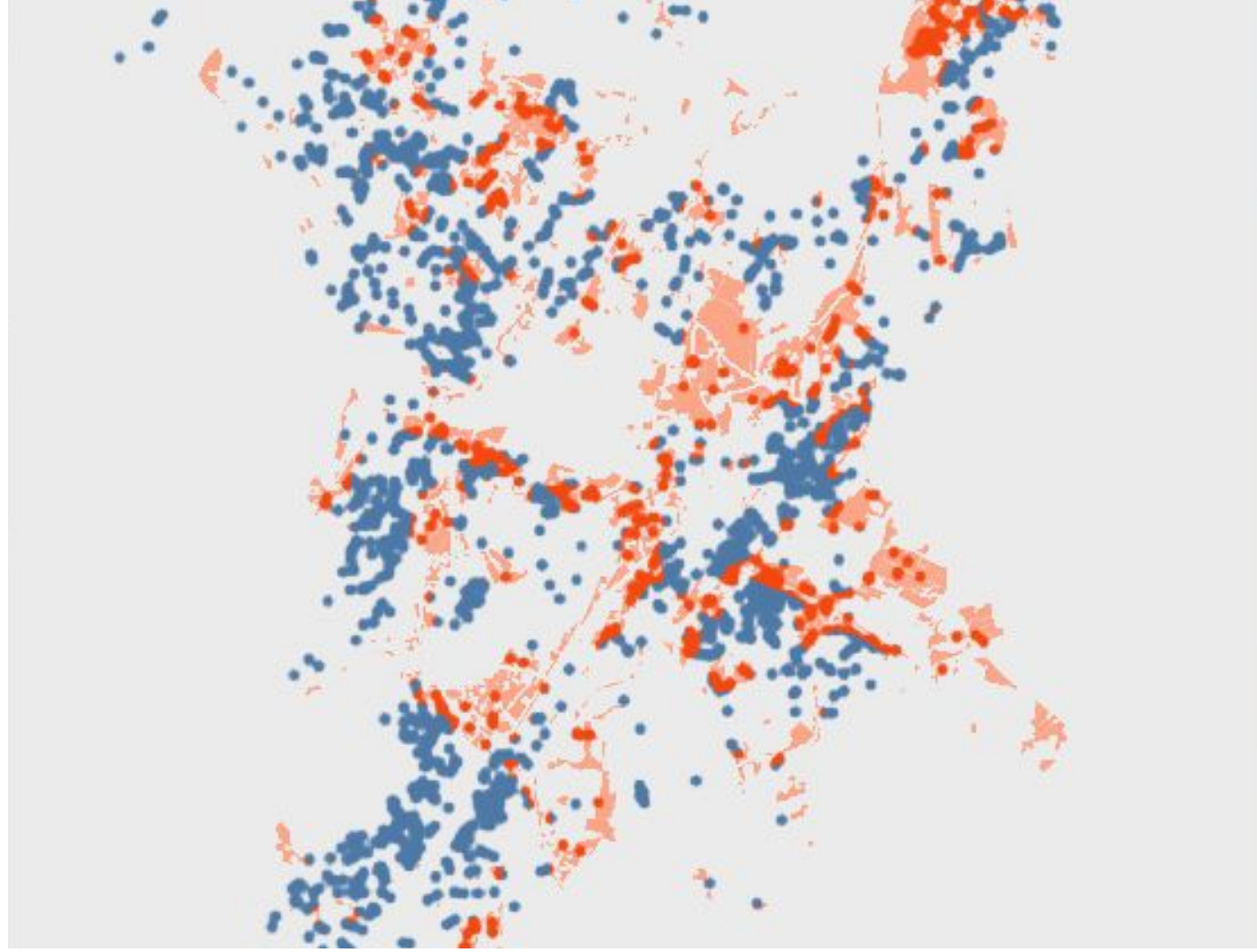
```
Test on rio: 0.5058  
Test on mumbai: 0.5095  
Test on hyderabad: 0.4721  
Test on chennai: 0.4777  
Test on delhi: 0.5115
```

- The definition of a “Slum Area” varies between cities
- Real Estate data features vary between websites
- Slum Areas are consistently under-represented in real estate data
  - Clustering “empty space” ...











# Satellite Imagery Acquisition

- No Free High Res API
- Google Earth Screenshots

# Example Non Slum





# Example Slum



# Satellite Imagery Classification

- Scale and Split
- MobileNetV2

# Conclusion

- Slums are identifiable from real estate data within a city using our models, but those models don't generalize to other cities.
- Slums can be Identified from satellite imagery

# Next Steps

- Try Classifying Slums in other cities with satellite imagery
- Look at other sources of data for slum identification



# Sources

## Chennai Slum Map

[http://censusindia.gov.in/maps/Town\\_maps/chennai\\_mun\\_cor\\_per\\_slum\\_pop.aspx](http://censusindia.gov.in/maps/Town_maps/chennai_mun_cor_per_slum_pop.aspx)

## Delhi Slum Map

[https://www.researchgate.net/publication/281845188\\_Financing\\_Cities\\_of\\_the\\_Future\\_Tools\\_to\\_Scale-up\\_Clean\\_Urban\\_Development](https://www.researchgate.net/publication/281845188_Financing_Cities_of_the_Future_Tools_to_Scale-up_Clean_Urban_Development)

## Hyderabad Slum Map

<https://notanatlas.org/maps/a-civic-mapping-project-in-an-indian-megacity/>

## Mumbai Slum Map

<http://www.pkdas.com/maps/3-Mumbai's-Slums-Map.pdf>

## Rio Slum Map

[https://citygeographics.files.wordpress.com/2013/11/rio\\_landuse\\_v2\\_simplified.png](https://citygeographics.files.wordpress.com/2013/11/rio_landuse_v2_simplified.png)

# Cont.

UN Definition of Slum

<https://www.un.org/ruleoflaw/files/Challenge%20of%20Slums.pdf>