Automatic Classification of Building Function from OSM

M. Minghini[1], C. Fonte[2,3], V. Antoniou[4], J. Patriarca[2], L. See[5]

[1]Department of Civil and Environmental Engineering, Politecnico di Milano, Milan, Italy - marco.minghini@polimi.it

[2]University of Coimbra, Coimbra, Portugal - cfonte@mat.uc.pt
[3] Institute for Systems Engineering and Computers at Coimbra, Portugal
[4] Geographic Directorate, Hellenic Army General Staff, Athens, Greece
[5] International Institute for Applied Systems Analysis, Laxenburg, Austria

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Aim

- Produce a dataset on building function using available Volunteered Geographic Information (VGI):
  - OSM
    - Buildings
    - POIs
  - Facebook POIs
  - Foursquare POIs
- Useful for different applications
  - determination of energy demand
  - evaluation of contributions to greenhouse gas emissions
  - inputs to urban climate and energy balance modelling
  - …
- The approach was applied to Milan city centre

Classes used for building function

- Residential
- Commercial
- Industrial
- Educational
- Healthcare
- Cultural
- Entertainment
- Religious
- Accommodation

- Safety authorities
- Agricultural
- Civic amenities/ government offices
- Transportation
- Non-governmental/ non-profit
- Military

Case study: Milan

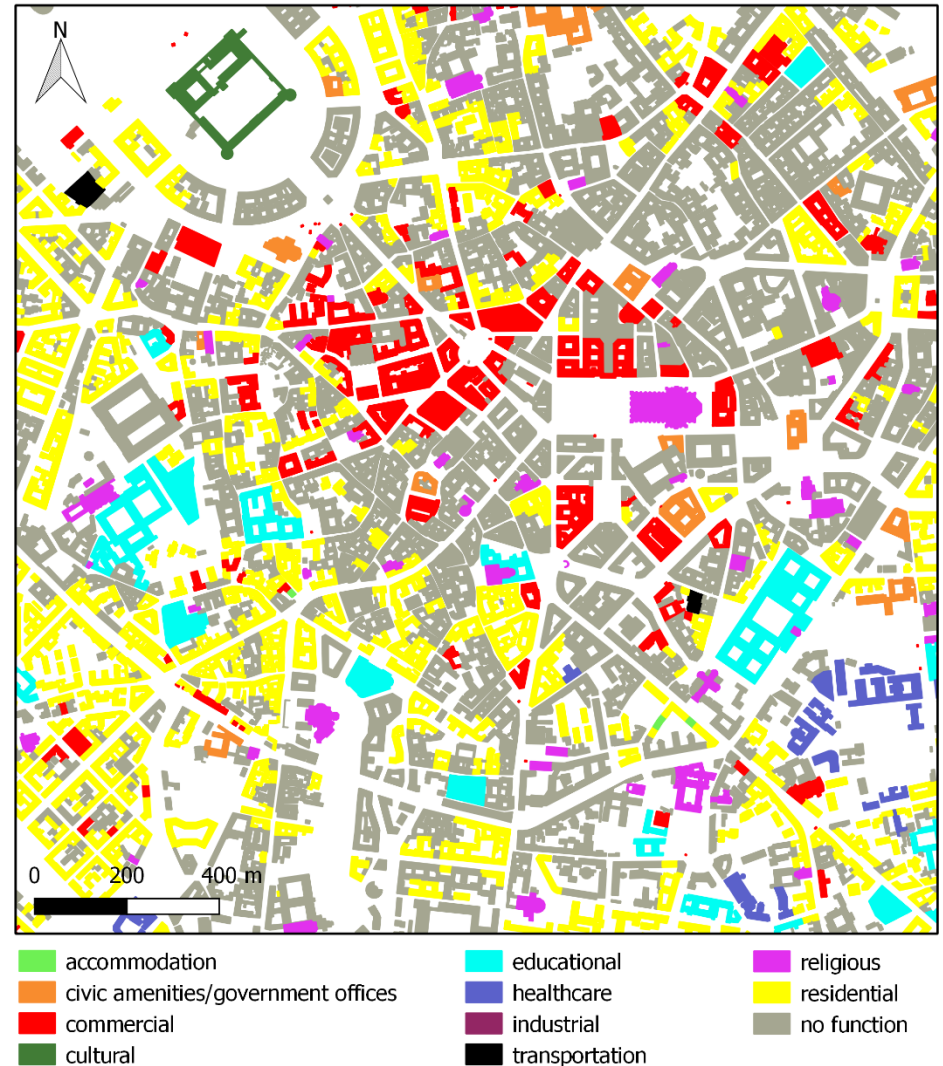- A 2km x 2km area in the city centre of Milan
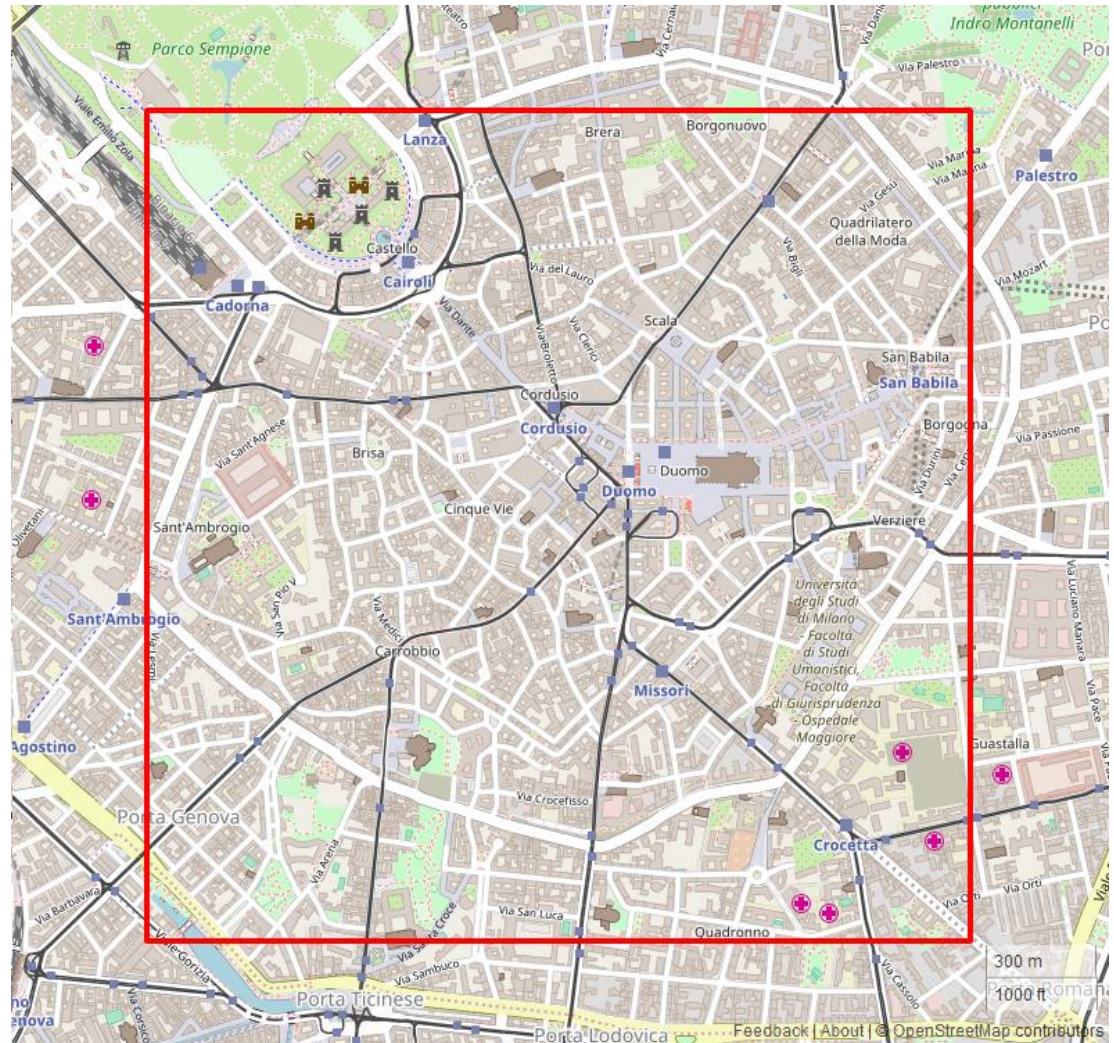
OSM buildings

Building function	Values of the *building* key
residential	apartments, house, detached, residential, dormitory, terrace, houseboat, bungalow, static_caravan, carport, conservatory, garage, garages, garbage_shed, shed
commercial	commercial, office, retail, kiosk, cabin
industrial	industrial, warehouse, bakehouse, digester, hangar, transformer_tower, service, water_tower, pumping_station
educational	kindergarten, school, university
healthcare	hospital
cultural	pavilion, castle
entertainment	stadium, grandstand, riding_hall
religious	religious, cathedral, chapel, church, mosque, temple, synagogue, shrine, monastery

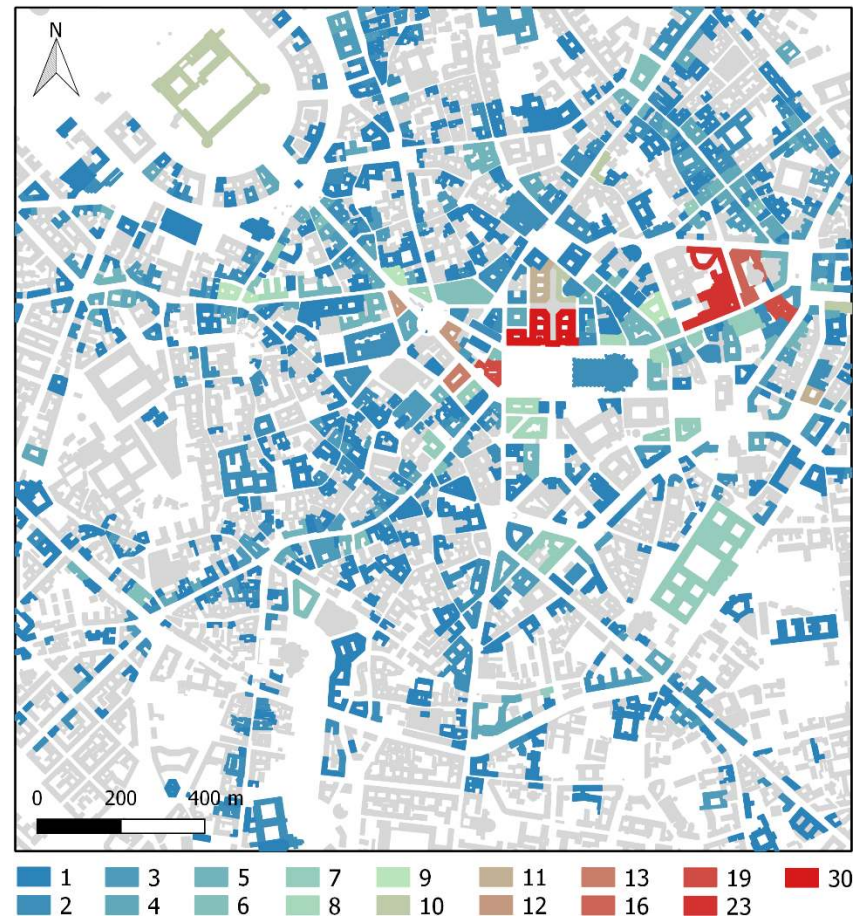| Building function	Values of the *building* key
accommodation	hotel, hut
safety authorities	-
agricultural	farm, farm_auxiliary, barn, cowshed, greenhouse, stable, sty
civic amenities/ government offices	public, civic
transportation	train_station, transportation, aerodome, bridge, parking, ferry_terminal
non-governmental/ non-profit	-
military	bunker
no function	yes, construction, roof, ruins, collapsed

OSM buildings

- 1249 buildings (**43%** of the total) associated with a specific class of building function

Legend:
- accommodation
- civic amenities/government offices
- commercial
- cultural
- educational
- healthcare
- industrial
- transportation
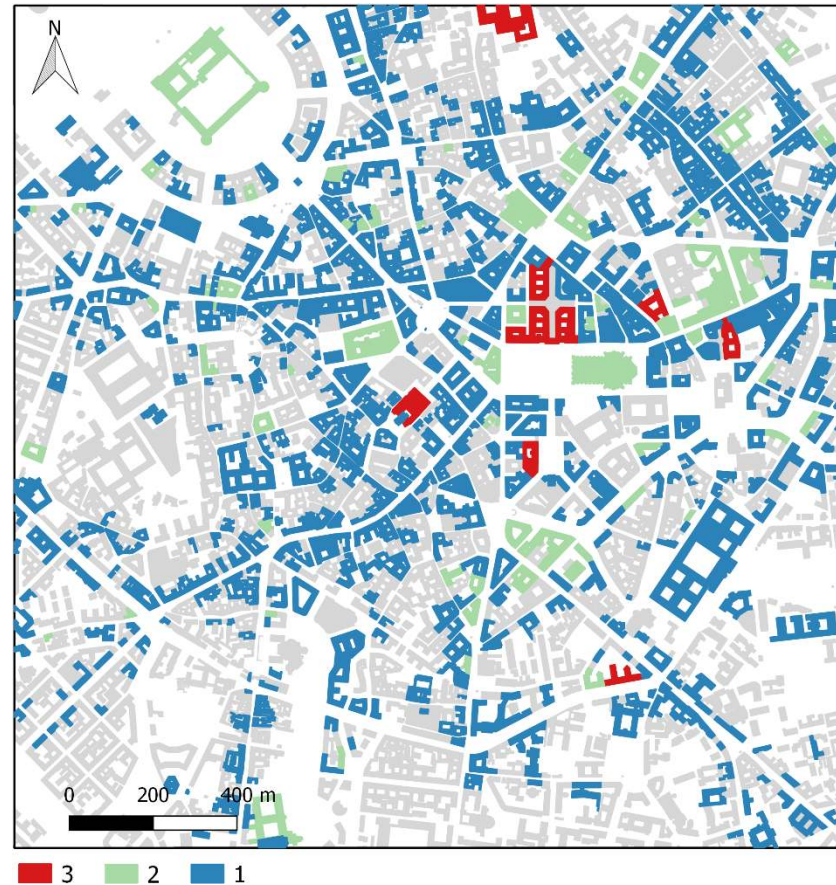- religious
- residential
- no function

OSM POIs

- 2197 POIs extracted (**90%** inside buildings, **6%** outside within 5m from buildings)

OSM POIs

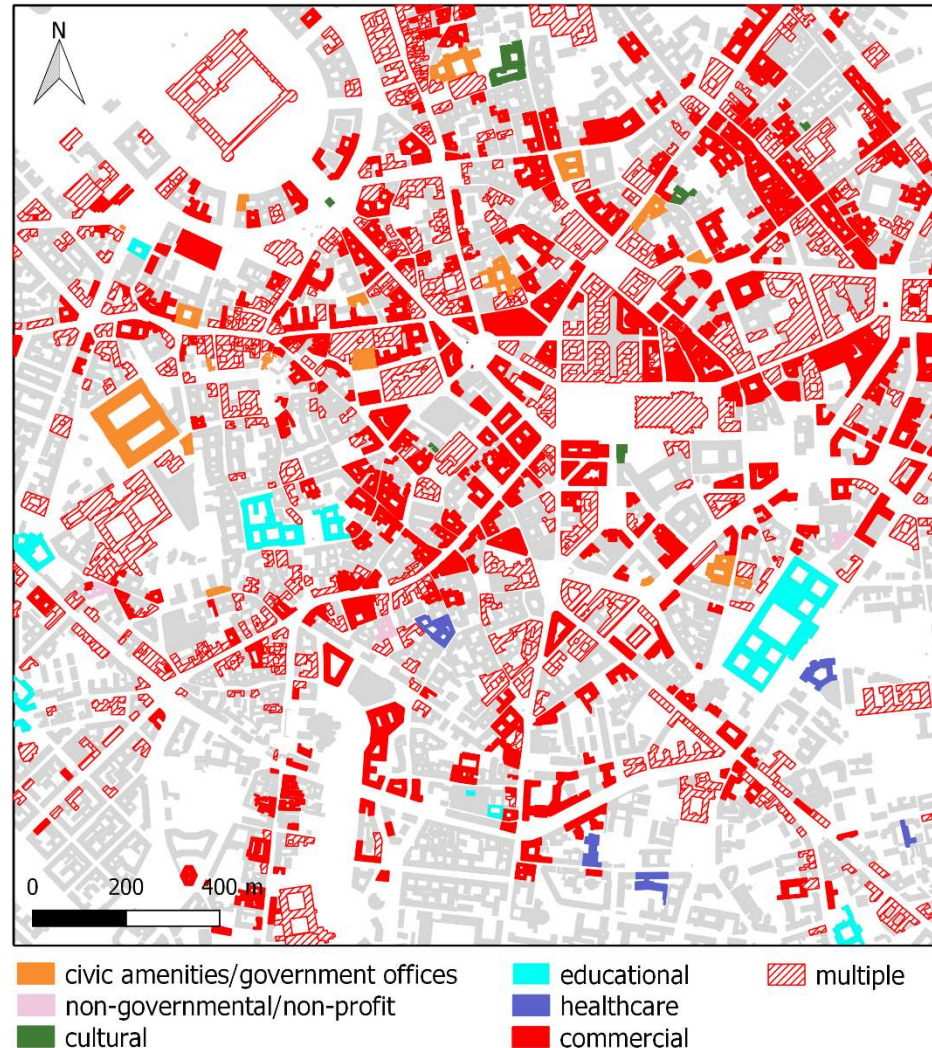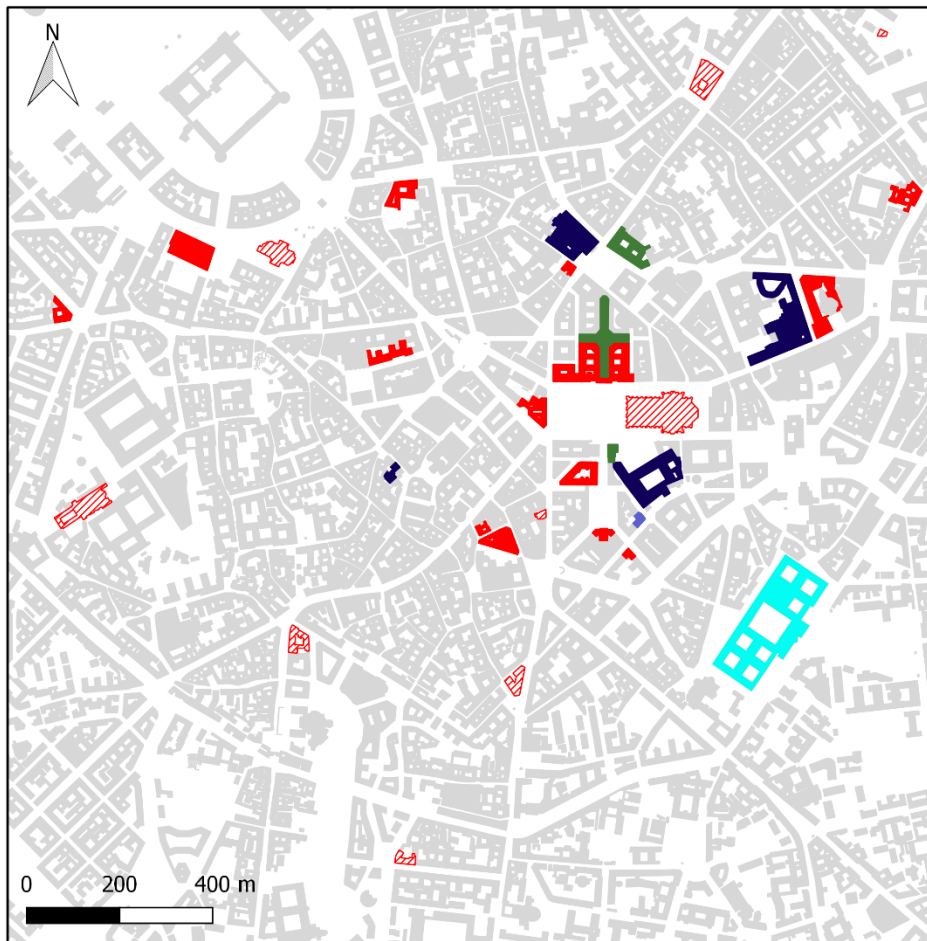- Number of functions per building from OSM POIs
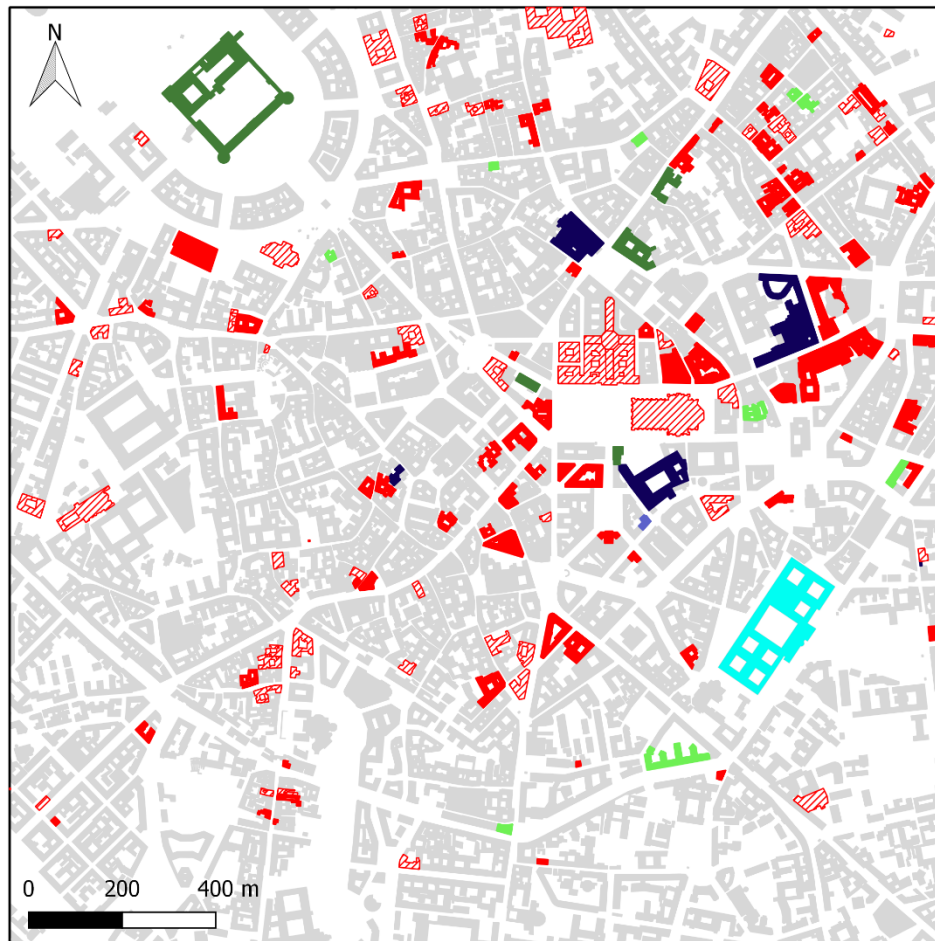
Building classification using OSM POIs

legend:
- civic amenities/government offices (orange)
- non-governmental/non-profit (pink)
- cultural (dark green)
- educational (cyan)
- healthcare (blue)
- commercial (red)
- multiple (hatched red)

Building classification using Facebook and Foursquare POIs

58 POIs

🟥 commercial	🟦 healthcare
🟩 cultural	⬛ entertainment
🟦 educational	multiple

312 POIs

🟥 commercial	🟩 accommodation
🟩 cultural	multiple
⬛ entertainment	

Final results from all sources

- 2382 classified buildings (82% of the total)

- 867 classified as having multiple functions

civic amenities/government offices | commercial | entertainment
non-governmental/non-profit | healthcare | accommodation
cultural | religious | multiple
educational | residential | no function
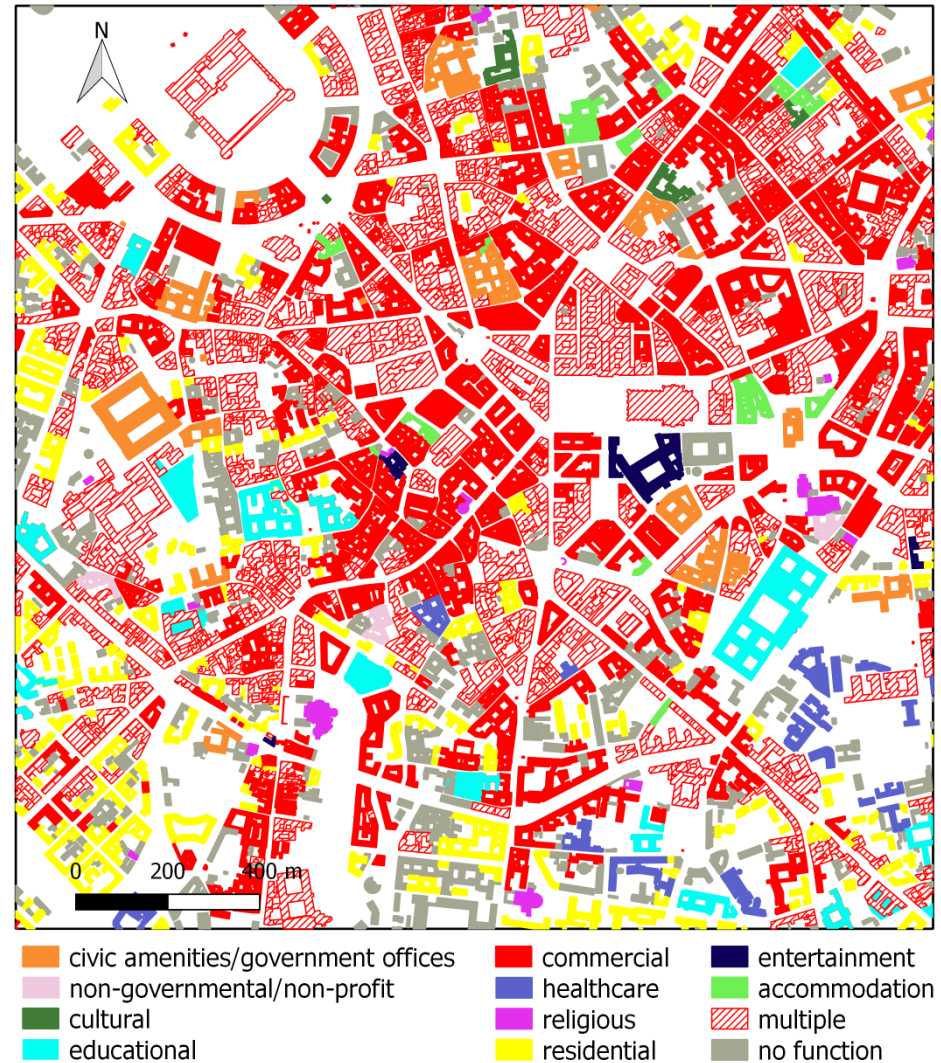
Conclusions

- More than 80% of the buildings were classified

- Most of the data was extracted from OSM (both buildings and POIs)

- Many buildings (36%) have multiple functions

- This work will proceed and will be applied to other cities

- Validation with independent data

Thank you !

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