Trentino Tourist Facilities

Outdoor activities within Trentino region

Knowledge Graph Engineering 2024

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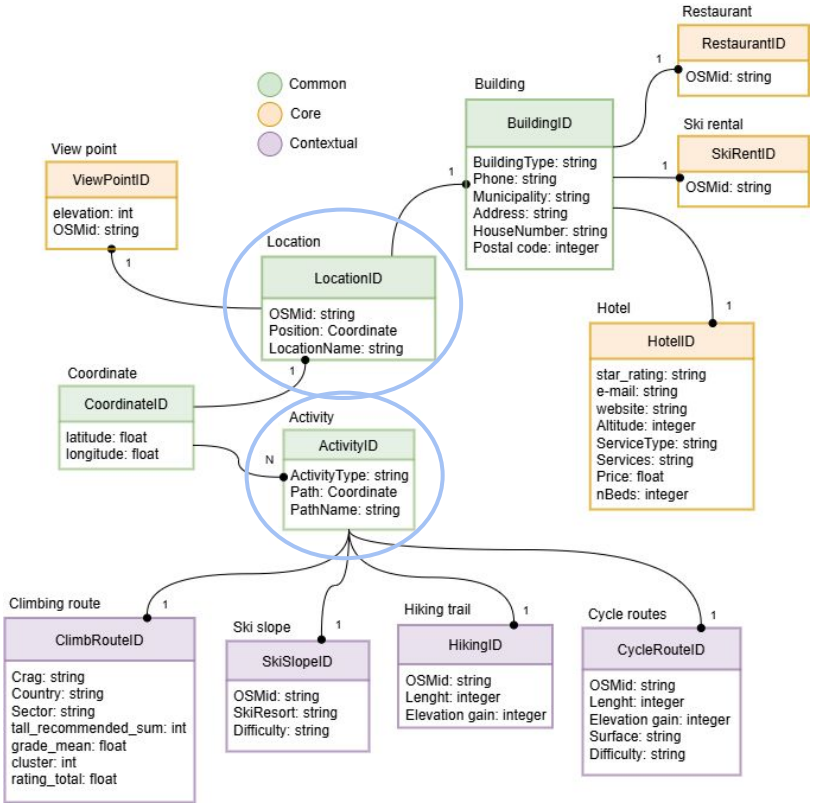
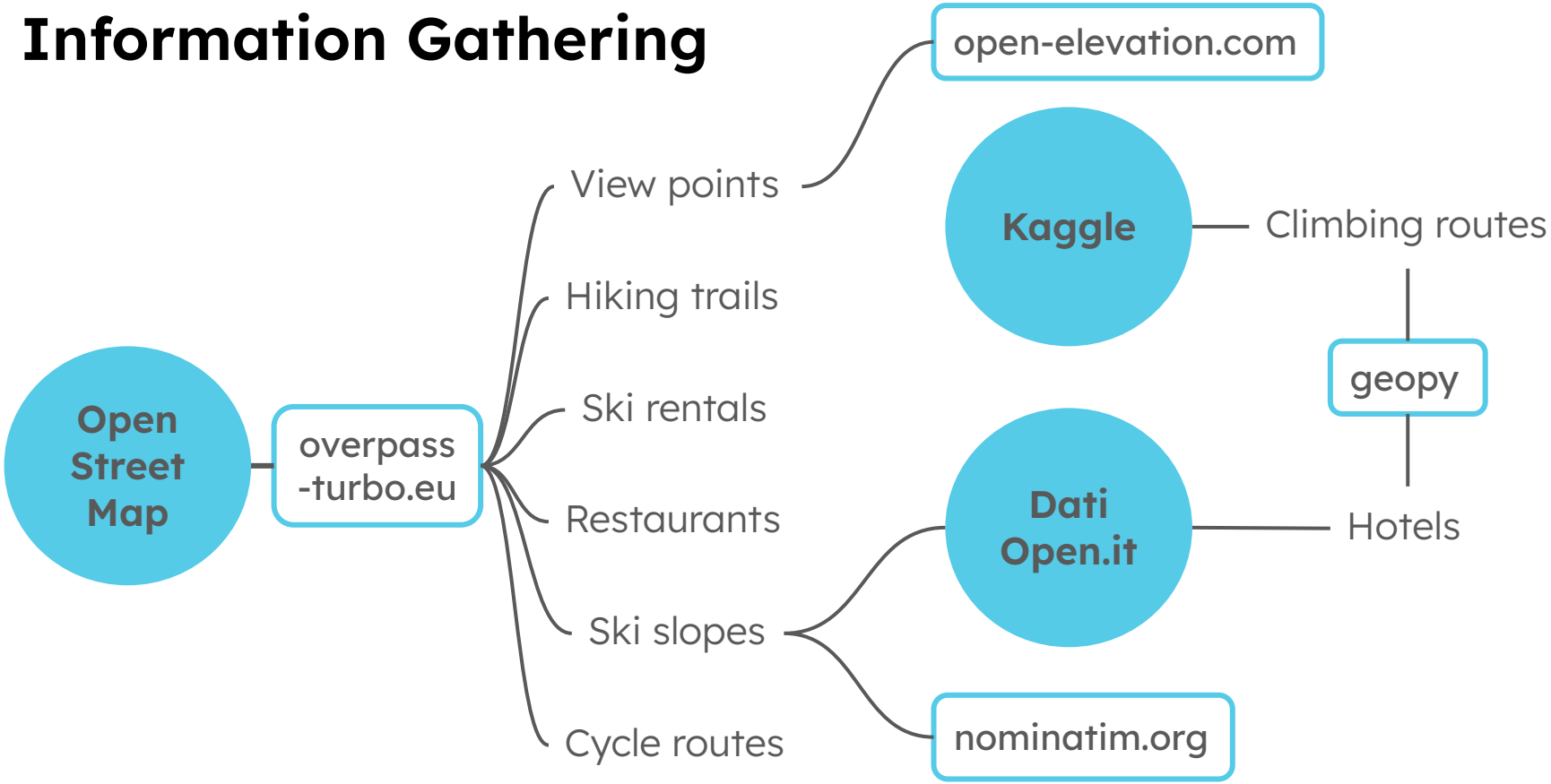
Purpose Formalization

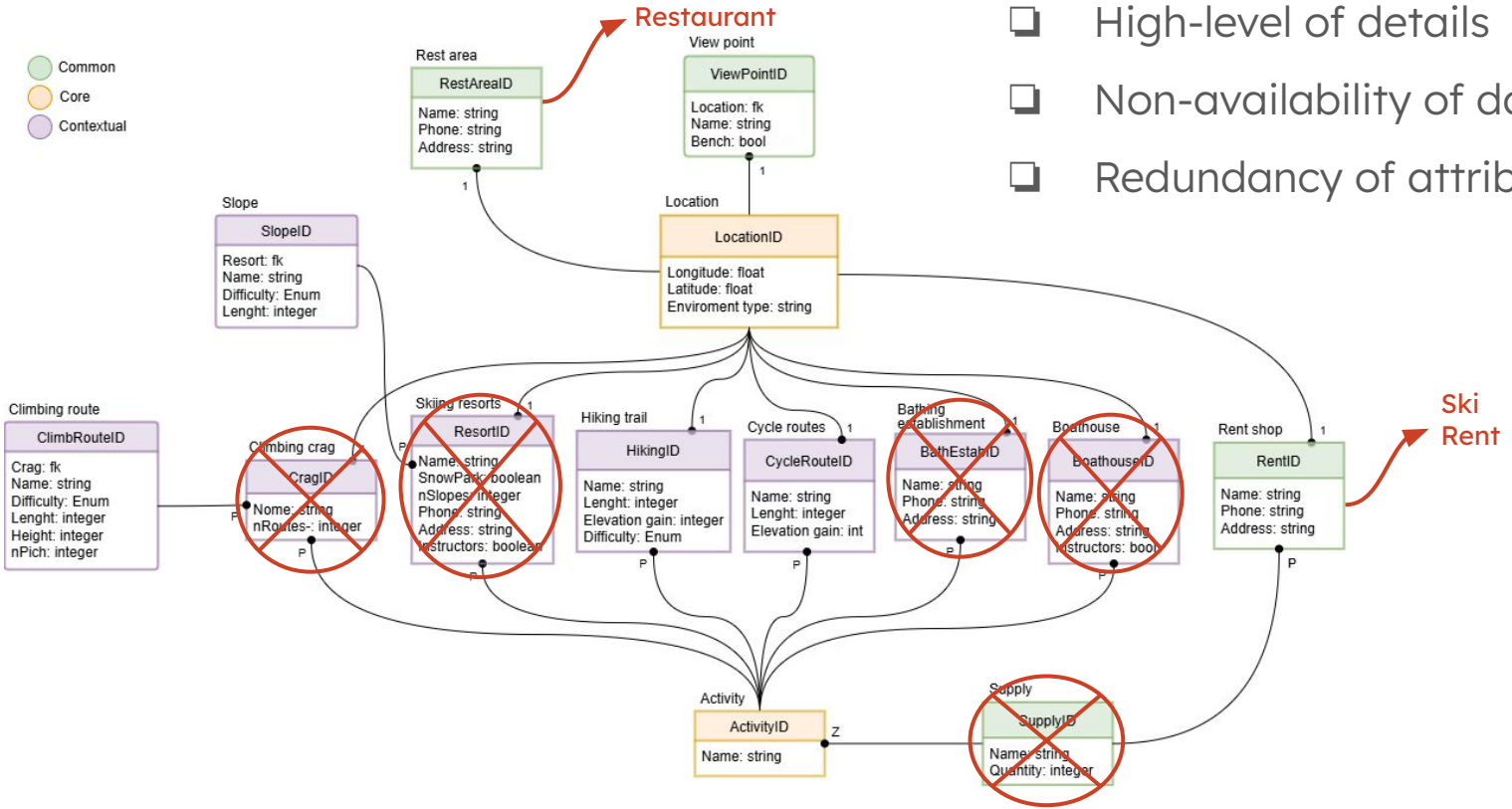
- Stores, organizes, and provides easy access to information about tourist facilities in the Trentino region, with a specific focus on **outdoor activities**.
- Mountain Adventure
- Sustainable Tourism and Ecotourism
- Contextual: **Climbing** Route, **Ski** Slope, **Hiking** Trail, **Cycle** Route
- Core: View Point, Restaurant, Ski Rent, Hotel



Information Gathering



Issues



- High-level of details
- Non-availability of data
- Redundancy of attributes

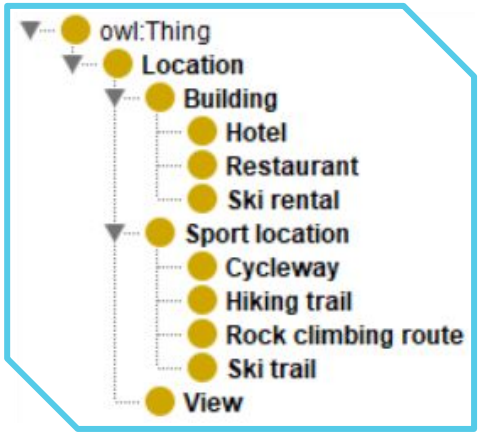
Language Definition

ConceptID	Word-en	Gloss-en
UKC-50	location	A point or extent in space
UKC-31769	view	The visual percept of a region
UKC-15330	building	A structure that has a roof and walls and stands more or less permanently in one place
UKC-18979	hotel	A building where travelers can pay for lodging and meals and other services
UKC-22077	restaurant	A building where people go to eat
ski_rental_OSM	ski_rental, ski rental	A shop that rents skis and related accessories.
KGE24-2-22	sport location	A location or path where outdoor sport can be done
KGE24-2-1	hiking trail	A path or track roughly blazed through wild or hilly country where to go hiking
UKC-22959	ski trail	Trail or slope prepared for skiing
cycleway_OSM	cycleway	A separate way for the use of cyclists.
KGE24-2-2	rock climbing route	A path by which a climber reaches the top of a mountain, a rock face or an ice-covered obstacle.

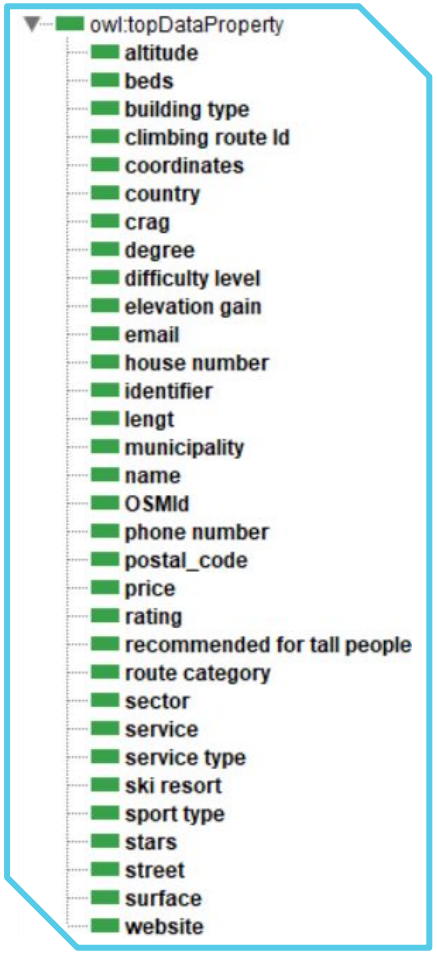
Knowledge Definition

- ❏ Exploit OSM schema
- ❏ Maximize the reusability
- ❏ **No** object properties: only IS-A relationships

Entities:



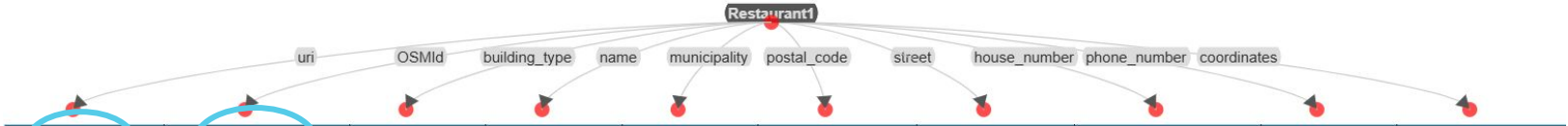
Data properties:



Issues:

- ❏ absence of the property **way** (list of coordinates) in the OSM ontology
- ❏ absence of some important (for our purpose) entities in the OSM ontology
- ❏ some CQs cannot be completely satisfied

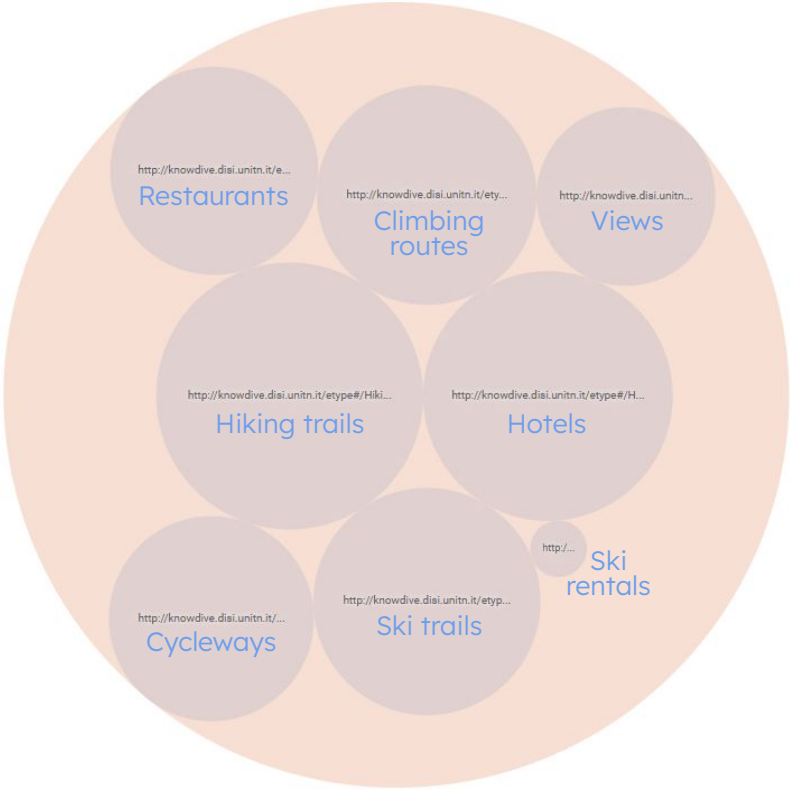
Entity Definition



id	osmId	type	name	addrCity	addrPostcode	addrStreet	addrHousenumber	phone	coordinates
resturant0	node/247887464	resturant	Dal Boccia		38121-38123	Via degli Alberti Poja	13	+39 0461 437903	[[11.1404686, 46.0718261]]
resturant1	node/268430904	resturant	Dalla Sora Giovanna	Trento	38122	Via Roggia Grande	8	+39 0461 095967	[[11.1243864, 46.0674055]]
resturant2	node/268432521	resturant	Trattoria Al Tino	Trento	38122	Via Santissima Trinitá	10		[[11.1229923, 46.066267]]
resturant3	node/268435080	resturant	Trattoria Al Mercato	Trento	38122	Piazza Giovanni Battista Garzetti	15		[[11.1238802, 46.0659754]]
resturant4	node/268435081	resturant	Borgo Nuovo Trento	Trento	38122	Prima Androna di Borgo Nuovo	20	+39 0461 261375	[[11.1236344, 46.0658302]]
resturant5	node/269145543	resturant	Alla Grotta	Arco	38062	Via Monte Brione	5		[[10.8702292, 45.8949163]]

- ❏ Entity identification with **both** OSMid and custom identifiers
- ❏ Entity mapping only for **leaf** nodes

Exploitation




```
PREFIX xsd: <http://www.w3.org/2001/XMLSchema#>
SELECT ?sector (MAX(xsd:decimal(?difficulty)) - MIN(xsd:decimal(?difficulty)) AS ?difficultyRange)
WHERE {
    # Retrieve all climbing routes with their sector and difficulty degree
    ?route <http://www.w3.org/1999/02/22-rdf-syntax-ns#type>
<http://knowdive.disi.unitn.it/etype#/Rock_climbing_route> ;
    <http://knowdive.disi.unitn.it/etype#/sector> ?sector ;
    <http://knowdive.disi.unitn.it/etype#/degree> ?difficulty .
}
GROUP BY ?sector
ORDER BY DESC(?difficultyRange)
LIMIT 5
```

```
PREFIX xsd: <http://www.w3.org/2001/XMLSchema#>
SELECT DISTINCT ?crag ?sector ?viewName
WHERE {
    # Retrieve all Rock_climbing_route entities with crag, sector, and coordinates
    ?route <http://www.w3.org/1999/02/22-rdf-syntax-ns#type>
<http://knowdive.disi.unitn.it/etype#/Rock_climbing_route> ;
          <http://knowdive.disi.unitn.it/etype#/crag> ?crag ;
          <http://knowdive.disi.unitn.it/etype#/sector> ?sector ;
          <http://knowdive.disi.unitn.it/etype#/coordinates> ?routeCoordString .

    # Parse the coordinates of the climbing route
    BIND(REPLACE(?routeCoordString, "^[\\[]+|[\\]]+$", "") AS ?routeTrimmedString)
    BIND(xsd:decimal(REPLACE(?routeTrimmedString, ",.*$", "")) AS ?routeLat)
    BIND(xsd:decimal(REPLACE(REPLACE(?routeTrimmedString, "^.*,", ""), "].*$", "")) AS ?routeLong)

    # Retrieve all View entities with name, elevation, and coordinates
    ?view <http://www.w3.org/1999/02/22-rdf-syntax-ns#type> <http://knowdive.disi.unitn.it/etype#/View> ;
          <http://knowdive.disi.unitn.it/etype#/name> ?viewName ;
          <http://knowdive.disi.unitn.it/etype#/coordinates> ?viewCoordString .

    # Parse the coordinates of the view
    BIND(REPLACE(?viewCoordString, "^[\\[]+|[\\]]+$", "") AS ?viewTrimmedString)
    BIND(xsd:decimal(REPLACE(?viewTrimmedString, ",.*$", "")) AS ?viewLong)
    BIND(xsd:decimal(REPLACE(REPLACE(?viewTrimmedString, "^.*,", ""), "].*$", "")) AS ?viewLat)

    # Compare the coordinates with a tolerance of ±0.008
    FILTER(ABS(?routeLat - ?viewLat) <= 0.008)
    FILTER(ABS(?routeLong - ?viewLong) <= 0.008)
}
ORDER BY ?crag ?sector ?climbingRouteName ?viewName
```

Evaluation

	Location	Building	Hotel	Restaurant	Ski Rental	Sport Location	Cycleway	Hiking Trail	Rock Climbing Route	Ski Trail	View
Location	16606	0	0	0	0	0	0	0	0	0	0
Building	0	15525	0	0	0	0	0	0	0	0	0
Hotel	0	0	16868	0	0	0	0	0	0	0	0
Restaurant	0	0	0	7424	0	0	0	0	0	0	0
Ski Rental	0	0	0	0	48	0	0	0	0	0	0
Sport Location	0	0	0	0	0	12969	0	0	0	0	0
Cycleway	0	0	0	0	0	0	5808	0	0	0	0
Hiking Trail	0	0	0	0	0	0	0	6065	0	0	0
Rock Climbing Route	0	0	0	0	0	0	0	0	10243	0	0
Ski Trail	0	0	0	0	0	0	0	0	0	6595	0
View	0	0	0	0	0	0	0	0	0	0	1274

Given a set of CQ, the etype coverage of Teleontology:

$$Cov_e(CQ_E) = \frac{|CQ_E \cap T_E|}{CQ_E} = \frac{8}{14} \approx 0.571$$

Given a set of CQ, the property coverage of the Teleontology:

$$COV_p(CQ_P) = \frac{|CQ_P \cap T_P|}{CQ_P} = \frac{24}{32} \approx 0.75$$

Entity connectivity for the whole KG:

$$EC(KG) = \sum_{X=1}^{N} EC(X) = 0$$

Property connectivity for the whole KG:

$$PC(KG) = \sum_{X=1}^{N} PC(X) = 15803$$

Conclusions

- We had to narrow down the domain of interest (no Lake Tourism)
- Limited data availability
  - Missing data-values for some instances
  - Old datasets that are not updated
- CQs could have been more specific and gone into more detail
  - More specific attributes were not taken into account
- **The initial purpose was respected**
- We **reused** everything we could and made it as **reusable** as possible