

Tourism and Territory

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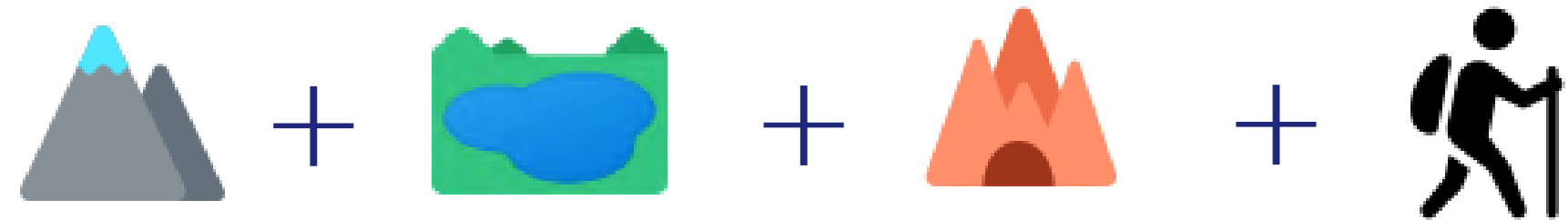


PHASE 1

Purpose Definition



- **Purpose**
- Scenarios
- Personas
- Competency questions (CQs)
- Entity types classification
- EER model



The purpose of this project is to provide in a single place all the information that is available on **nature tourism** in the Trentino territory. To provide that service we will build a knowledge graph (KG) that provides all the information about the natural tourism attractions such as lakes, natural parks, camp sites, waterfalls... and how to get there via bus/train/bike/taxi.

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Relaxing Scenic Stroll



Moderate Nature Experience



Challenging Adventure

PHASE 1

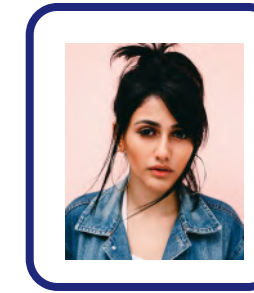
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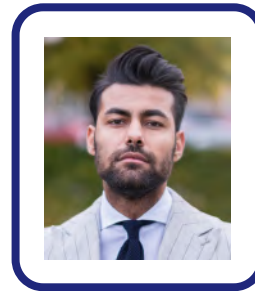
Antonio, 55 - Lombardy, Italy

- Expertise: high
- Skiing, climbing
- Owns a car



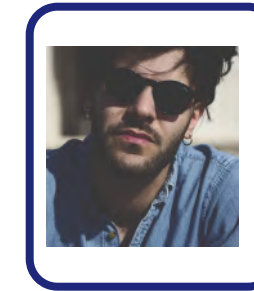
Giulia, 28 - Toscana, Italy

- Expertise: medium
- Art, history, biking



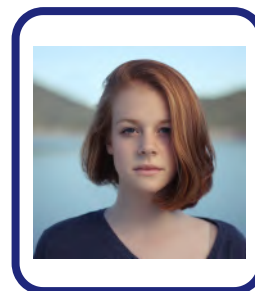
Mario, 27 - Toscana, Italy

- Expertise: low
- Travels with wife and kids



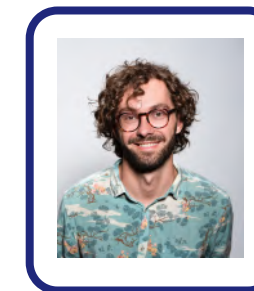
Dalim, 32 - Munich, Germany

- Expertise: low
- Scenics spots, gentle walks



Veronica, 23 - Brno, Czech Republic

- Expertise: high
- Erasmus student
- Challenging hikes



Tymoteusz, 26 - Kraków, Poland

- Expertise: medium
- Nature lover, caves
- Swimming

PHASE 1

Purpose Definition

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- • **Competency questions (CQs)**
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- What are the top three challenging trails in Trentino?
- Can you suggest a moderate hill trail with altitude lower than 2000 m?
- Are there any beginner-friendly walks near Trento?
- How can I reach the Dolomites?
- Can you provide a list of must-visit lakes in the Trentino region?
- Who can I ask for general touristic info in each comune?
- Who can I ask for information when I go to Lago di Santa Giustina?
- What public transportation options are available from Trento to the starting point of a beginner-friendly trail?
- Is there any easy hike close to Pozza di Fassa?
- Where can I buy sleeping bags and a basic tent close to my accommodation? (I'm Antonio)
- How many caves, mountains, and lakes can be visited in Baselga di Pine in a day trip?
- What public transportation is available from Trento to popular hiking destinations?
- How can I get to the longest ski resort?
- How can I access the different ski stations in Trento?
- Is there a bus I can take to reach the Dolomites?
- What are three mountains ONLY accessible by car?
- Which mountains are close to the lakes?
- Can you provide a list of mountain shelters or camping sites along popular mountain trails?
- What is the closest gas station to every ski station?
- Which natural attraction is closest to the train station Levico Terme?

PHASE 1

Purpose Definition

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Common

- Transportation
- Formation (mountains, caves, lakes)
- Region
- Gas station

Core

- Hike
- Ski resort
- Guide
- Accommodation

Contextual

- Tourist
- Store

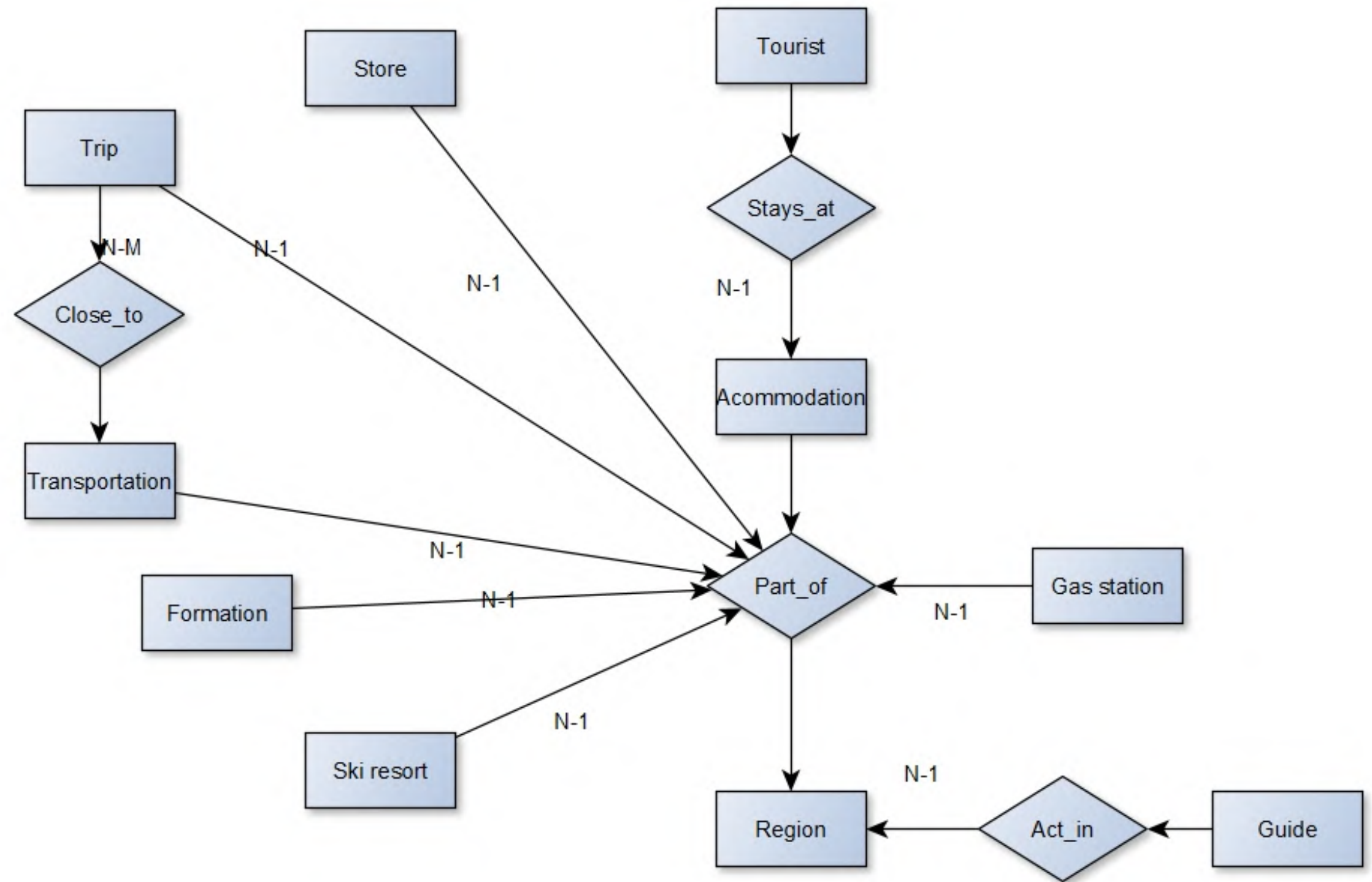
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- Entity types classification



- **EER model**

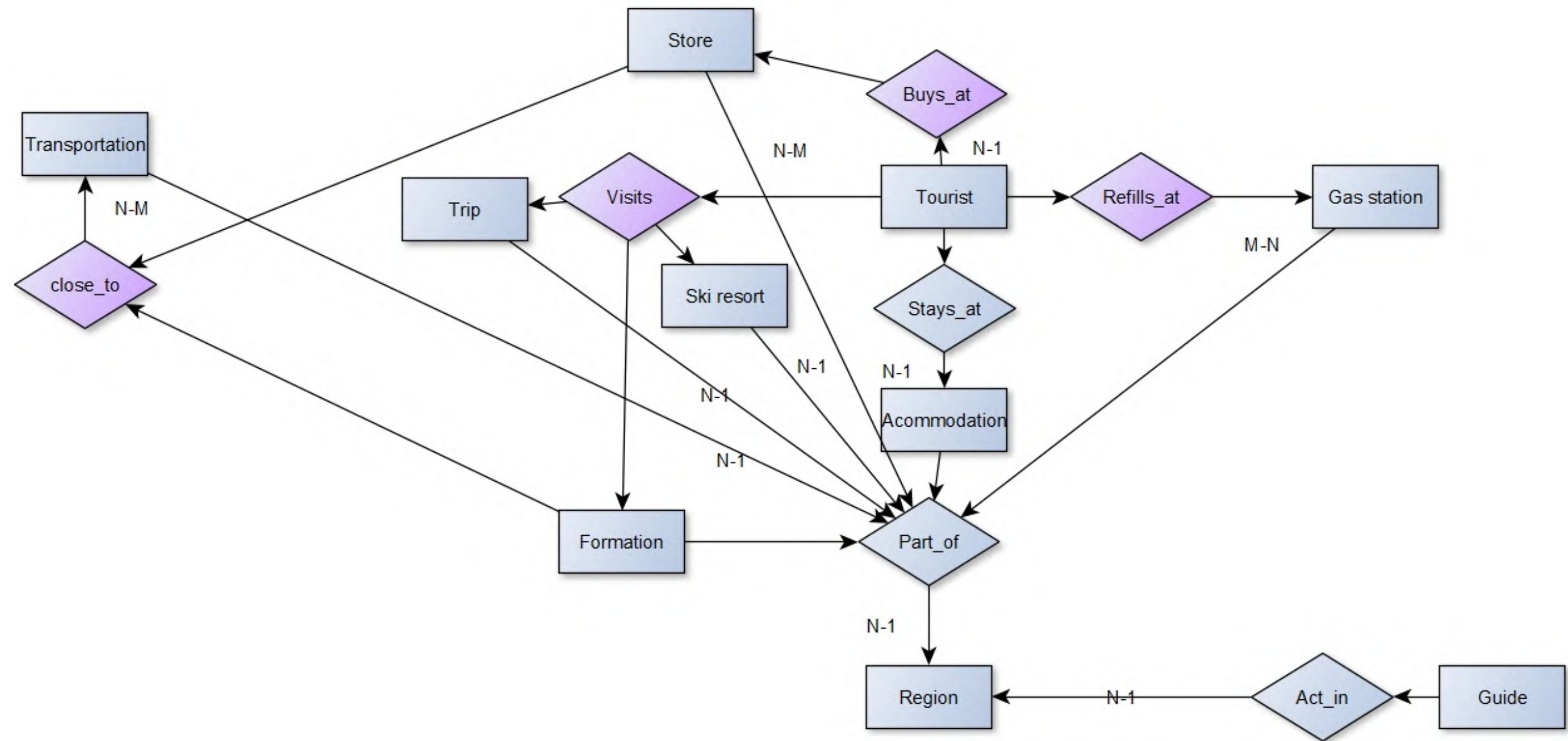


PHASE 1

Purpose Definition


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→ • **EER model**



PHASE 2

Information Gathering

- 
- **Knowledge and Data Sources**
 - Data cleaning
 - Karma and Protegé

1. Informal data sources - Producer

- OPEN DATA TRENTINO

This source contains 6.556 different datasets of the Trentino province of different data formats and topic

- ISTAT Turismo

This source contains contact emails of experts in the ISTAT declaration (economic activity classification) by municipality.

- Komoot

2. Semi-Formal data sources

- KGE22 - Trentino Tourist Facilities

This source contains individual datasets of bus, train and bike stops; taxi companies; bars and restaurants; campsites, hotels and vacation houses; gas stations and souvenir shops; and museums, ski stations and natural attractions.

3. Formal knowledge and data sources - Consumer

- Trentino OSM places

This dataset contains information scraped from Open Street Maps about the Trentino region: springs, peaks, cave entrances and other natural wonders are listed here

- OSM Lightweight Ontology

4. Custom

PHASE 2

Information

Gathering

- Knowledge and Data Sources



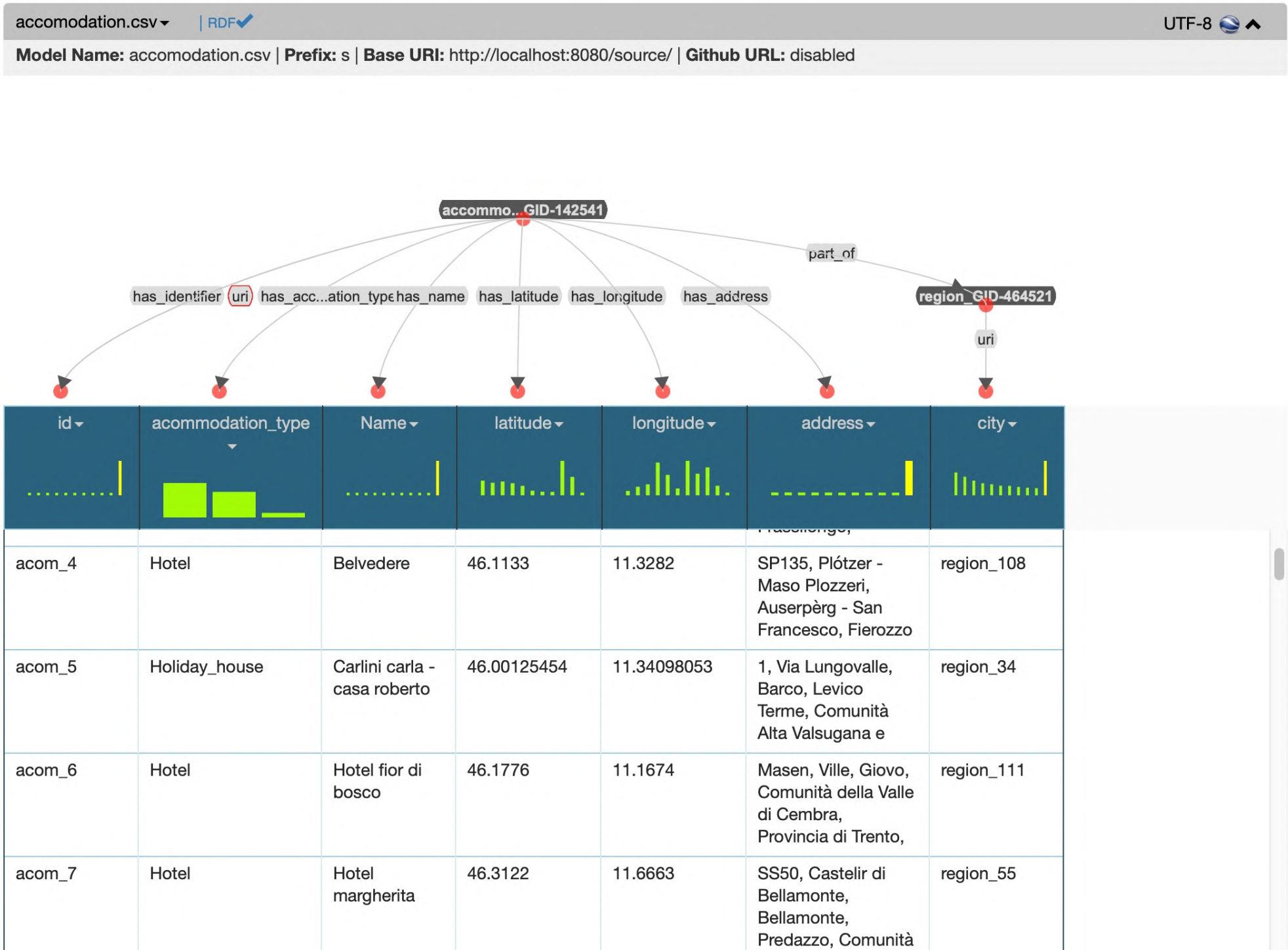
- **Data cleaning**
- Karma and Protegé

1. Deleting columns of entities that are not relevant to our purpose
2. Deleting data from areas outside Trentino area
3. Modify word accents
4. Remove repeated entries and null values
5. Transform data from POINT(latitude, longitude) to different columns

PHASE 2

Information Gathering

- Knowledge and Data Sources
- Data cleaning
- ➔ • Karma and Protegé



PHASE 3

Language

Definition

Word lemma	Schema.org	Concept label	Description
accommodation	accommodation	accommodation_GID-14254	living quarters provided for public convenience
accommodation type	accommodationCategory	has_accommodation_type_GID-14001	specific category of housing that individuals can choose from when seeking a place to stay
latitude	latitude	has_latitude_GID-46263	the angular distance between an imaginary line around a heavenly body parallel to its equator and the equator itself
longitude	longitude	has_longitude_GID-46270	the angular distance between a point on any meridian and the prime meridian at Greenwich
city	city	has_city_GID-45988	an incorporated aministrative district established by state charter
address	address	has_address_GID-45803	the place where a person or a place can be found or communicated with
hike	tourist_trip	hike_GID-1458	a long walk usually for exercise or pleasure
identifier	id	has_identifier_GID-39085	a symbol that establishes the identity of the one bearing it
name	name	has_name_GID-2	a language unit by which a person or a thing is known
expertise	touristtype, description	has_expertise_GID-30843	skillfulness by virtue of possessing special knowledge
origin	trip_origin	has_origin_GID-45883	the place where something begins, where it springs into being
duration	arrival_time	has_duration_GID-80582	the period in time during which something continues
guide	person_tourismofficial	guide_GID-34478	someone that offers basic information or instruction

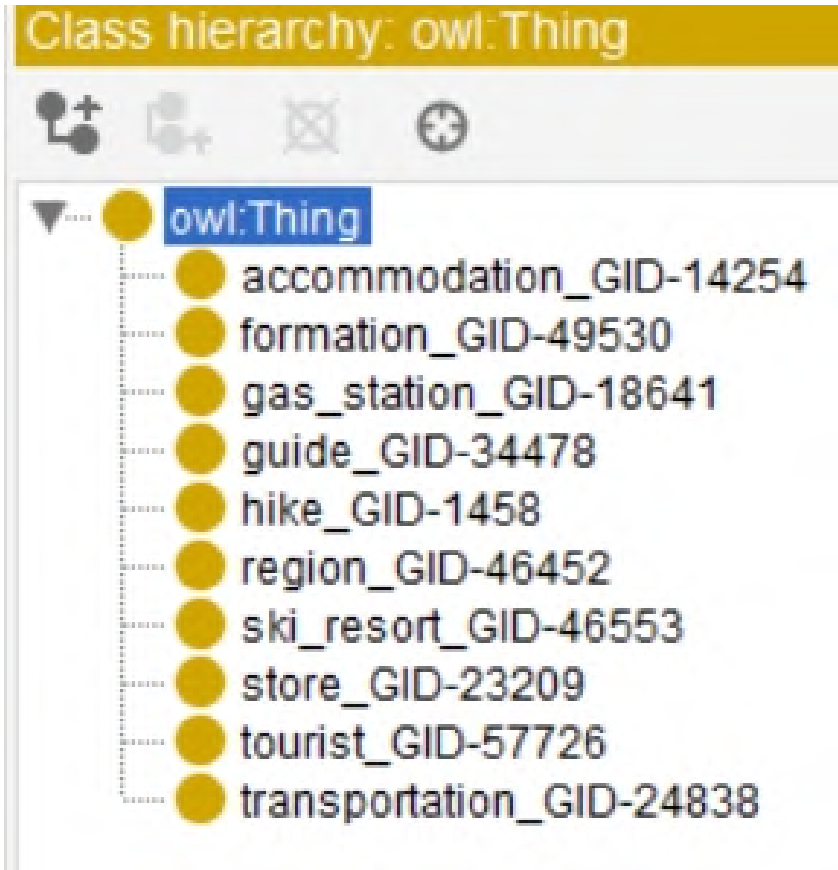
 custom

 uncertain concepts from schema.org

PHASE 4

Knowledge Definition

- • **Ontology and teleology**
- Teleontology



Object property hierarchy: close

Annotations: close

owl:topObjectProperty

- acts_in
- close
- part_of
- stays_at

Annotations: close

Characteristic

- ☐ Functional
- ☐ Inverse functional
- ☐ Transitive
- ☐ Symmetric
- ☐ Asymmetric
- ☐ Reflexive
- ☐ Irreflexive

Description: close

Equivalent To +

SubProperty Of +

- owl:topObjectProperty

Inverse Of +

Domains (Intersection) +

- transportation
- tourist_trip

Ranges (Intersection) +

Disjoint With +

SuperProperty Of (Chain) +

PHASE 4

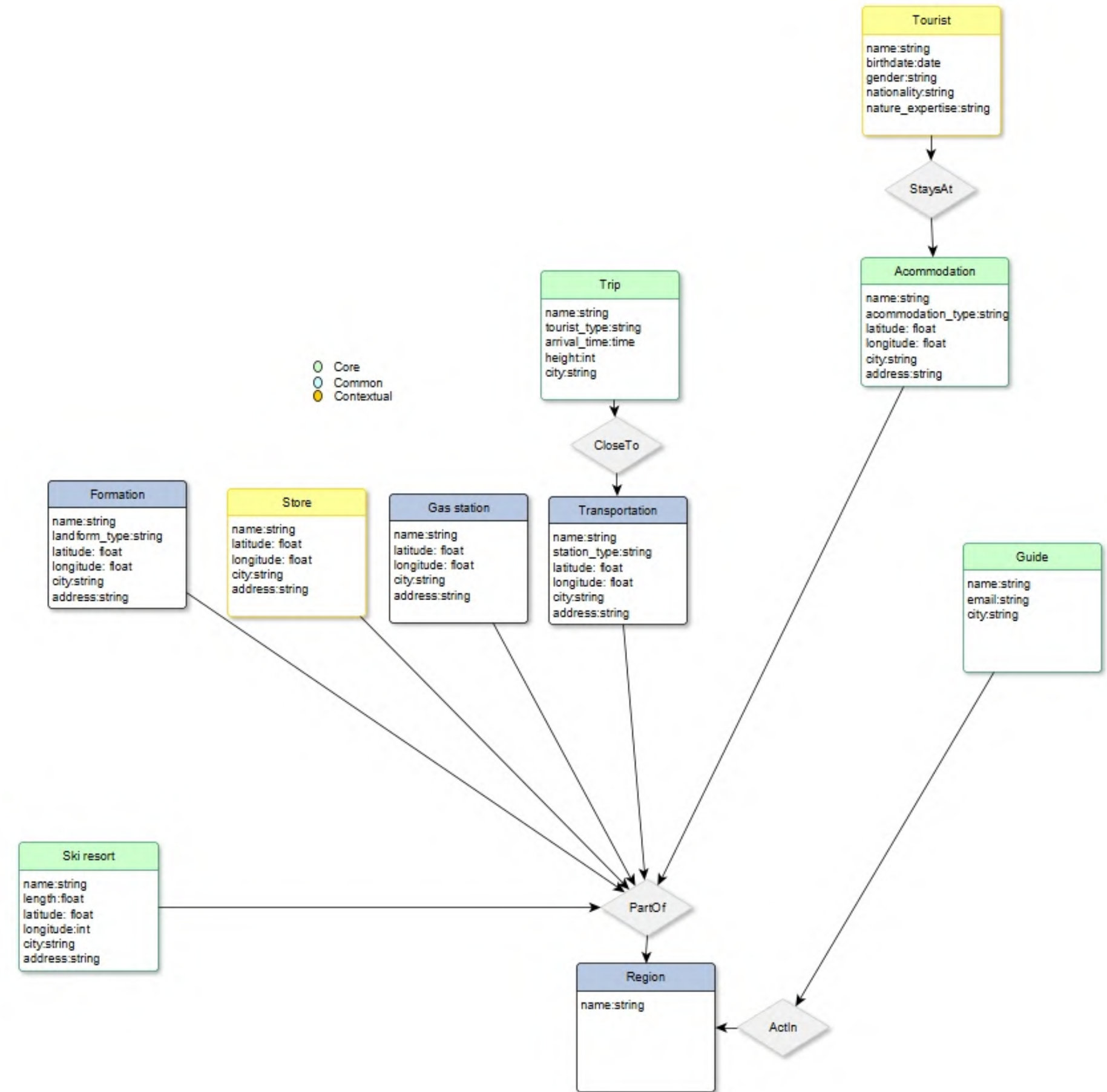
Knowledge

Definition

- Ontology and teleology



- **Teleontology**



PHASE 5


Data Definition

Data mapping with Karma

- Producer
 - Entity identification
 - Mapping individual dataset
- Consumer
 - Entity mapping: link to accommodation and region
 - Final knowledge graph



KG's evaluation and query

- 
- Evaluation
 - Query

Variable	Concept	Value
Cov_E	Number of etypes extracted from the CQs	10
T_E	Number of etypes of the Teleontology	10
Cov_P	Number of properties extracted from the CQs	22
T_P	Number of properties of the Teleontology	25
RO_E	Number of etypes extracted from the ROs	791
RO_P	Number of properties extracted from the ROs	0

$$Cov_E(CQ_E) = \frac{|CQ_E \cap T_E|}{CQ_E} = \frac{10}{10} = 1$$

$$Cov_P(CQ_P) = \frac{|CQ_P \cap T_P|}{CQ_P} = \frac{25}{25} = 1$$

$$Cov_E(RO_E) = \frac{|RO_E \cap T_E|}{RO_E} = \frac{10}{791} = 0,013$$

$$Cov_P(RO_P) = \frac{|RO_P \cap T_P|}{RO_P} = \frac{25}{0} = \textit{undefined}$$

KG's evaluation and query

-
- Evaluation
 - Query

Competency question 1: What are the top three challenging trails in Trento

```
PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX etype: <http://knowdive.disi.unitn.it/etype#>

SELECT ?name ?origin ?expertise ?time ?height ?region
WHERE {
  ?hike rdf:type etype:hike_GID-1458 ;
        etype:has_name_GID-2 ?name ;
        etype:has_duration_GID-80582 ?time ;
        etype:has_height_GID-28272 ?height ;
        etype:has_expertise_GID-30843 ?expertise ;
        etype:close_GID-84218 ?stationid ;
        etype:part_of_GID-14002 ?regionid .
  FILTER(?expertise = "high") .
  ?regionid etype:has_name_GID-2 ?region .
  ?stationid etype:has_name_GID-2 ?origin .
}
LIMIT 3
```

	name ↕	origin ↕	expertise ↕	time ↕	height ↕	region ↕
1	"Val di Ledro, Wasserfall Via del ponale loop from Riva del Garda"	"Bastione"	"high"	"03:25"	"470"	"Riva del Garda"
2	"Bastione Santa Barbara loop from Sant'Alessandro"	"Dimaro Ferrovia"	"high"	"04:50"	"780"	"Riva del Garda"
3	"Lago di Tenno â€” TÃ¼rkisfarbener Tenno See loop from Gavazzo"	"Arco Piazza Italia"	"high"	"05:03"	"840"	"Tenno"

KG's evaluation and query

-
- Evaluation
 - Query

Competency question 2: How can I access the different skis stations in Trento?

```
PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX etype: <http://knowdive.disi.unitn.it/etype#>
PREFIX omgeo: <http://www.ontotext.com/owlim/geo#>

SELECT ?ski_name ?distance ?station_name ?station_type
WHERE
{
    ?ski_resort rdf:type etype:ski_resort_GID-46553 ;
                etype:has_name_GID-2 ?ski_name ;
                etype:has_latitude_GID-46263 ?ski_latitude ;
                etype:has_longitude_GID-46270 ?ski_longitude .

    ?station rdf:type etype:transportation_GID-24838 ;
              etype:has_name_GID-2 ?station_name ;
              etype:has_latitude_GID-46263 ?station_latitude ;
              etype:has_longitude_GID-46270 ?station_longitude ;
              etype:has_transportation_type_GID-14005 ?station_type .

    BIND(omgeo:distance(?ski_latitude, ?ski_longitude, ?station_latitude, ?
                        station_longitude) as ?distance) .

    {
        SELECT ?ski_name (MIN(?distance) AS ?mindistance)
        WHERE
        {
            ?ski_resort rdf:type etype:ski_resort_GID-46553 ;
                        etype:has_name_GID-2 ?ski_name ;
                        etype:has_latitude_GID-46263 ?ski_latitude ;
                        etype:has_longitude_GID-46270 ?ski_longitude .

            ?station rdf:type etype:transportation_GID-24838 ;
                      etype:has_name_GID-2 ?station_name ;
                      etype:has_latitude_GID-46263 ?station_latitude ;
                      etype:has_longitude_GID-46270 ?station_longitude ;
                      etype:has_transportation_type_GID-14005 ?station_type .

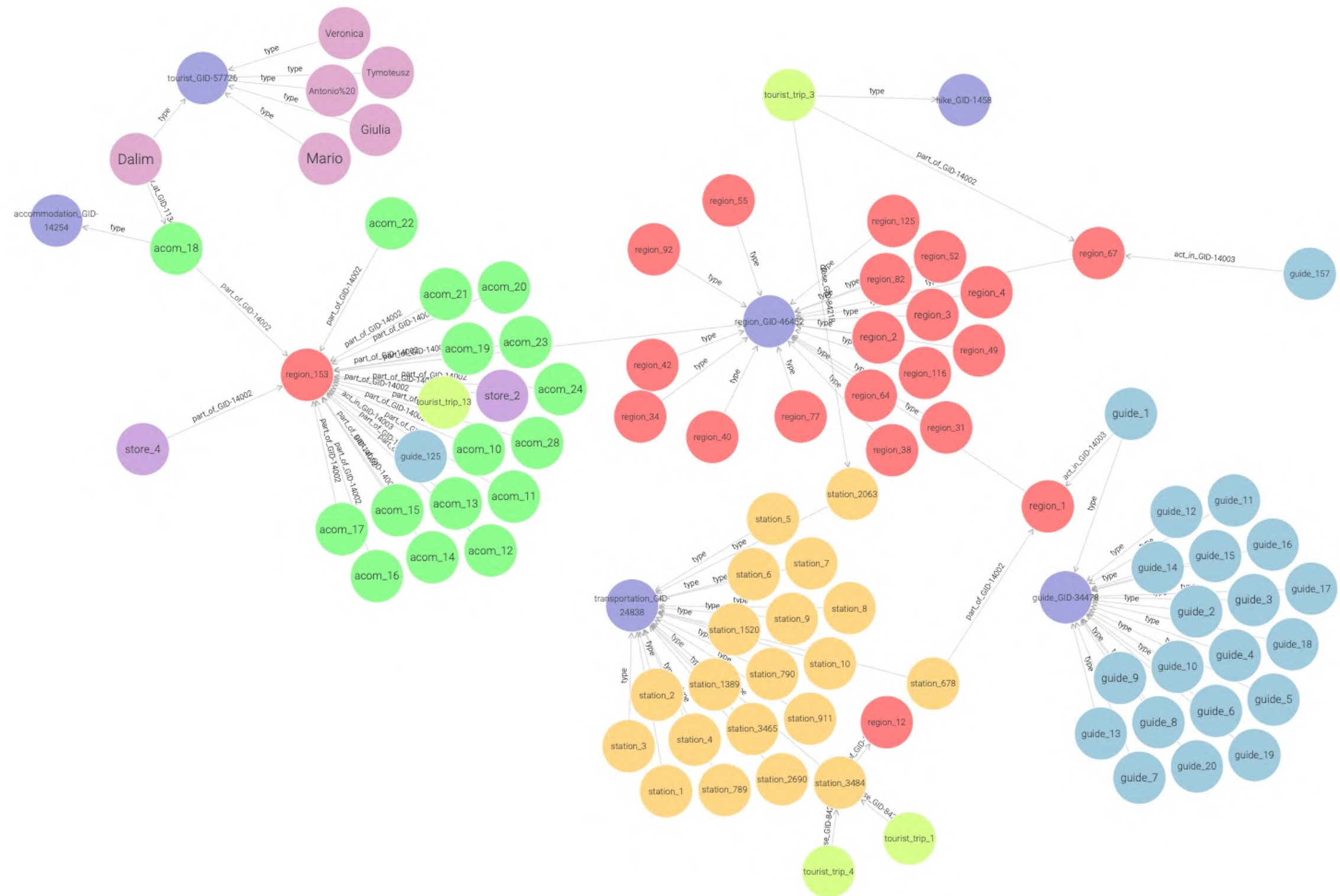
            BIND(omgeo:distance(?ski_latitude, ?ski_longitude, ?station_latitude, ?
                                station_longitude) as ?distance) .
        }
        GROUP BY (?ski_name)
    }

    FILTER(?mindistance = ?distance) .
}
LIMIT 5
```

	ski_name	distance	station_name	station_type
1	"San Martino di Castrozza"	"0.08514792715984919" ^{^^xsd:float}	"S.Martino di C.-Im.Col Verde"	"bus"
2	"Madonna di Campiglio"	"0.2864411797943001" ^{^^xsd:float}	"M.Campiglio Des Alpes"	"bus"
3	"Passo San Pellegrino"	"0.5985344616477905" ^{^^xsd:float}	"P.So S.Pellegrino-Segg.Cost."	"bus"
4	"Belvedere/Col Rodella"	"1.8102107285667173" ^{^^xsd:float}	"Penia Alta"	"bus"
5	"Paganella/Andalo"	"3.2507951498166046" ^{^^xsd:float}	"Andalo-Maso Toscana"	"bus"

KG's evaluation and query

- Evaluation
- • Query

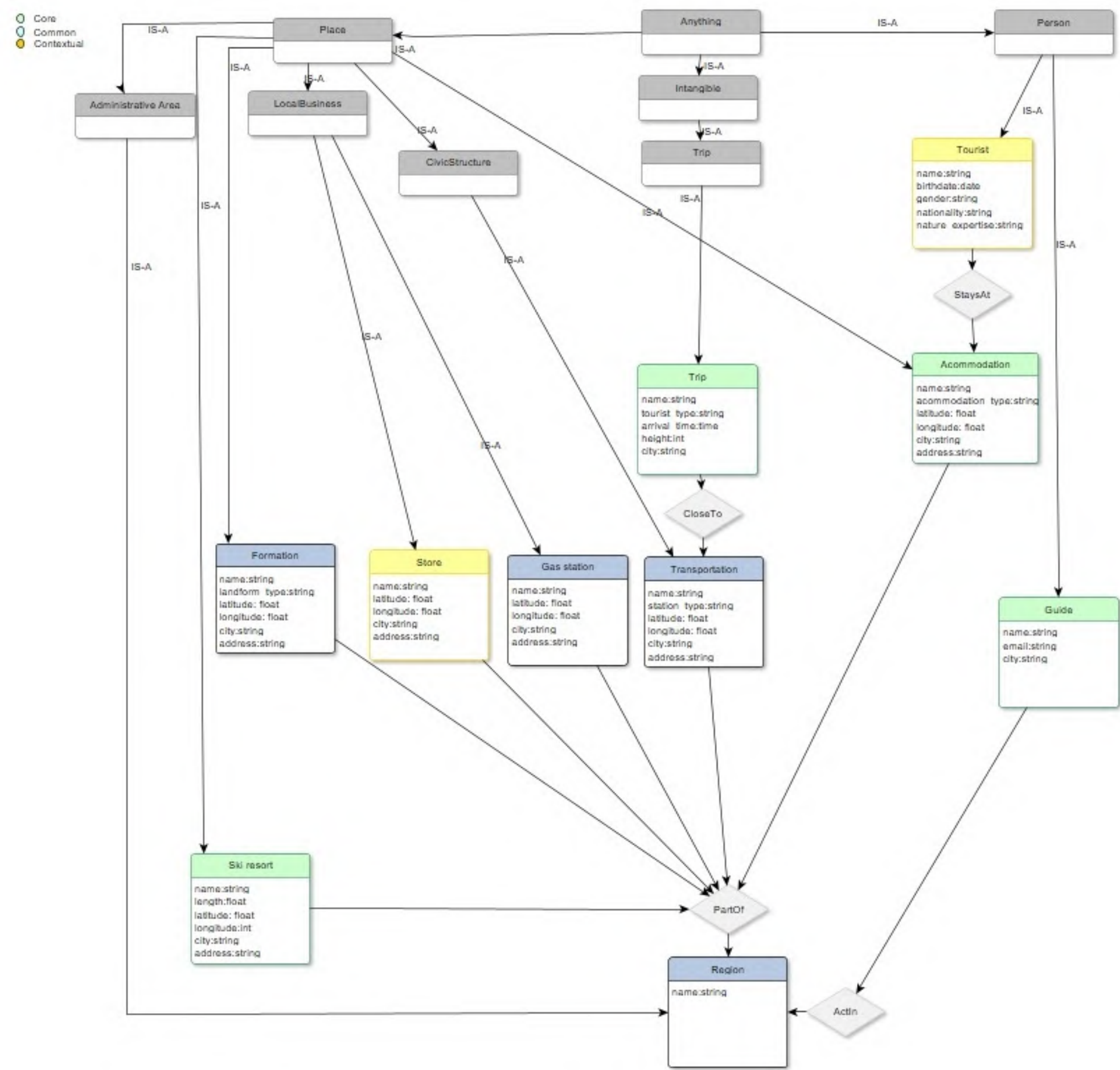


Open Issues

Did the project respect the scheduling expected in the beginning ?

Are the final results able to satisfy the initial Purpose ?

Future work





Pitch

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