

Travel Knowledge Graph

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Use Case

- With the rise in social media marketing of travel destinations, the interest in traveling around Europe has gained global attention.
- Limited and not so good means of sources to get adequate information necessary for planning the entire trip.
- A creation of a knowledge graph could help give the tourist all the necessary details for structuring their entire trip.

Goal of Knowledge Graph

- Identify tourist destinations based on personal preferences and recommend possible destinations for users
- Consider budget, length of time, destination interests, destination reviews, transportation options, and activities when recommending travel options



Modules

- Transport
- Financial Resource
- Activity
- Location
- Accommodation
- Restaurant

Other Modules

- Category
- Spatial Object
- Review



Competency Questions



- What are the details and specifications of a location that is to be visited ?
- What can be the mode of transport for a given range of budget?
- What kind of activities can be performed in a given location?
- What are the locations that facilitate one particular activity, sorted from low to high based on price range?
- What are the different tourist spots for a given location?

Competency Questions (Cont.)



- What type of accommodations are available in a budget range for a given location ?
- Which locations offers multi-cuisine restaurants?

Descoped

- What are the nearby places/tourist attractions?
- What are the preferred activities for the current season?
- Which are the destinations that offer water activities ?

Added to scope

- What are the top-rated accommodations, attractions, modes of transport & restaurants ?

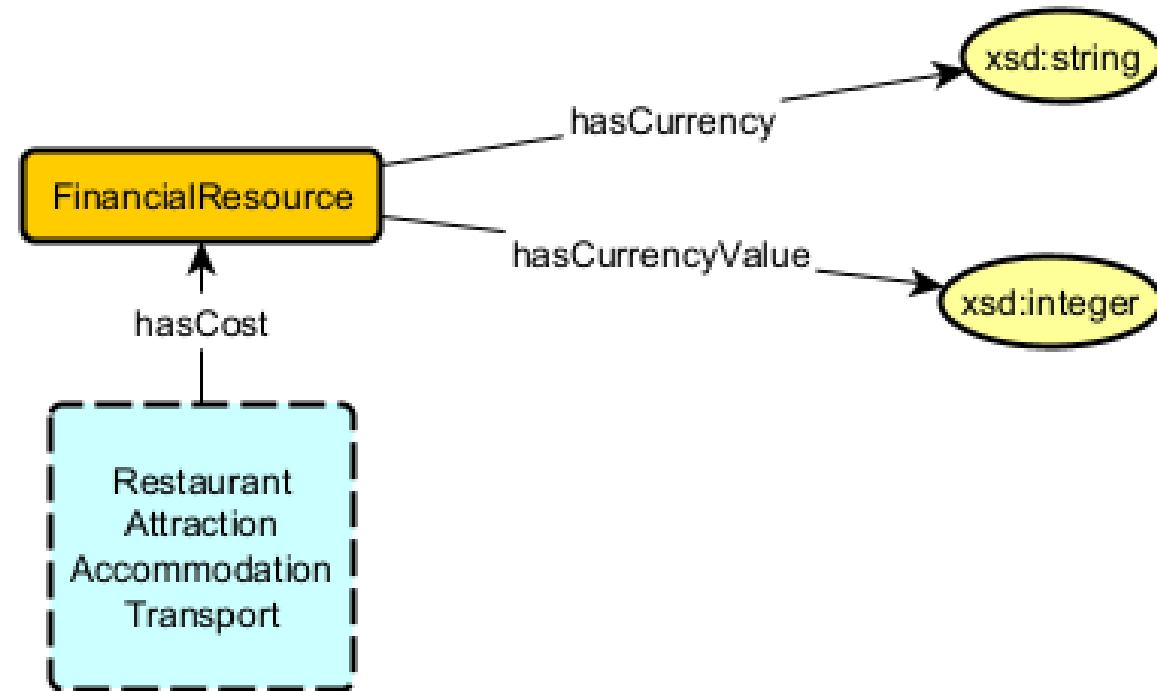
Financial Resource

Source Pattern: Quantity Pattern

Source Data: Tour Dataset

Axioms

- FinancialResource SubClassOf hasCurrency some xsd:string
- FinancialResource SubClassOf hasCurrencyValue some xsd:integer
- Restaurant SubClassOf hasCost some FinancialResource
- Activity SubClassOf hasCost some FinancialResource
- Accommodation SubClassOf hasCost some FinancialResource
- Transport SubClassOf hasCost some FinancialResource



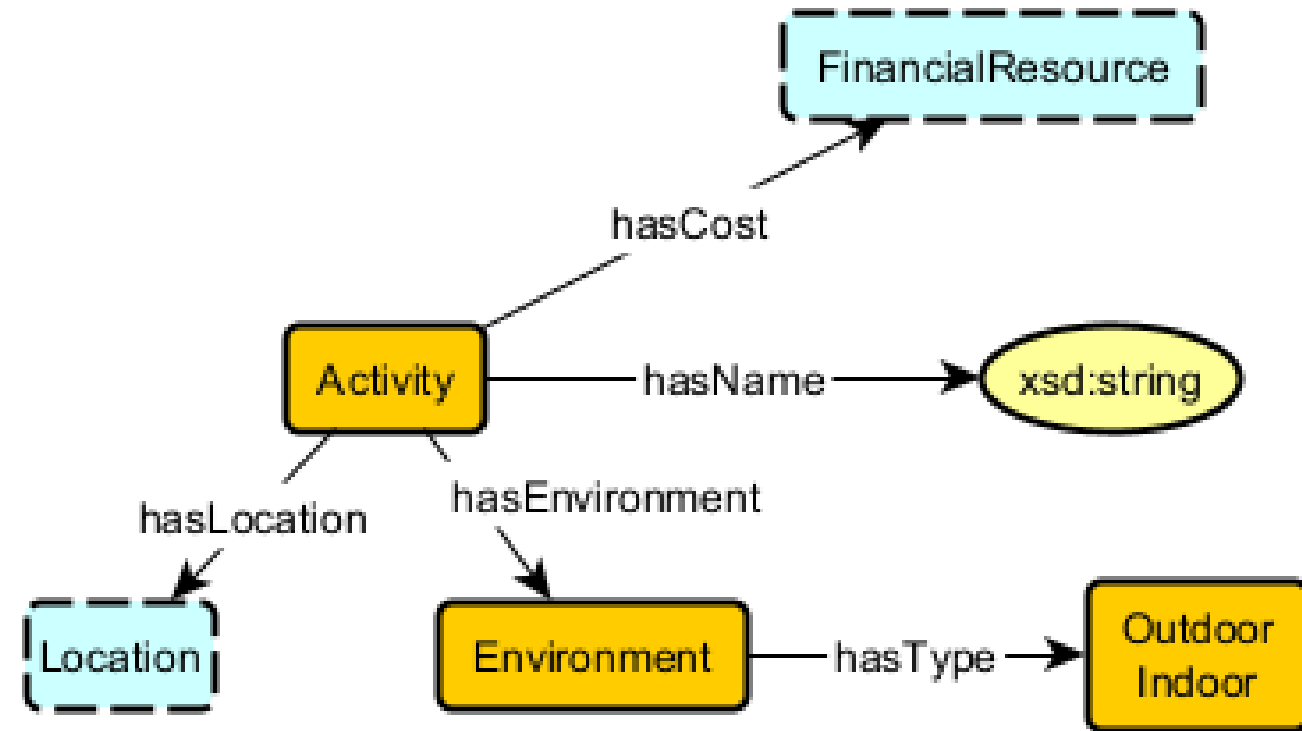
Activity

Source Pattern: SpatioTemporalExtent,
Temporal extent

Source Data: Tour Dataset

Axioms

- Activity SubClassOf hasCost exactly 1 FinancialResource
- Activity SubClassOf hasName some xsd:string
- Activity SubClassOf hasLocation exactly 1 Location
- Activity SubClassOf hasEnvironment some Environment
- Environment SubClassOf hasType either Outdoor or Indoor



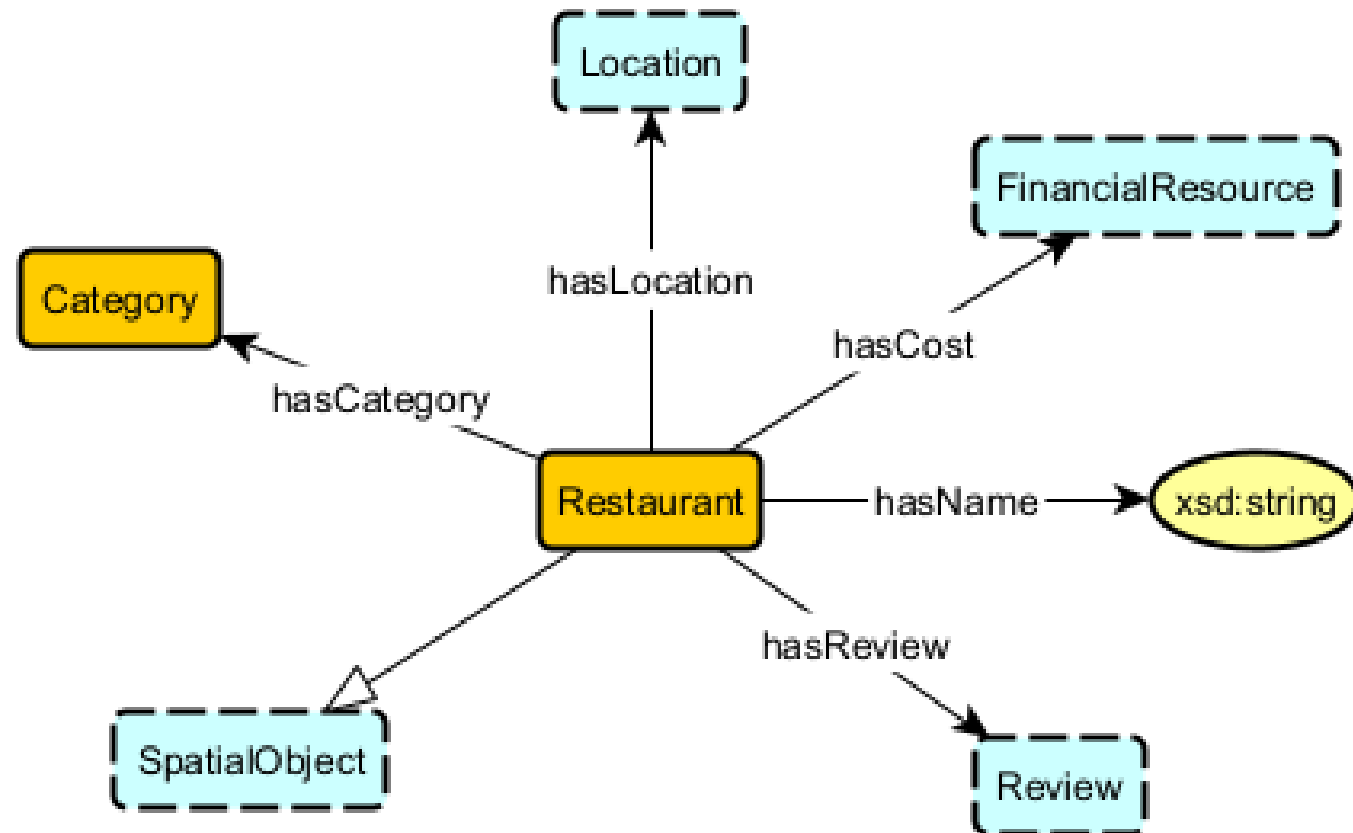
Restaurant

Source Pattern: Provenance, Temporal extent

Source Data: Restaurant info, Tour Dataset

Axioms

- Restaurant SubClassOf hasName some xsd:string
- Restaurant SubClassOf hasReview some Review
- Restaurant SubClassOf hasCategory exactly 1 Category
- Restaurant SubClassOf hasLocation exactly 1 Location
- Restaurant SubClassOf hasCost exactly 1 FinancialResource
- Restaurant SubClassOf SpatialObject



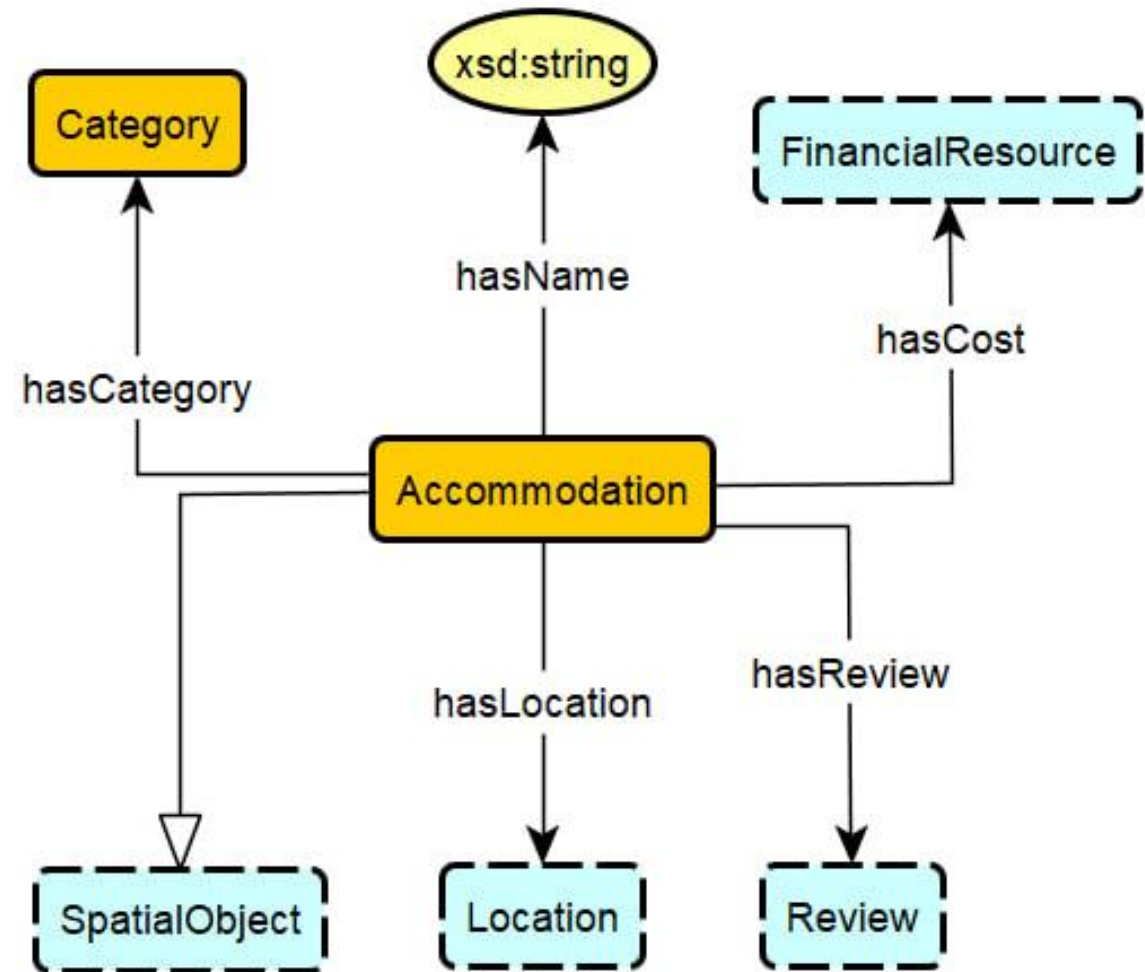
Accommodation

Source Pattern: Part-whole,
Quantity, SpatioTemporalExtent

Source Data: Berlin Airbnb Dataset,
Tour Dataset

Axioms

- Accommodation SubClassOf hasName some xsd:string
- Accommodation SubClassOf hasReview some Review
- Accommodation SubClassOf hasLocation exactly 1 Location
- Accommodation SubClassOf hasCategory exactly 1 Category
- Accommodation SubClassOf hasCost exactly 1 FinancialResource
- Accommodation SubClassOf SpatialObject



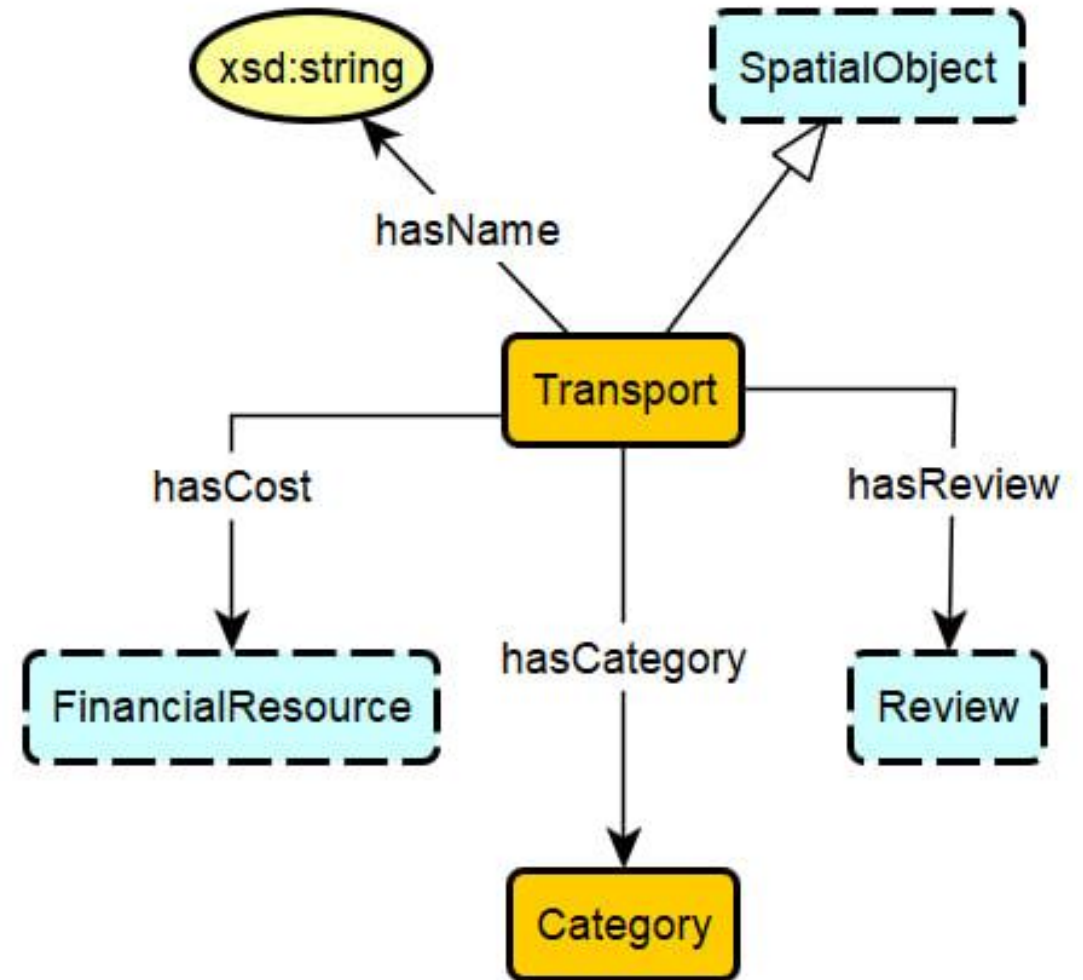
Transport

Source Pattern: Part-whole,
Hierarchical-cell-features

Source Data: Tour Dataset

Axioms

- Transport SubClassOf hasName some xsd:string
- Transport SubClassOf hasReview some Review
- Transport SubClassOf hasCategory exactly 1 Category
- Transport SubClassOf hasCost exactly 1 FinancialResource
- Transport SubClassOf SpatialObject



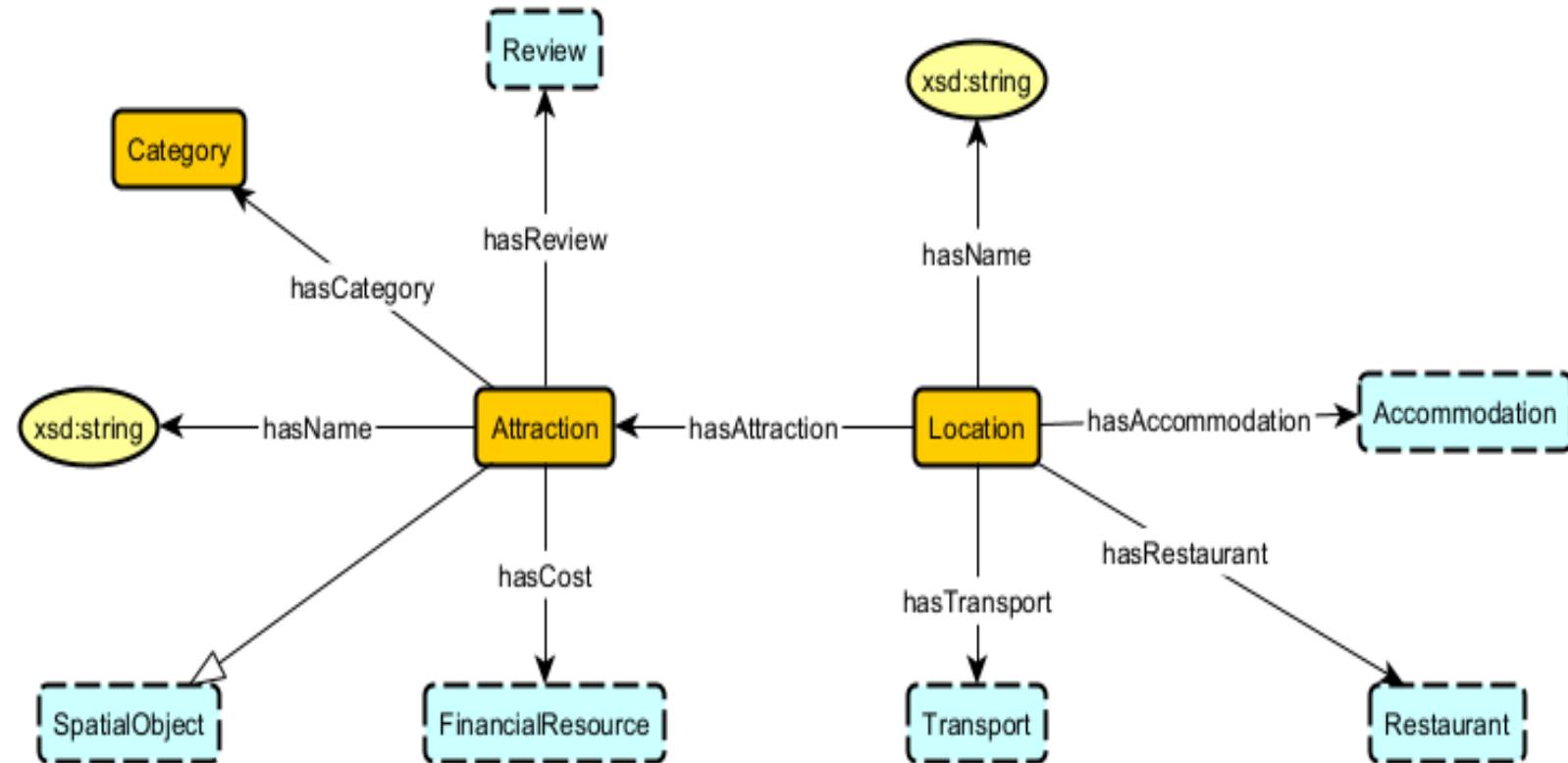
Location

Axioms

- Location SubClassOf hasAccommodation some Accommodation
- Location SubClassOf hasRestaurant some Restaurant
- Location SubClassOf hasTransport some Transport
- Location SubClassOf hasAttraction some Attraction
- Location SubClassOf hasName some xsd:string
- Attraction SubClassOf hasName some xsd:string
- Attraction SubClassOf hasReview some Review
- Attraction SubClassOf hasCategory exactly 1 Category
- Attraction SubClassOf hasCost exactly 1 FinancialResource
- Attraction SubClassOf SpatialObject

Source Pattern: SpatialObject or SpatialExtent

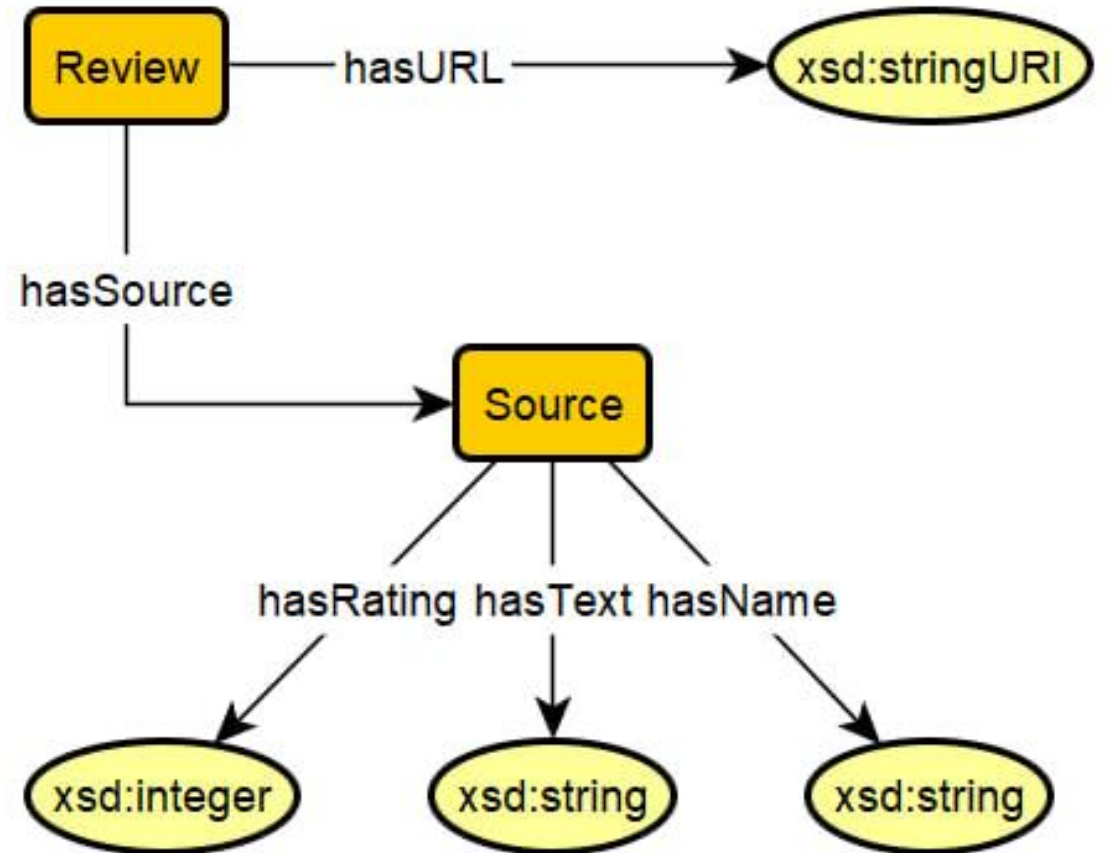
Source Data: Tour Dataset



Review

Axioms

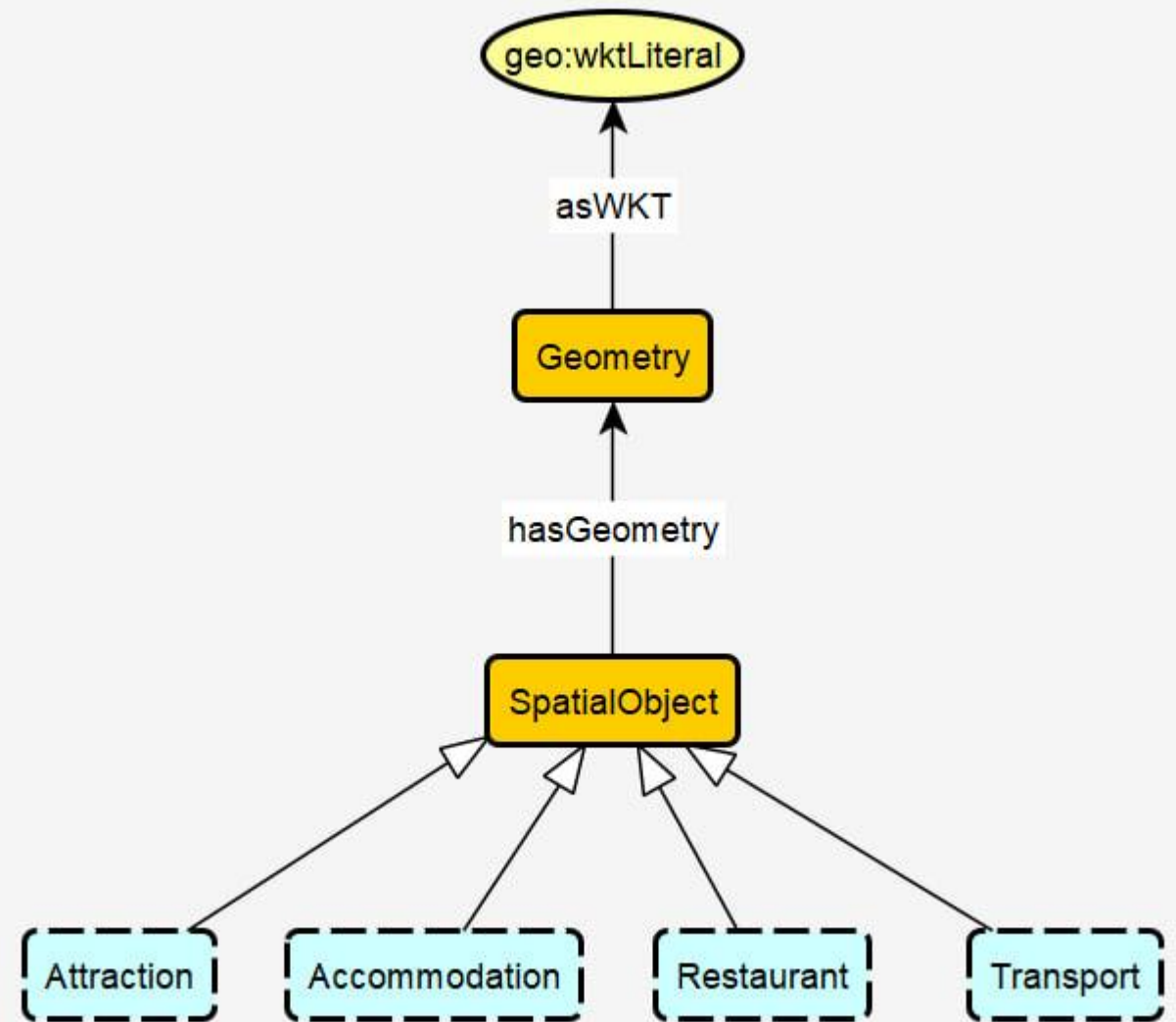
- Review SubClassOf hasURL some xsd:stringURI
- Review SubClassOf hasSource some Source
- Source SubClassOf hasName some xsd:string
- Source SubClassOf hasText some xsd:string
- Source SubClassOf hasRating some xsd:integer



Spatial Object

Axioms

- SpatialObject SubClassOf hasGeometry some Geometry
- Geometry SubClassOf asWKT some geo:wktLiteral
- Transport SubClassOf SpatialObject
- Attraction SubClassOf SpatialObject
- Restaurant SubClassOf SpatialObject
- Accommodation SubClassOf SpatialObject



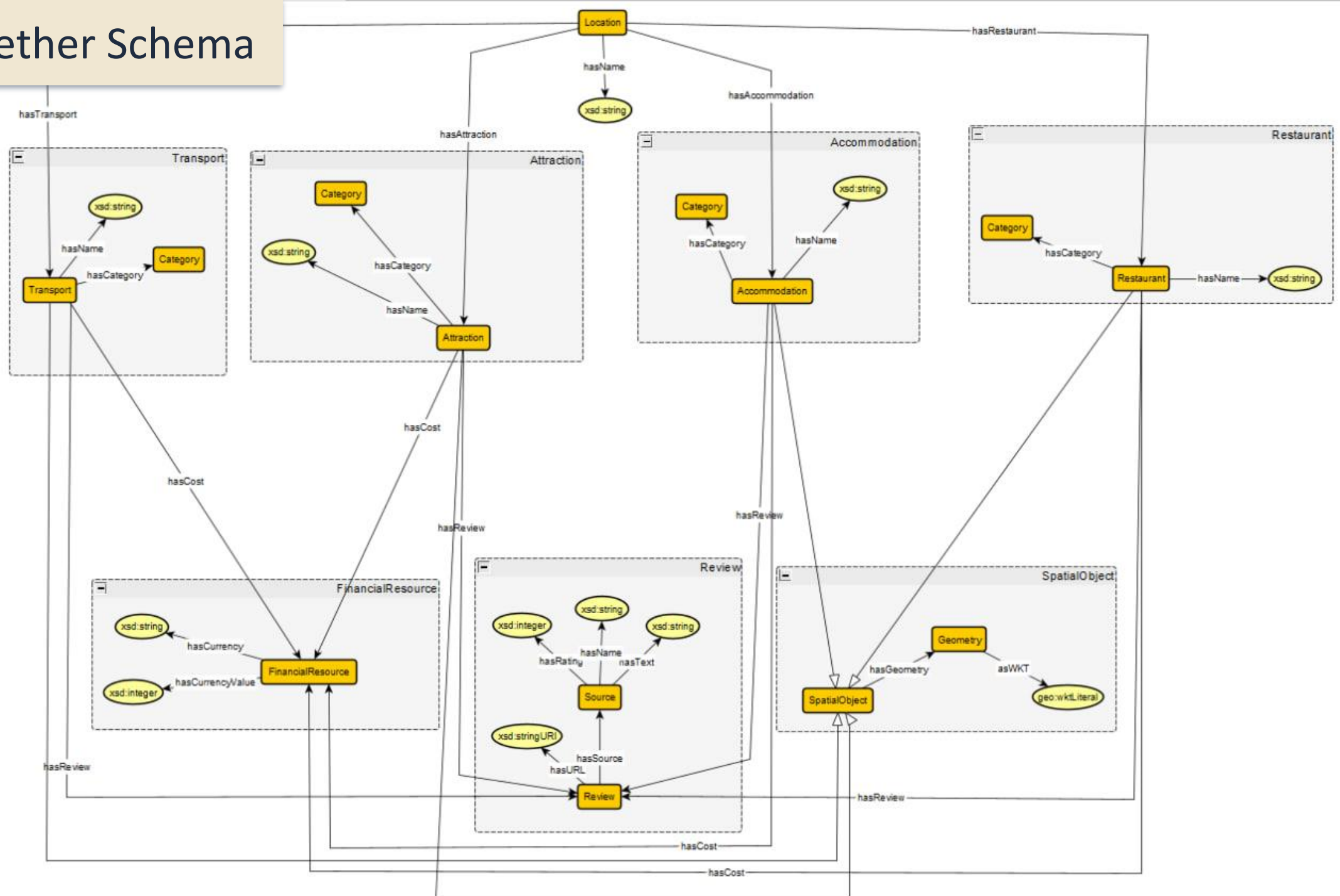
Category

Axioms

- Transport SubClassOf hasCategory exactly 1 Category
- Accommodation SubClassOf hasCategory exactly 1 Category
- Restaurant SubClassOf hasCategory exactly 1 Category
- Attraction SubClassOf hasCategory exactly 1 Category



Altogether Schema



CQ 2 – Budget based Transport

```
8 SELECT ?transport ?category ?currencyType ?price
9 WHERE {
10   ?transport a kl-ont:Transport ;
11             kl-ont:hasName ?transportName;
12             kl-ont:hasLocation ?location;
13             kl-ont:hasCategory ?category;
14             kl-ont:hasCost ?finuri .
15   ?finuri kl-ont:hasCurrency ?currencyType ;
16          kl-ont:hasCurrencyValue ?price .
17   ?location kl-ont:hasName ?locName .
18   FILTER (?price < 30)
19 } LIMIT 10
```

Table Response 10 results in 0.047 seconds

Simple view ☐ Ellipse ☒ Filter query results Page size:

	transport	category	currencyType	price
1	<https://kastle-lab.org/lod/resource/1850>	<https://kastle-lab.org/lod/resource/Boat_or_Ferry>	USD	"25"^^<http://www.w3.org/2001/XMLSchema#integer>
2	<https://kastle-lab.org/lod/resource/31654>	<https://kastle-lab.org/lod/resource/Road>	USD	"18"^^<http://www.w3.org/2001/XMLSchema#integer>
3	<https://kastle-lab.org/lod/resource/38045>	<https://kastle-lab.org/lod/resource/Travel_Lounge>	USD	"20"^^<http://www.w3.org/2001/XMLSchema#integer>
4	<https://kastle-lab.org/lod/resource/8584>	<https://kastle-lab.org/lod/resource/Bus_Line>	USD	"28"^^<http://www.w3.org/2001/XMLSchema#integer>
5	<https://kastle-lab.org/lod/resource/11744>	<https://kastle-lab.org/lod/resource/Bus_Line>	USD	"29"^^<http://www.w3.org/2001/XMLSchema#integer>
6	<https://kastle-lab.org/lod/resource/43496>	<https://kastle-lab.org/lod/resource/Taxi>	USD	"24"^^<http://www.w3.org/2001/XMLSchema#integer>
7	<https://kastle-lab.org/lod/resource/37315>	<https://kastle-lab.org/lod/resource/Train_Station>	USD	"21"^^<http://www.w3.org/2001/XMLSchema#integer>

CQ 3 – Activities based on Location

```
8 SELECT ?location ?attraction ?category
9 WHERE {
10   ?location a kl-ont:Location;
11   kl-ont:hasAttraction ?attraction .
12   ?attraction kl-ont:hasCategory ?category
13
14   FILTER (?location = kl-res:Amsterdam)
15
16 } LIMIT 10
```

Table Response 10 results in 0.046 seconds

Simple view ☐ Ellipse ☒ Filter query results

	location	attraction	category
1	<https://kastle-lab.org/lod/resource/Amsterdam>	<https://kastle-lab.org/lod/resource/29216>	<https://kastle-lab.org/lod/resource/Skydiving>
2	<https://kastle-lab.org/lod/resource/Amsterdam>	<https://kastle-lab.org/lod/resource/29252>	<https://kastle-lab.org/lod/resource/Harbor_Marina>
3	<https://kastle-lab.org/lod/resource/Amsterdam>	<https://kastle-lab.org/lod/resource/29089>	<https://kastle-lab.org/lod/resource/Nightclub>
4	<https://kastle-lab.org/lod/resource/Amsterdam>	<https://kastle-lab.org/lod/resource/28933>	<https://kastle-lab.org/lod/resource/Hotel_Bar>
5	<https://kastle-lab.org/lod/resource/Amsterdam>	<https://kastle-lab.org/lod/resource/29295>	<https://kastle-lab.org/lod/resource/Hookah_Bar>
6	<https://kastle-lab.org/lod/resource/Amsterdam>	<https://kastle-lab.org/lod/resource/29200>	<https://kastle-lab.org/lod/resource/Cocktail_Bar>
7	<https://kastle-lab.org/lod/resource/Amsterdam>	<https://kastle-lab.org/lod/resource/29449>	<https://kastle-lab.org/lod/resource/Gym_Fitness_Center>

CQ 4 – Locations based on Activities

```
7
8 SELECT ?location ?attraction ?category
9 WHERE {
10   ?location a kl-ont:Location;
11   kl-ont:hasAttraction ?attraction .
12   ?attraction kl-ont:hasCategory ?category
13
14   FILTER (?category = kl-res:Skydiving)
15
16 } LIMIT 10
```

Table Response 10 results in 0.026 seconds

Simple view ☐ Ellipse ☒ Filter query results Pa

	location	attraction	category
1	<https://kastle-lab.org/lod/resource/Amsterdam>	<https://kastle-lab.org/lod/resource/29216>	<https://kastle-lab.org/lod/resource/Skydiving>
2	<https://kastle-lab.org/lod/resource/Berlin>	<https://kastle-lab.org/lod/resource/95369>	<https://kastle-lab.org/lod/resource/Skydiving>
3	<https://kastle-lab.org/lod/resource/Tuscany>	<https://kastle-lab.org/lod/resource/187294>	<https://kastle-lab.org/lod/resource/Skydiving>
4	<https://kastle-lab.org/lod/resource/Tuscany>	<https://kastle-lab.org/lod/resource/187453>	<https://kastle-lab.org/lod/resource/Skydiving>
5	<https://kastle-lab.org/lod/resource/Tuscany>	<https://kastle-lab.org/lod/resource/187441>	<https://kastle-lab.org/lod/resource/Skydiving>
6	<https://kastle-lab.org/lod/resource/Berlin>	<https://kastle-lab.org/lod/resource/95992>	<https://kastle-lab.org/lod/resource/Skydiving>
7	<https://kastle-lab.org/lod/resource/Amsterdam>	<https://kastle-lab.org/lod/resource/29502>	<https://kastle-lab.org/lod/resource/Skydiving>

CQ 6 – Accommodation for budget (x-y) & location (z)

```
8
9 SELECT ?locName ?accomodationName ?currencyType ?price
10 WHERE {
11   ?location a kl-ont:Location;
12   kl-ont:hasName ?locName;
13   kl-ont:hasAccomodation ?accomodation .
14   ?accomodation kl-ont:hasName ?accomodationName;
15   kl-ont:hasCost ?financialRes .
16   ?financialRes kl-ont:hasCurrency ?currencyType ;
17               kl-ont:hasCurrencyValue ?price .
18   FILTER (?location = kl-res:London && ?price > 110 && ?price < 150)
19 } LIMIT 10
```

Table Response 10 results in 0.028 seconds

Simple view ☐ Ellipse ☒ Filter

	locName	accomodationName	currencyType	price
1	London	The Florida Room	USD	"140"^^<http://www.w3.org/2001/XMLSchema#integer>
2	London	Lidl	USD	"124"^^<http://www.w3.org/2001/XMLSchema#integer>
3	London	Sleeping Beauty Motel	USD	"138"^^<http://www.w3.org/2001/XMLSchema#integer>
4	London	Premier Inn	USD	"129"^^<http://www.w3.org/2001/XMLSchema#integer>
5	London	Church Cottage	USD	"112"^^<http://www.w3.org/2001/XMLSchema#integer>
6	London	Chumleigh Lodge	USD	"149"^^<http://www.w3.org/2001/XMLSchema#integer>
7	London	AirBNB 37 Commercial Road	USD	"142"^^<http://www.w3.org/2001/XMLSchema#integer>

Retrospective

Rakesh

Happy about

- Levelling-Up in KGs
- Revision of Logics
- Grip on concepts

Hard time

- Finding Data

Would be optimal

- If more of Protégé was learnt/taught

Chaitanya

Happy about

- Unconstrained flow of Course
- Enjoyed being the single group

Hard time

- Overwhelming content in the beginning

Would be optimal

- If the initial content lectures lasted few more weeks

Calvin

Happy about

- Team-work
- Reintroduction to logic & other course material.

Hard time

- Getting and fitting data to our project

Would be optimal

- If the lectures were 1 day per week and then group work was the other day

Skyler

Happy about

- Subject not being too difficult
- Having group that actually wanted to work

Hard time

- Finding good data

Would be optimal

- If the lectures were tapered off a bit more slowly like around 5 or 6 weeks



Thank you!