Computer Science and Computer Engineering (CS)

November 12, 2020

Characterization of Objects in Indoor Spaces of Human Occupation Using Knowledge Graphs
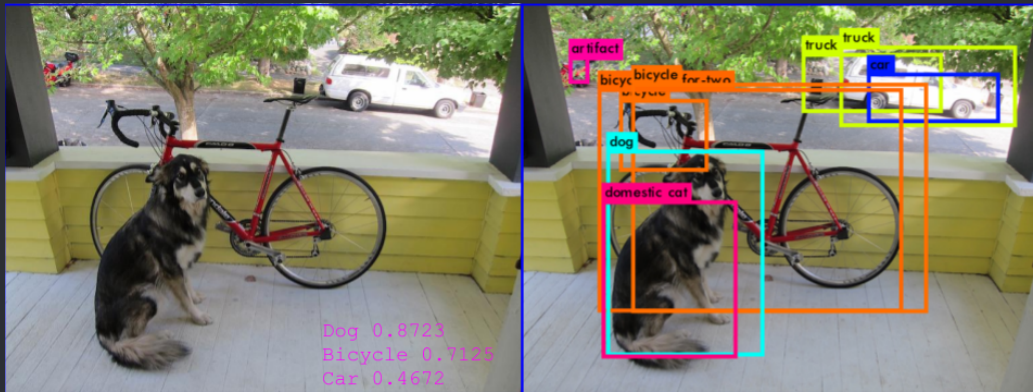
Rodrigo Francisco (FI, UNAM)

Object Detection
Characteristics

Object detection has *two* main tasks:

- Image classification.
- Object localization.

Object Detection
Object localization

R-CNN: *Regions with CNN features*

warped region

aeroplane? no.
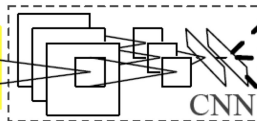
person? yes.

tvmonitor? no.

CNN

1. Input image

2. Extract region proposals (~2k)

3. Compute CNN features
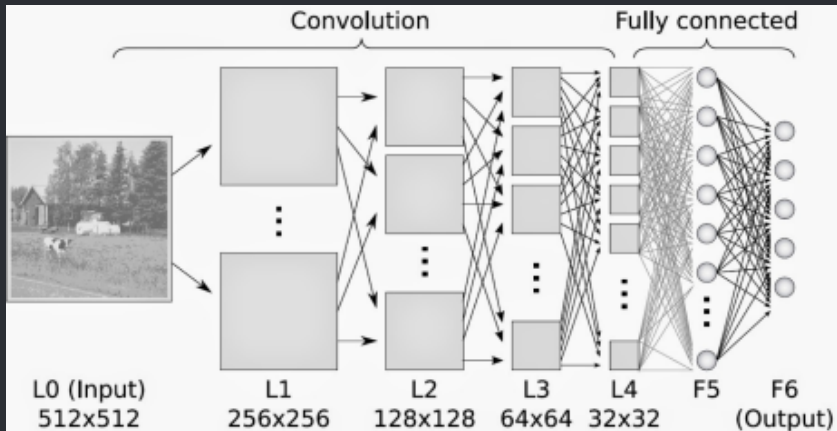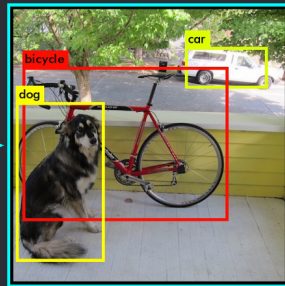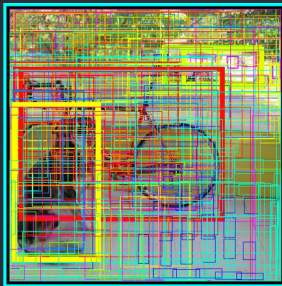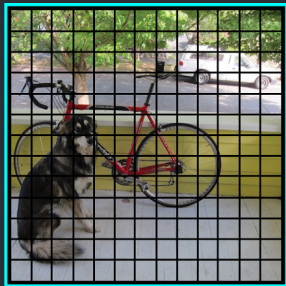
4. Classify regions
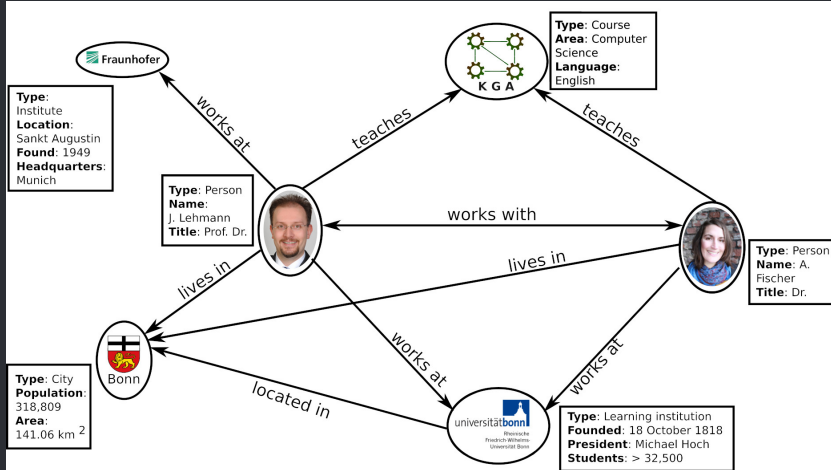
Object detection
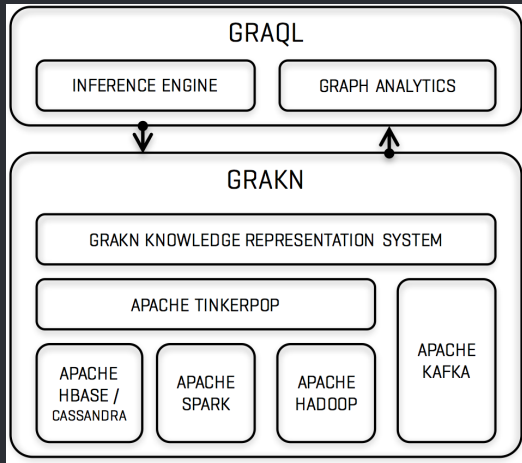*Convolutional Layer*

Object detection
YOLOv2 model

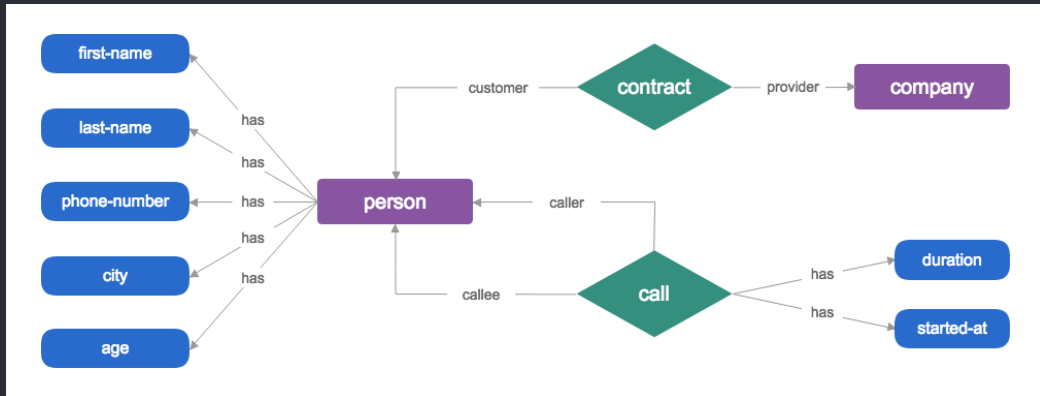# Knowlegde graph
Example case

Grakn
Architecture

Grakn
Schema

Grakn
DDL & DML


```
DATA DEFINITION

DEFINE          define schema_statement+;
UNDEFINE        undefine schema_statement+;


DATA MANIPULATION

GET             match pattern+;  get variable*;  modifiers*;
DELETE          match pattern+;  delete variable+;  modifiers*;
INSERT          [match pattern+;] insert instance_statement+;

GROUP           match pattern+;  get variable*;  group variable;  [count;]
AGGREGATE VALUES match pattern+;  get variable*;  aggregate_function variable;
COMPUTE ANALYTICS compute condition+;
```
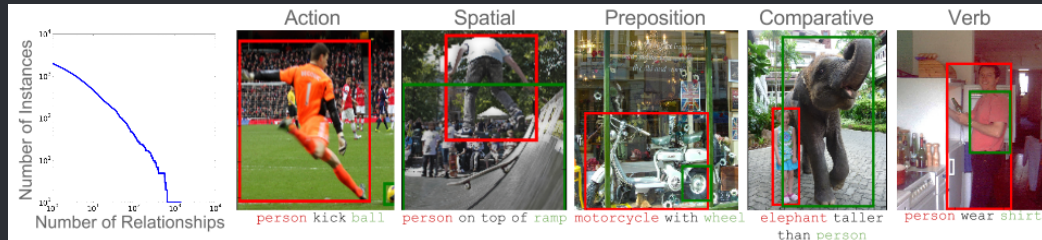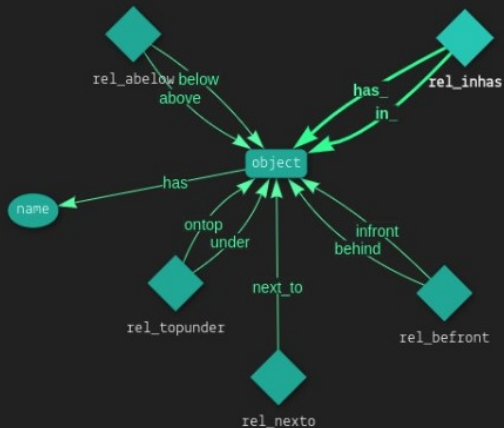
one_or_more+ zero_or_more* [optional]

Solution
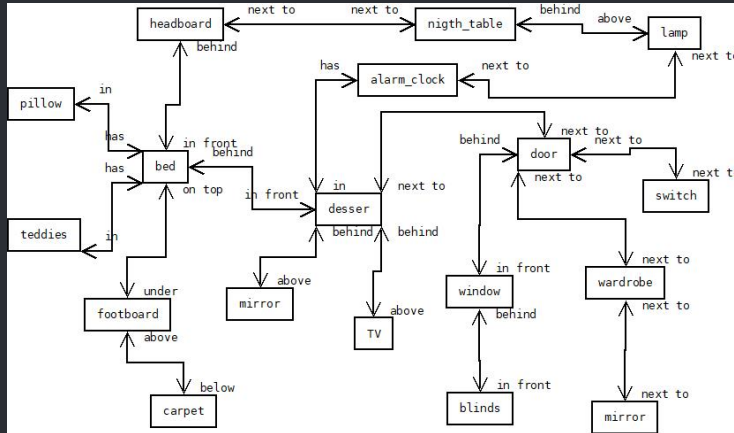
Types of semantic relationships

Solution
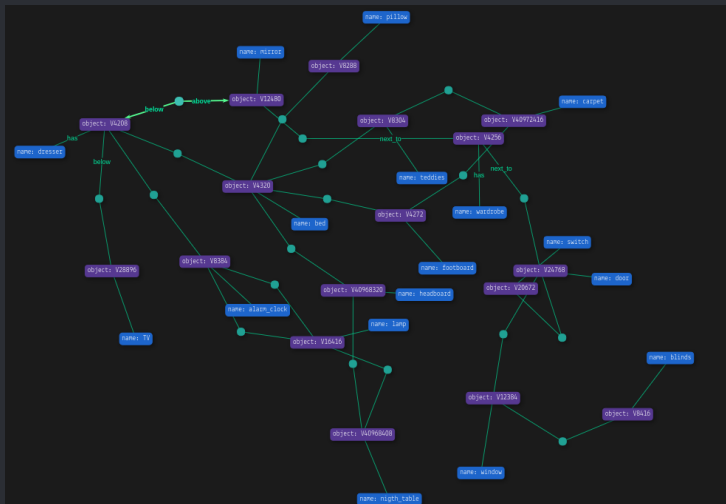*Predicates of the semantic relationships types*

Solution

Relationships draft

The following figure shows a draft of all the relations ships recover from our study object.

Solution
Graph generate with Grakn

Solution
Graph generate with Grakn

Conclusions

- We show that it is possible to create a knowledge graph from the semantic relationships that occur in an indoor space of human ocuppation

- The most accurate predicate, in our scenario for binding two objects is the *spatial* relationship.
    - Indeed, in most localization scenarios this predicate is the most accurate because the other produces so many combinations.

- Grakn is a very outstading tool to create knowlegde graph with a given list of predicates.
    - Grakn even offers the possibility of making *machine reasoning* from the data input.

- We seek to create complementary datasets that will help convolutional layer neural network to reduce processing time.