Object extraction techniques and visual image search with Semantic web techniques

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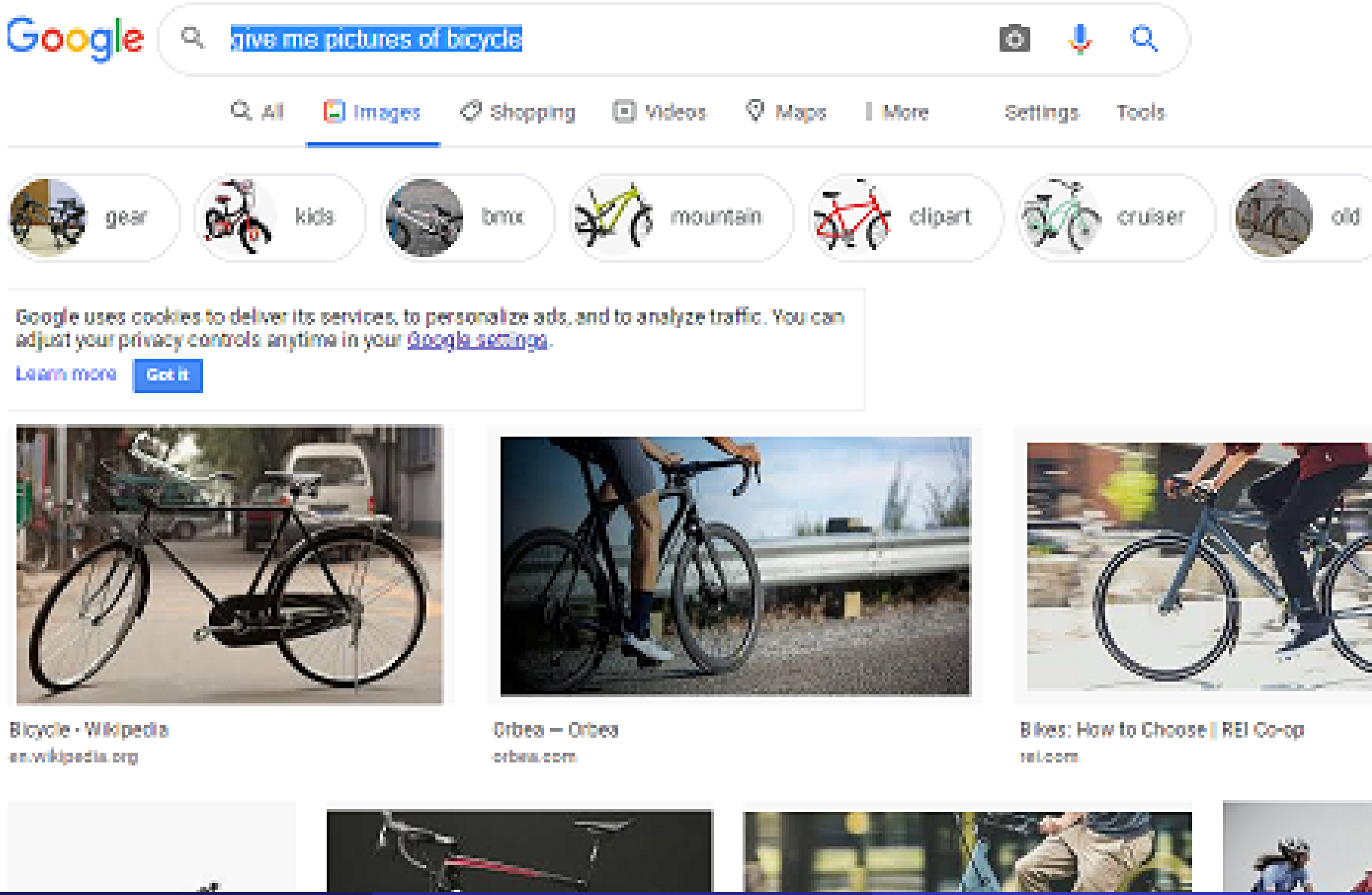
July 2020

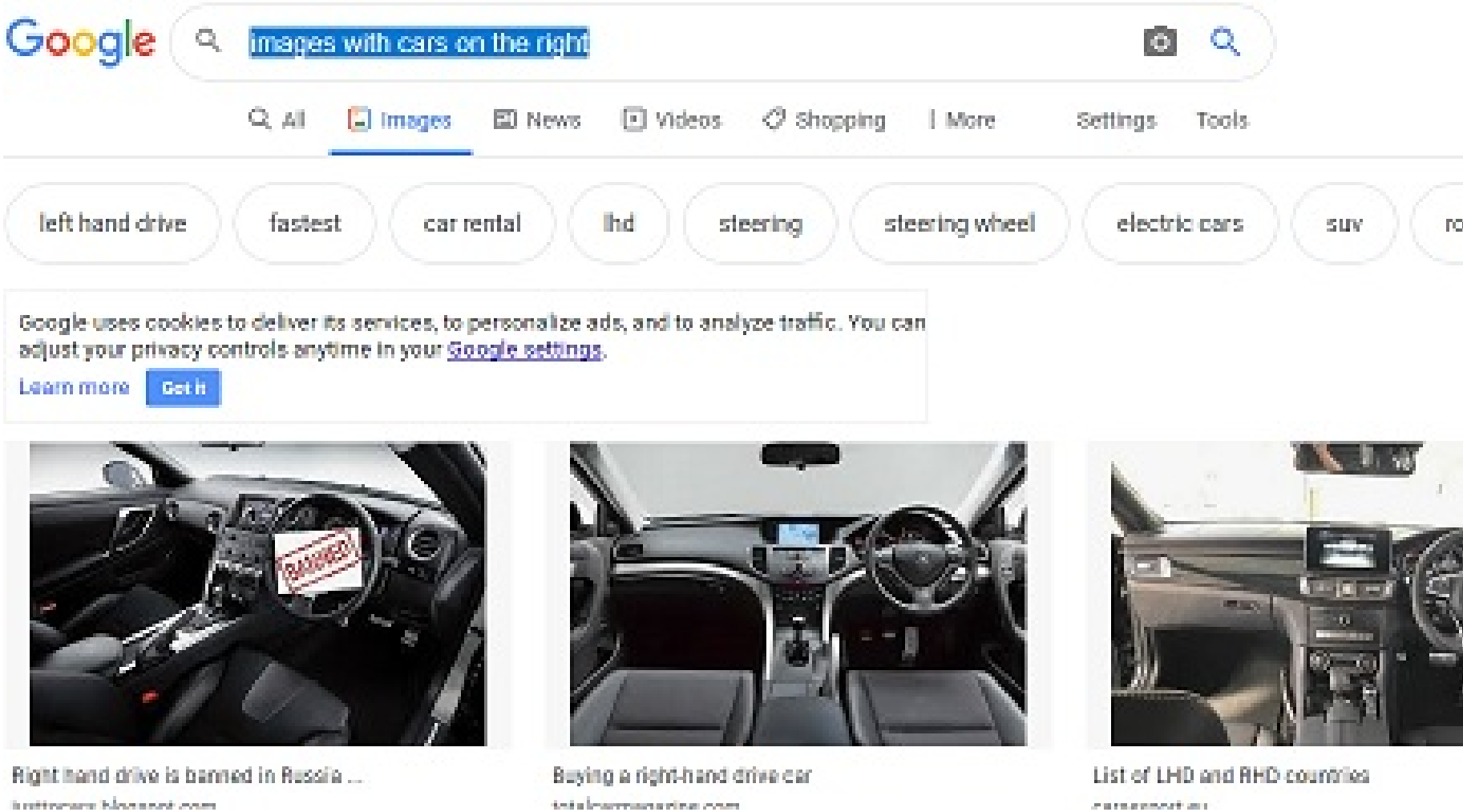
Introduction:Just Google

- images with bicycles



Google vs Qanswer

- images with cars on the right



Qanswer: images with car in the right

give me pictures of car in the right | Go

Confidence : 39 %

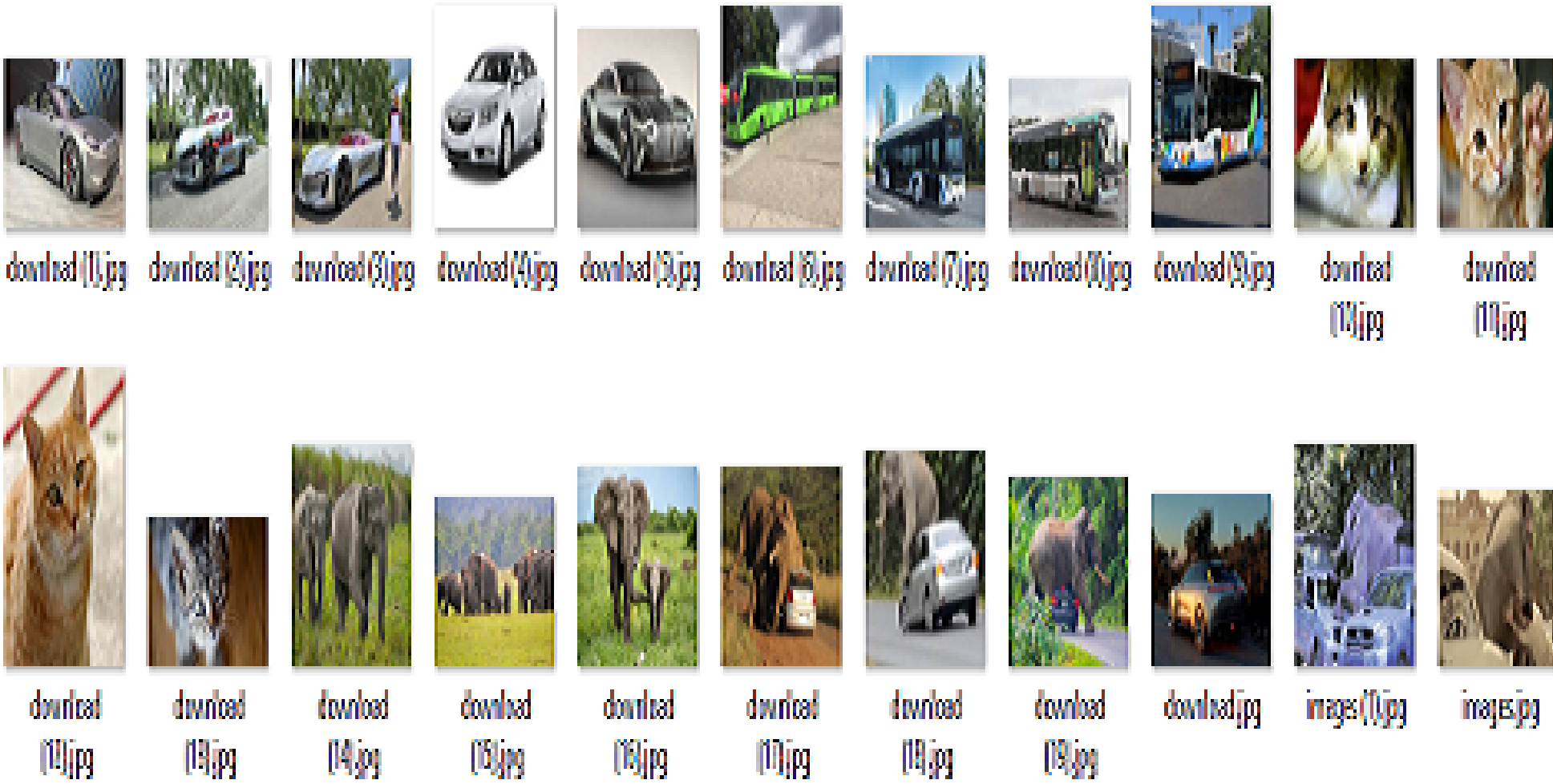
SPARQL LIST | DID YOU MEAN | DIRECT ANSWER

Is this the right answer? Yes No

/ has on the right / car

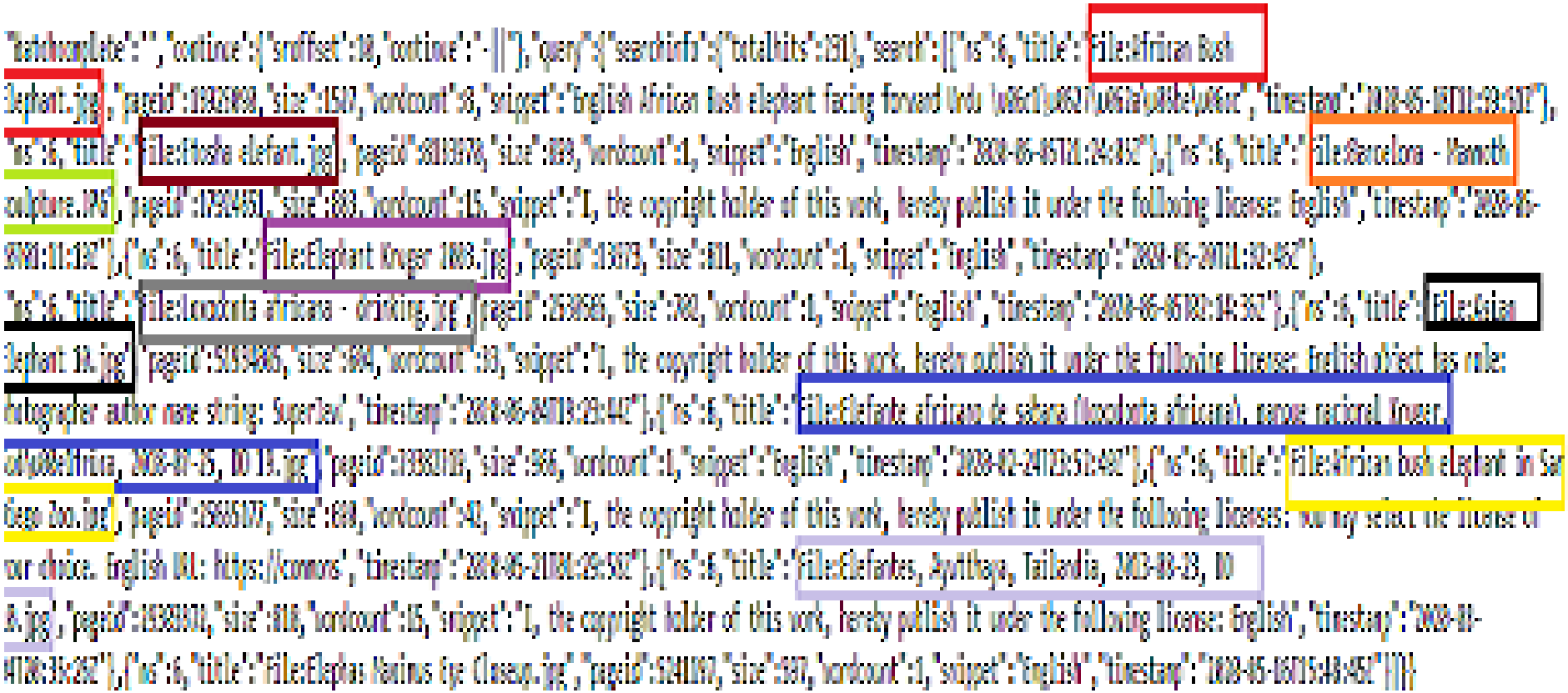
download (2).jpg

Initialisation of work with a set of 22 images



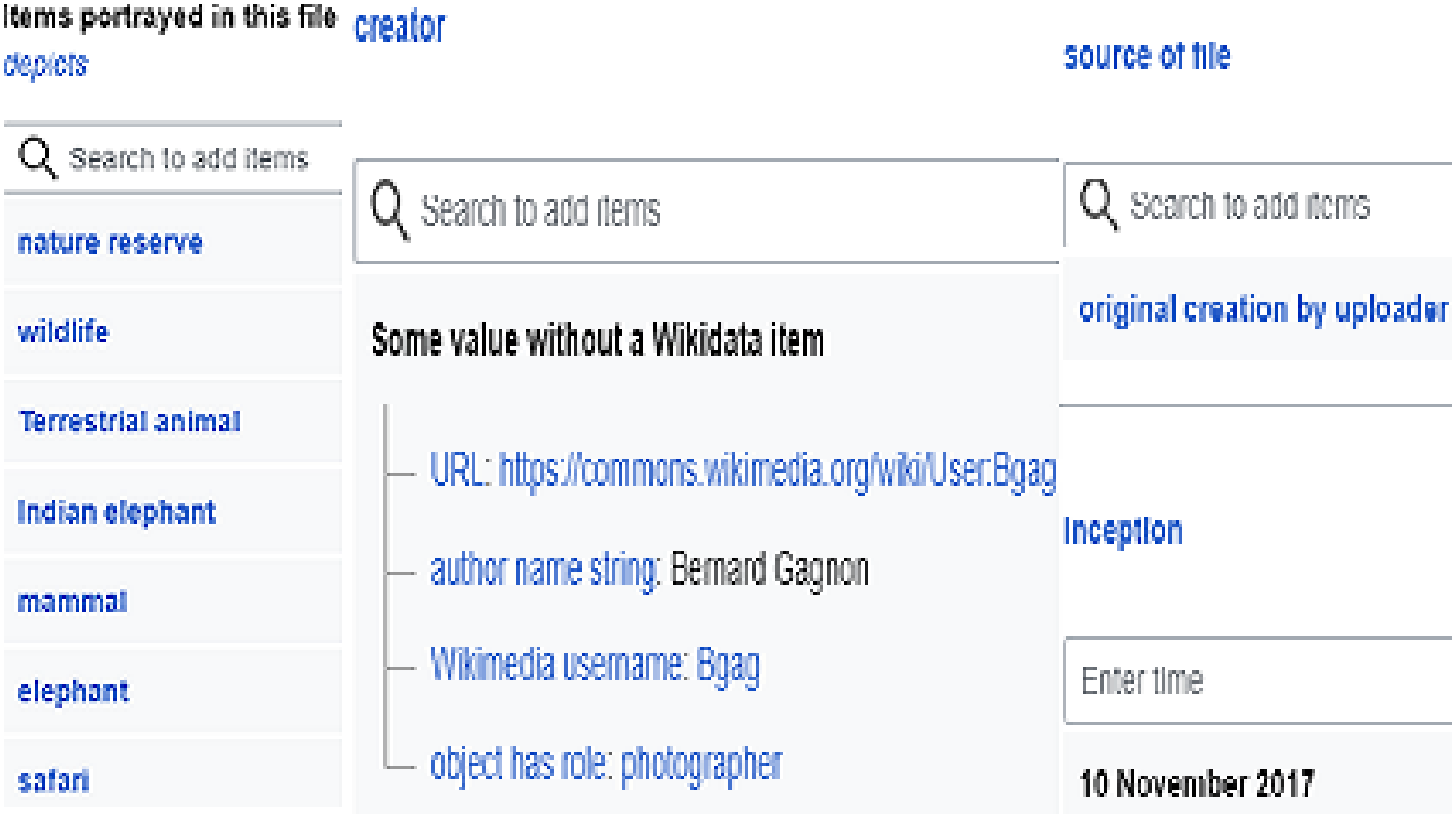
special Wikimediacommons api give images

https://commons.wikimedia.org/w/api.php?action=query&list=search&srsearch=haswbstatement:P180=Q7378&srnamespace=6&format=json



special Wikimediacommons api give human hand-annotated structured data

https://commons.wikimedia.org/wiki/File:African_elephants,_Lake_St_Lucia_06.jpg



special Wikimediacommons api give human hand-annotated structured data like copyright details

special Wikimediacommons api QID modified

https://commons.wikimedia.org/w/api.php?action=query&list=search&srsearch=haswbstatement:P180=Q5113&srnamespace=6&format=json

https://commons.wikimedia.org/w/api.php?action=query&list=search&srsearch=haswbstatement:P180=Q7378&srnamespace=6&format=json

Q7378: elephant

Q5113:bird

general API documentation link

https://www.mediawiki.org/wiki/API:Search

additional parameter introduced in the special Wikimediacommons api

https://commons.wikimedia.org/w/api.php?action=query&list=search&srsearch=haswbstatement:P180=Q7378&srnamespace=6&srlimit=500&format=json

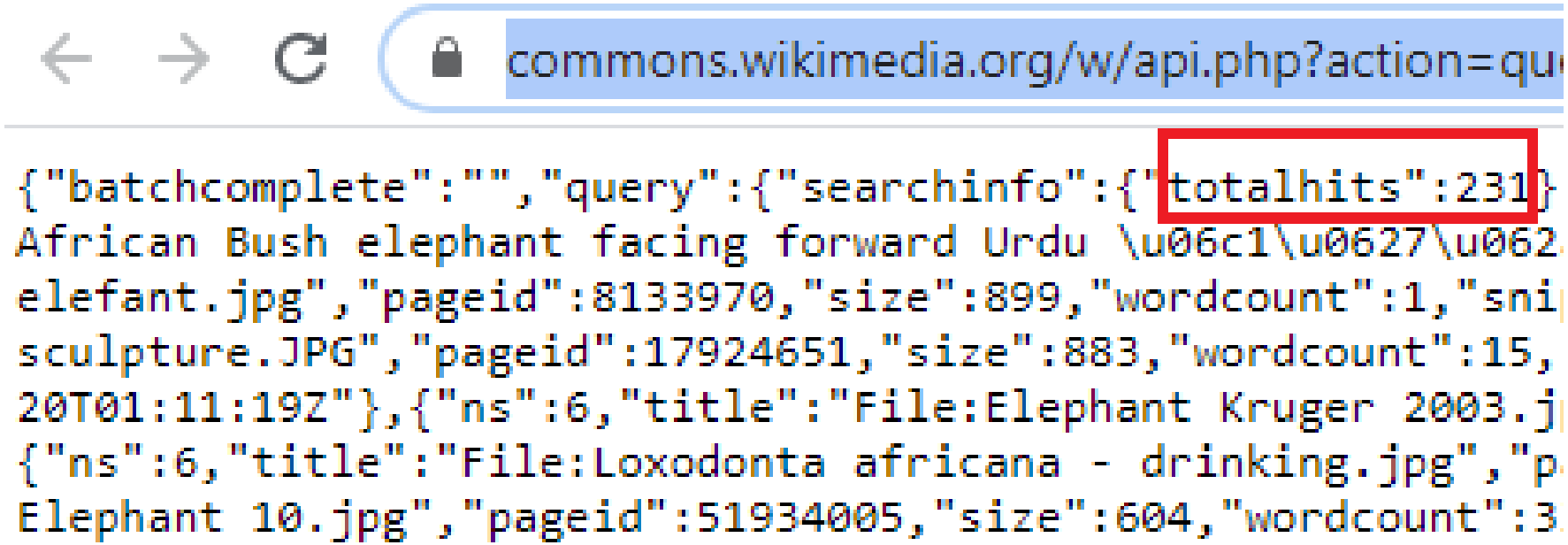
https://commons.wikimedia.org/w/api.php?action=query&list=search&srsearch=haswbstatement:P180=Q7378&srnamespace=6&srlimit=500&format=json

srlimit=10(by default)

srlimit=500(max value allowed)

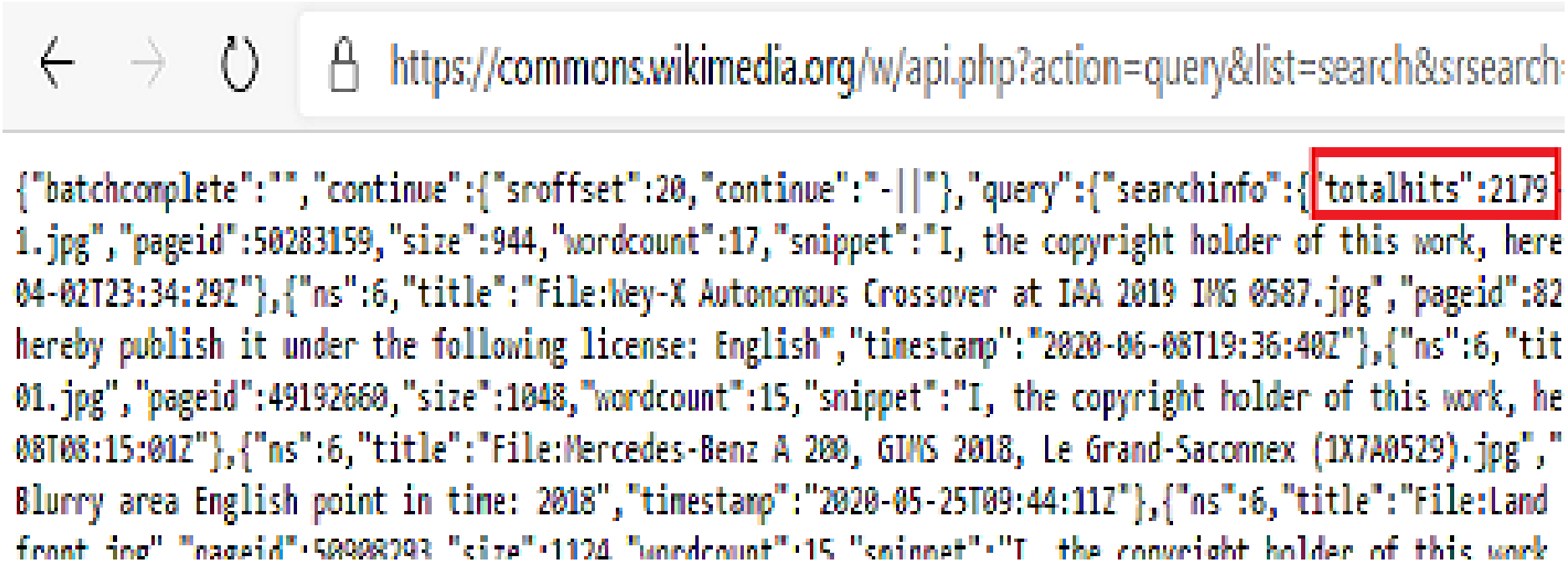
additional parameter introduced in the special Wikimediacommons api and we get 231 images for Q7378

https://commons.wikimedia.org/w/api.php?action=query&list=search&srsearch=haswbstatement:P180=Q7378&srnamespace=6&srlimit=500&format=json



special Wikimediacommons api gives more than 500 images for Q1420(car)

https://commons.wikimedia.org/w/api.php?action=query&list=search&srsearch=haswbstatement:P180=Q1420&srnamespace=6&srlimit=10&format=json&sroffset=10&continue=-||



additional parameter,sroffset, introduced in the special Wikimediacommons api and we iterate over

https://commons.wikimedia.org/w/api.php?action=query&list=search&srsearch=haswbstatement:P180=Q1420&srnamespace=6&srlimit=10&format=json&sroffset=10&continue=-||

```
i = 10
while i <= 3000:
    i += 10
    PARAMS['srsearch'] = 'haswbstatement:P180=' + inputQid
    PARAMS['sroffset'] = i
```

Qanswer: images with bicycle in the right

give me pictures of bicycle in the right | Go

Confidence : 39 %

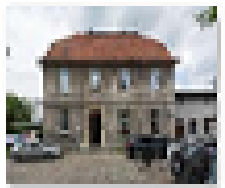
SPARQL LIST

Is this the right answer? Yes No

/ has on the right / bicycle

LIST IMAGES

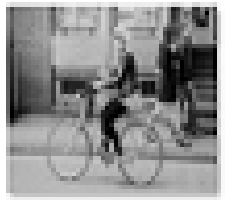
set of bicycle images


2016_Strzelin%2C_ul._%C5%9Awi%C4%99tego_Floriana_14_1.jpg

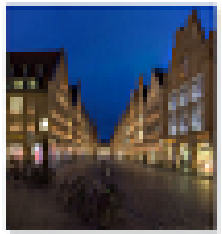

20080804_freight_bicycle_Shanghai_2383.jpg


Barclays_Cycle_Hire%2C_St._Mary_Axe%2C_Aldgate.jpg


Chapelle_de_Bastide_vers_Lasbros_DSC_0598.JPG

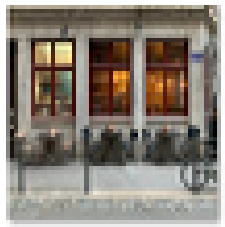

Cycling_Amsterdam.jpg


Juist%2C_Altes_Warmbad_--_2014_--_3630.jpg


M%C3%BCnster%2C_Prinzipalmarkt_--_2014_--_4689-93.jpg

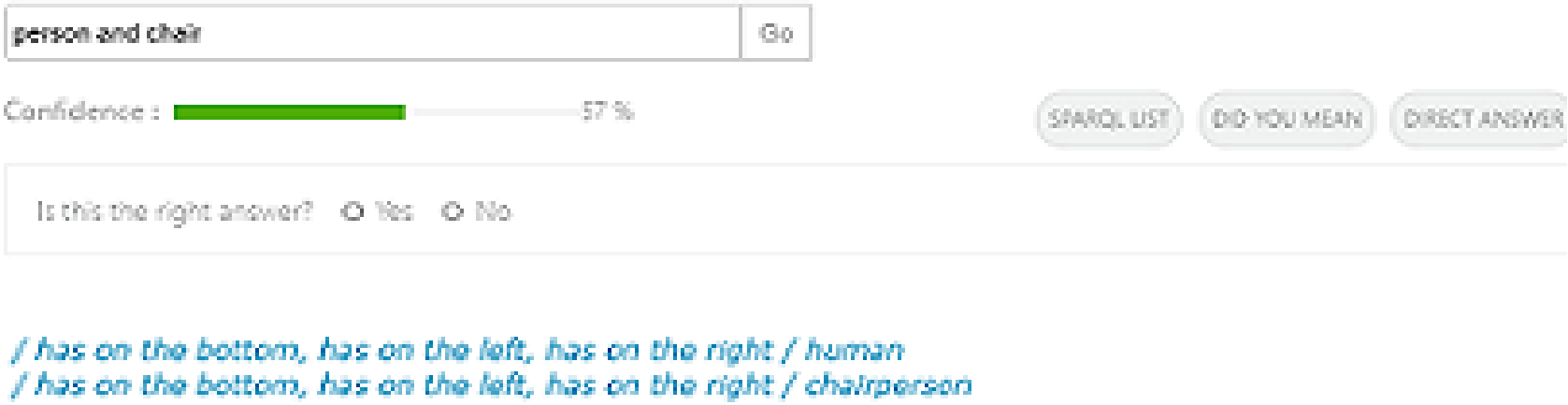

Preah_Sihanouk_National_Park_08.jpg

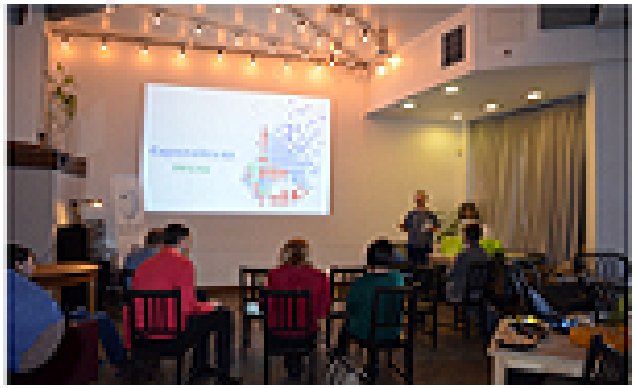

Puch_Olympian_12_01.jpg


Restaurant_Laska_-_c%C3%B4t%C3%A9_rue_Terraille_%C3%A0_Lyon...

Qanswer: Image-Object Relation–contains

- person and chair





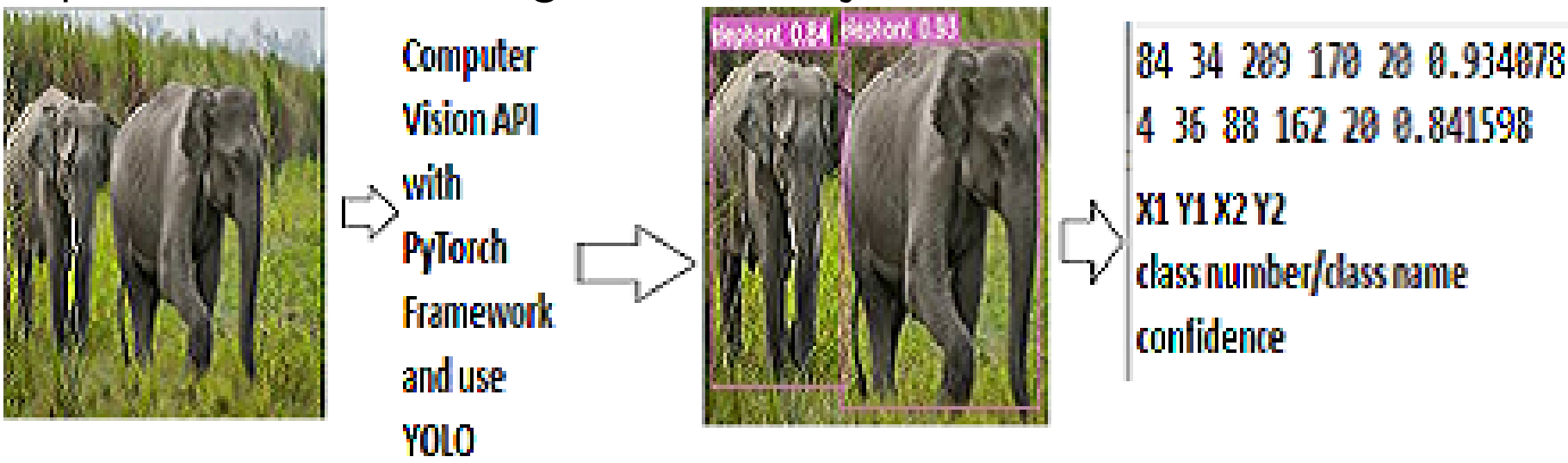
Content

- Implementation of an Algorithm for object extraction.
- Design of a semantic web modelling for extracted data.
- Implementation of a visual image search engine through Qanswer.

Implementation of an Algorithm for object extraction.

YOLO-(You Only Look Once)

- Implementation of an Algorithm for object extraction.

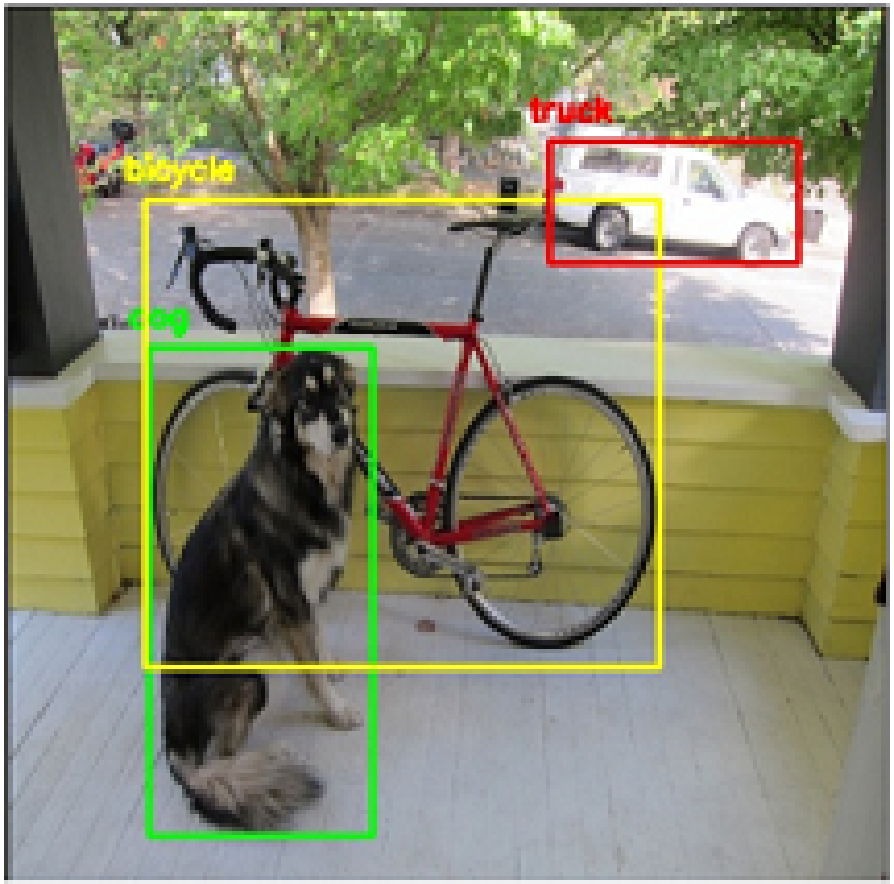


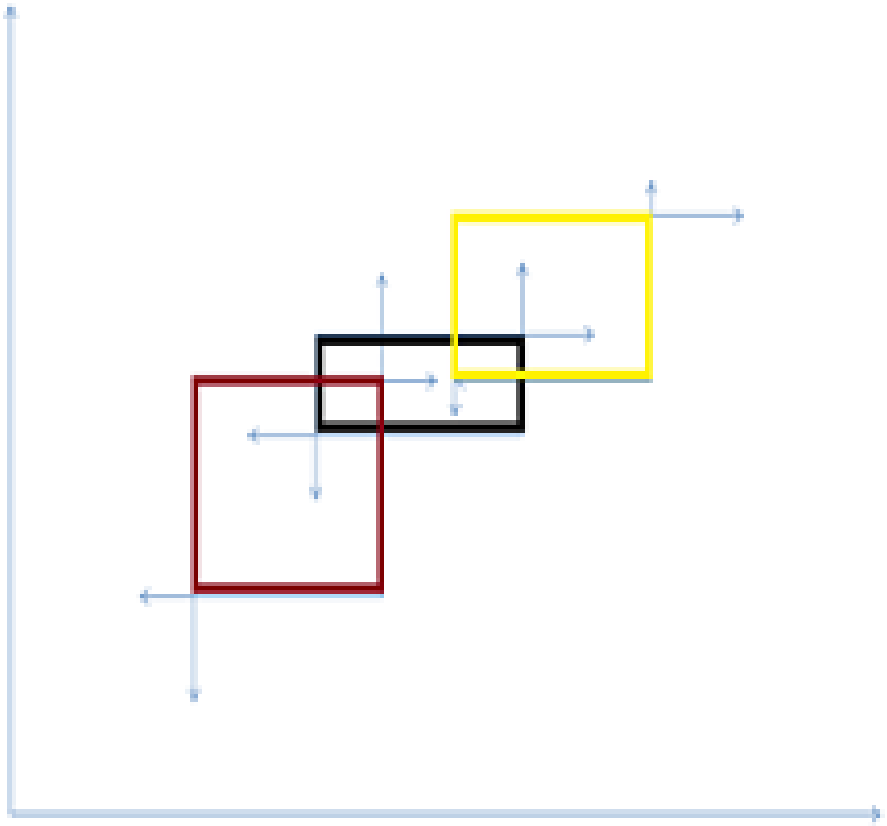
Class Number, Class Name, QID

https://github.com/pjreddie/darknet/blob/master/data/coco.names

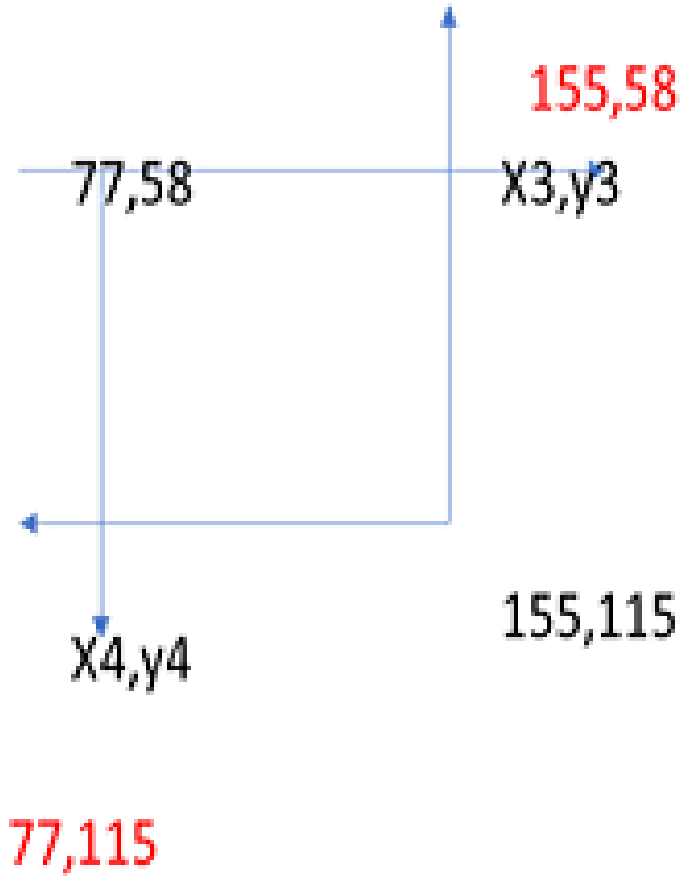
```
0. person-Q215627
1.bicycle-Q11442
2.car- Q1420
3.motorbike-Q34493
4.aeroplane-Q197
5.bus-Q5638
6.train-Q870
7.truck-Q43193
8.boat-Q25872
9.traffic light-Q8004
10.fire hydrant-Q634259
11.stop sign-Q250429
12.parking meter-Q953960
13.bench-Q204776
14.bird-Q5113
15.cat-Q4167836
16.dog-Q144
17.horse-Q726
18.sheep-Q7368
19.cow-Q830
20.elephant-Q7378
21.bear-Q30090244
22.zebra-Q32789
23.giraffe-Q862089
24.backpack-Q5843
25.umbrella-Q41607
26.handbag-Q467505
27.tie-Q44416
28.suitcase-Q200814
29.frisbee-Q131689
30.skis-Q172226
31.snowboard-Q178131
32.sports ball-Q63347096
33.kite-Q107061
34.baseball bat-Q809910
35.baseball glove-Q809894
36.skateboard-Q15783
37.surfboard-Q457689
38.tennis racket-Q153362
39.bottle-Q80228
40.wine glass-Q1531455
41.cup-Q81727
42.fork-Q81881
43.knife-Q32489
44.spoon-Q81895
45.bowl-Q153988
46.banana-Q503
47.apple-Q89
48.sandwich-Q28803
49.orange-Q39338
50.broccoli-Q47722
51.carrot-Q81
52.hot dog-Q181055
53.pizza-Q177
54.donut-Q192783
55.cake-Q13276
56.chair-Q15026
57.sofa-Q131514
58.pottedplant-Q203834
59.bed-Q42177
60.diningtable-Q10578291
61.toilet-Q7857
62.tvmonitor-Q289
63.laptop-Q3962
64.mouse-Q7987
65.remote-Q185091
66.keyboard-Q250
67.cell phone-Q17517
68.microwave-Q127956
69.oven-Q36539
70.toaster-Q14890
71.sink-Q140565
72.refrigerator-Q37828
73.book-Q571
74.clock-Q376
75.vase-Q191851
76.scissors-Q40847
77.teddy bear-Q21347
78.hair drier-Q15004
79.toothbrush-Q13420
```

Bounding Box





Co-ordinate representation of Bounding Box



X3=x2=155, y3=y1=58;
x4=x1=77, y4=y2=115

Image-Object Relations

Image	relation	property value
	has on the left	
	has on the right	
	has on the top	
	has on the buttom	
	has in the center	

Algorithms for Image-Object Relations

Algorithm 1 has on the left and right

1: **if** $X - centre \leq 0.3 * X - ImageDimentions$ **then**
2: $hasontheleft \leftarrow object$
3: **else**
4: **if** $X - centre \geq 0.6 * X - ImageDimentions$ **then**
5: $hasontheright \leftarrow object$
6: **end if**
7: **end if**

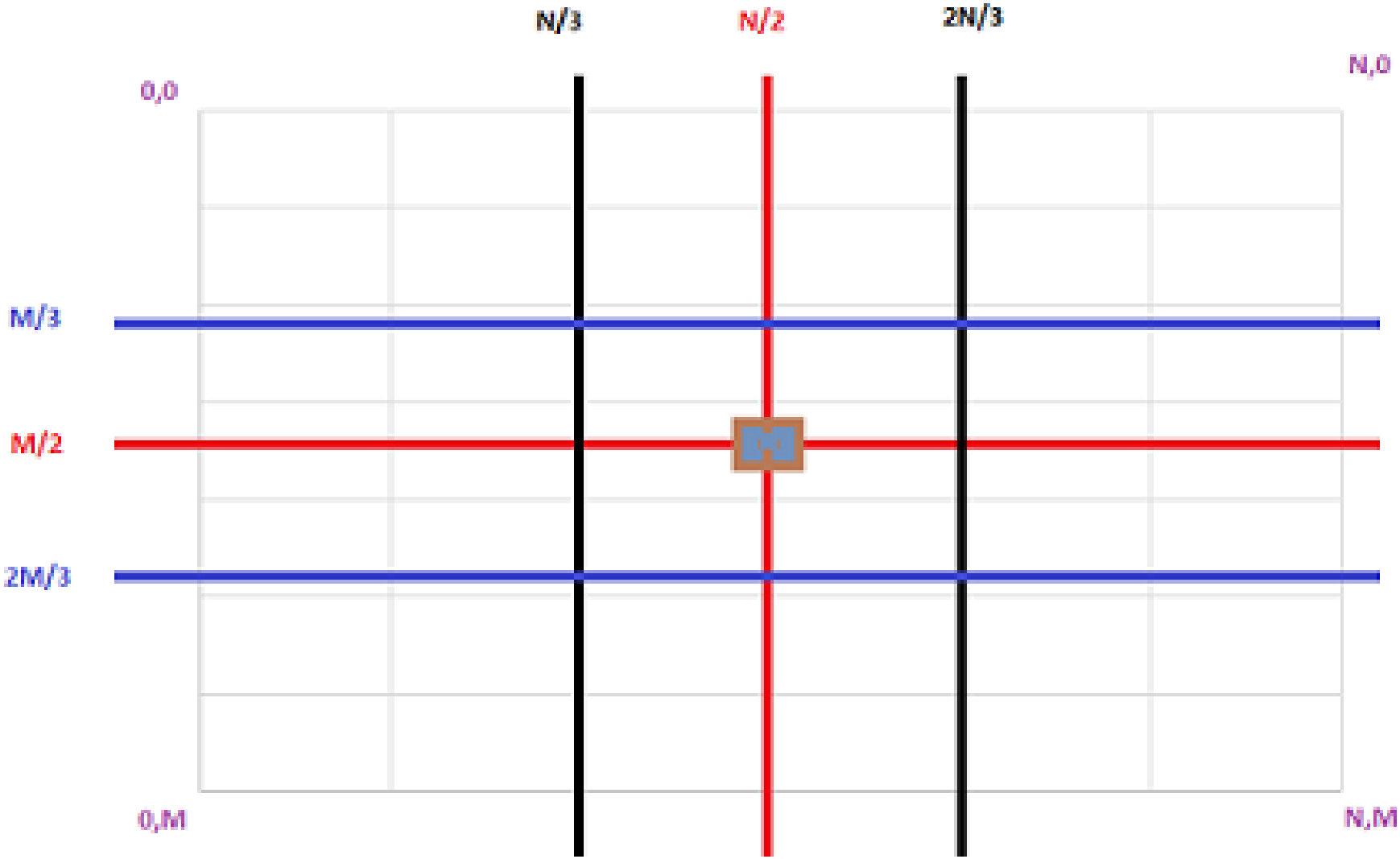
Algorithm 2 has on the top and bottom

1: **if** $Y - centre \leq 0.3 * Y - ImageDimentions$ **then**
2: $hasonthetop \leftarrow object$
3: **else**
4: **if** $Y - centre \geq 0.6 * Y - ImageDimentions$ **then**
5: $hasonthebottom \leftarrow object$
6: **end if**
7: **end if**

Algorithm 3 has in the center

1: **if** $X - centre \geq 0.3 * X - ImageDimentions$,
$X - centre \leq 0.66 * X - ImageDimentions$,
$Y - centre \geq 0.3 * Y - ImageDimentions$,
$Y - centre \leq 0.66 * Y - ImageDimentions$ **then**
2: $hasinthecenter \leftarrow object$

An attempt to show a graphical representation of tblrc



Using tblrc we create a csv file

X1	Y1	X2	Y2	object nar	Image nar	has on the left	has on the right	has on the	has on the bottom	has in the center
190	813	3897	1932	airplane	Antonov_	na	airplane	na	airplane	airplane
220	566	5021	1673	airplane	EBACE_20	na	airplane	na	airplane	airplane
742	1303	3933	2059	airplane	Embraer_I	na	airplane	na	airplane	airplane
889	1035	1378	1374	airplane	Kirchturm	na	airplane	na	airplane	airplane
172	278	4018	1722	airplane	Lufthansa	na	airplane	na	airplane	airplane
331	532	2362	1245	airplane	North_Am	na	airplane	na	airplane	airplane
1355	704	1444	813	person	North_Am	na	person	na	person	person
833	251	2202	1761	airplane	Paris_Air_	na	airplane	na	airplane	airplane
1460	1207	1579	1738	person	Playing_ir	na	person	na	person	na
224	1063	466	1813	person	Playing_ir	person	na	na	person	na
756	1286	845	1562	person	Playing_ir	person	na	na	person	na
2374	990	2486	1359	person	Playing_ir	na	person	na	person	na
468	1194	546	1264	frisbee	Playing_ir	frisbee	na	na	frisbee	na
264	273	2284	1571	airplane	RUAG_Avi	na	airplane	na	airplane	airplane

Design of a semantic web modelling for extracted data.

Image-Object Object-Object Relation

- Design of a semantic web modelling based on the csv file.

Image	relation	property value
	has on the left	
	has on the right	
	has on the top	
	has on the buttom	
	has in the center	

Subject
URI
Blank Node

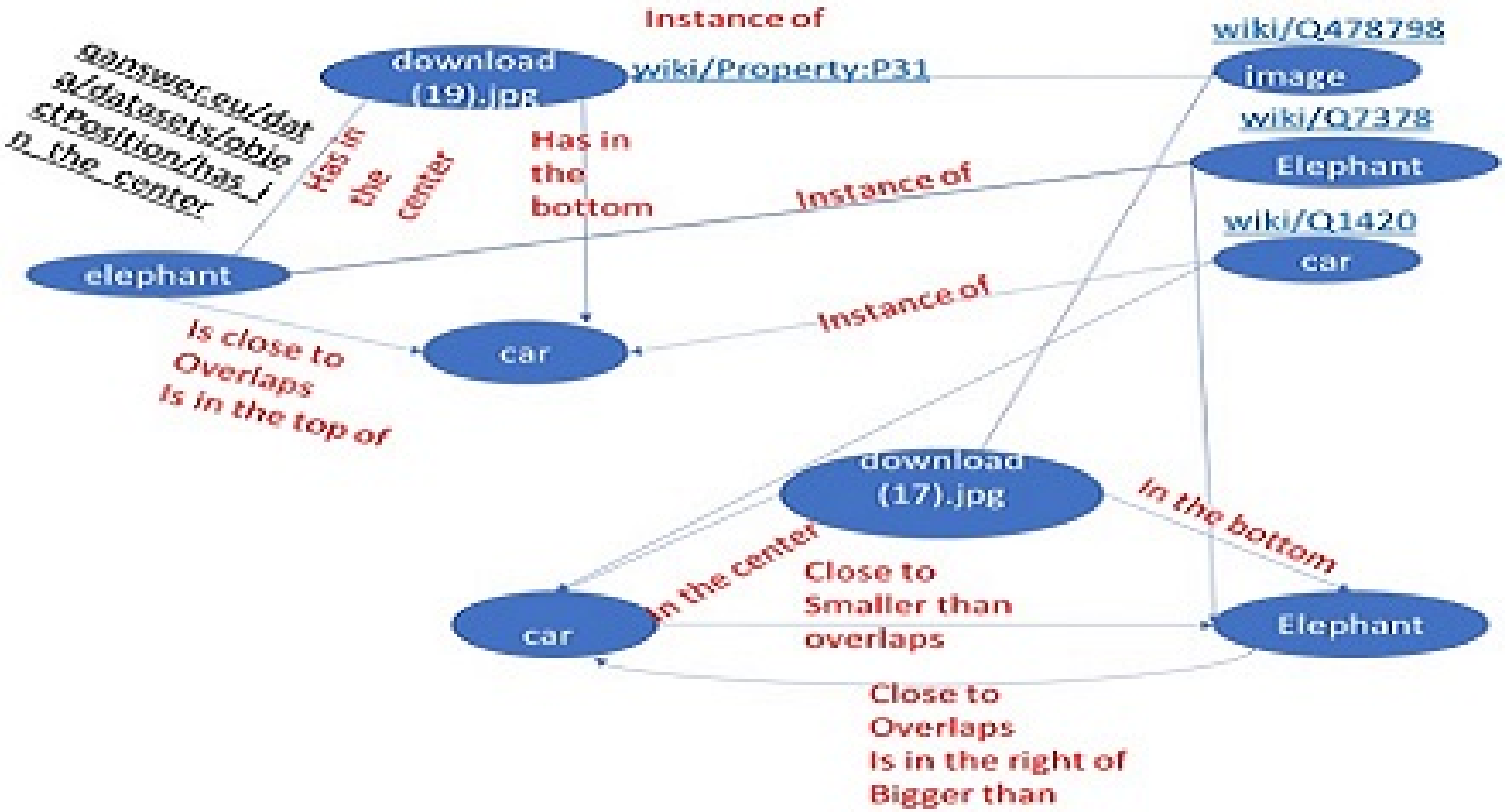
Predicate
URI

Object
URI
Blank Node
Literal

Design of a semantic web modelling for extracted data.

Image-Object Object-Object Relation

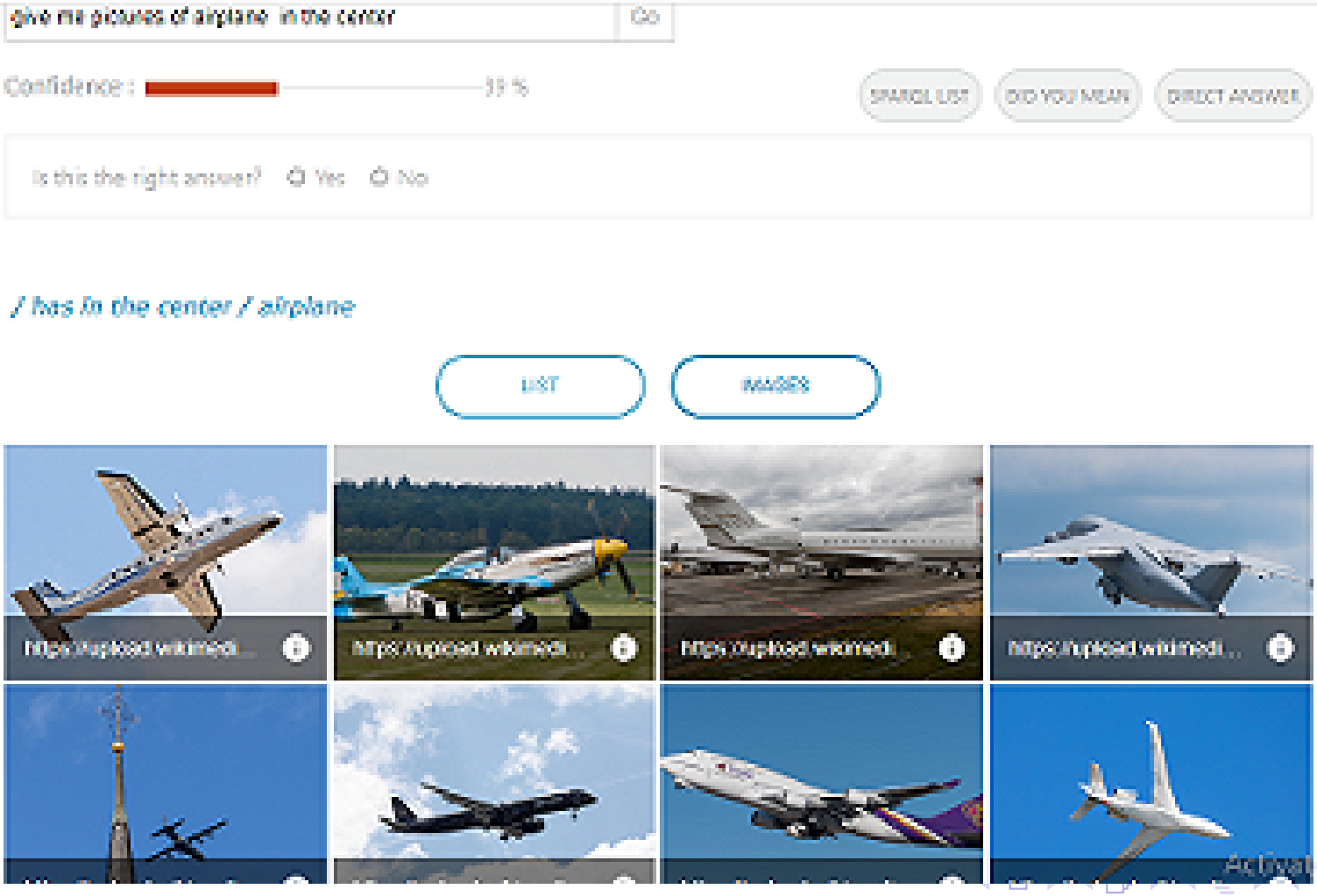
- Design of a semantic web modelling for extracted data.



Thereafter we use the CSV file in a Java program and convert it into a RDF file

Following this, we upload the file to QAnswer

- QAnswer: airplane in the center

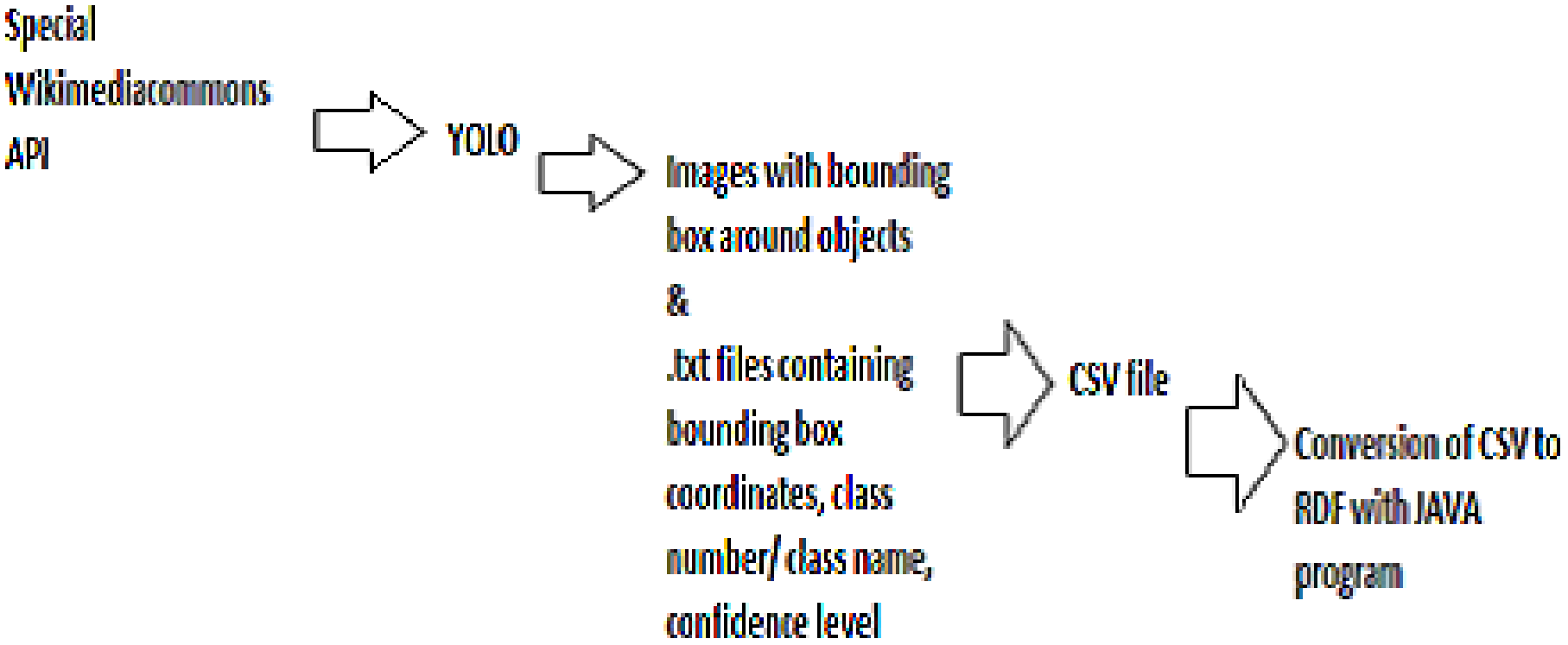


images in the left

train in the left

https://qanswer-frontend.univ-st-etienne.fr/user/query?kb=onto&user=anindamaulik

Automation pipeline



Limitations and Future Work

Query for images on the top

Issue with confidence of detection by YOLO

/ has on the top / clock

https://upload.wikimedia.org/wikipedia/commons/e/e7/Taipei_
Rheinland-Office-Building-02.jpg

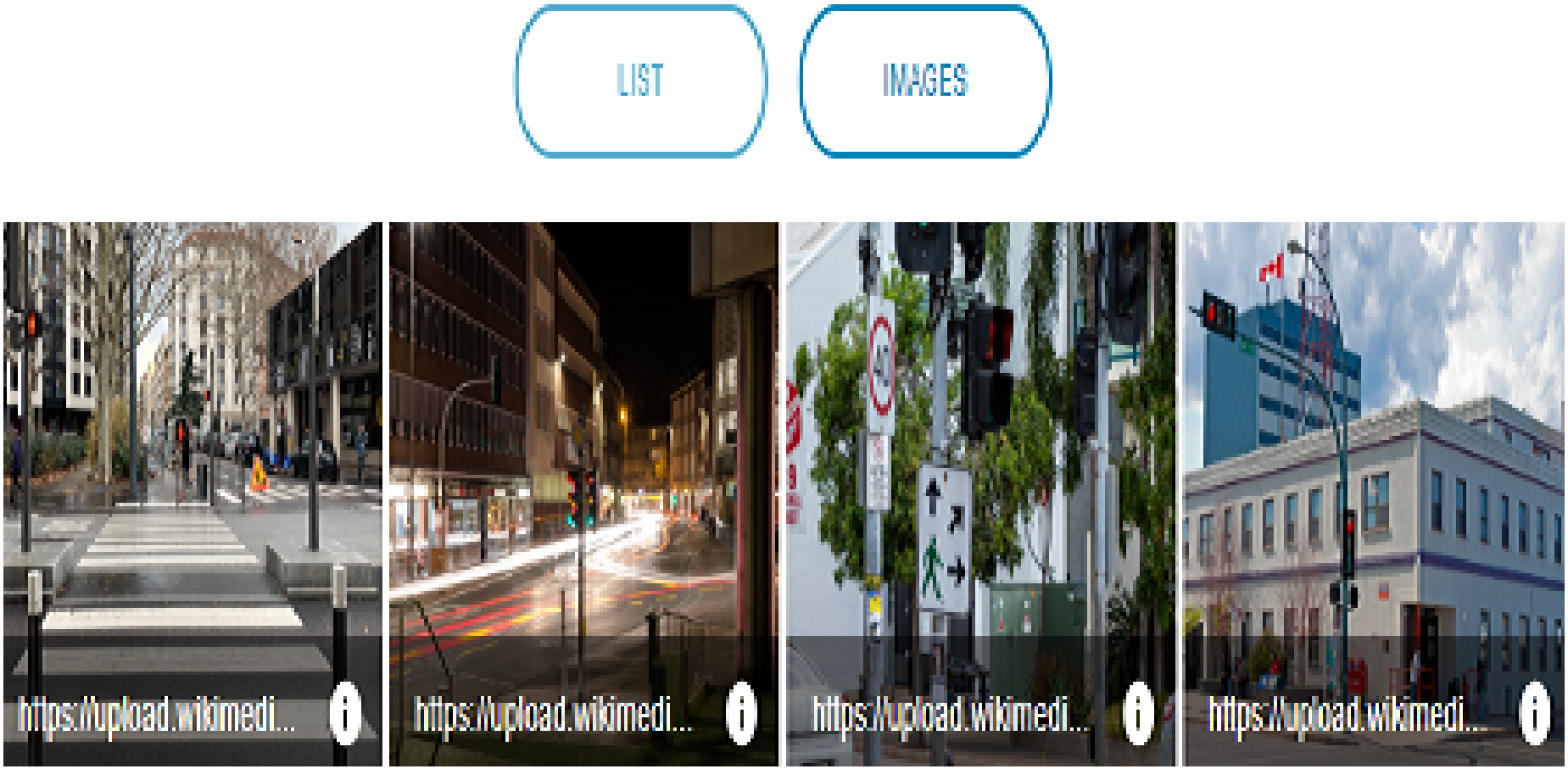
Contd..


clock 0.86
traffic light 0.87
truck 0.50
bicycle 0.99
motorcycle 0.97

Issue with the object name assigned by YOLO

Traffic instead of Traffic Light

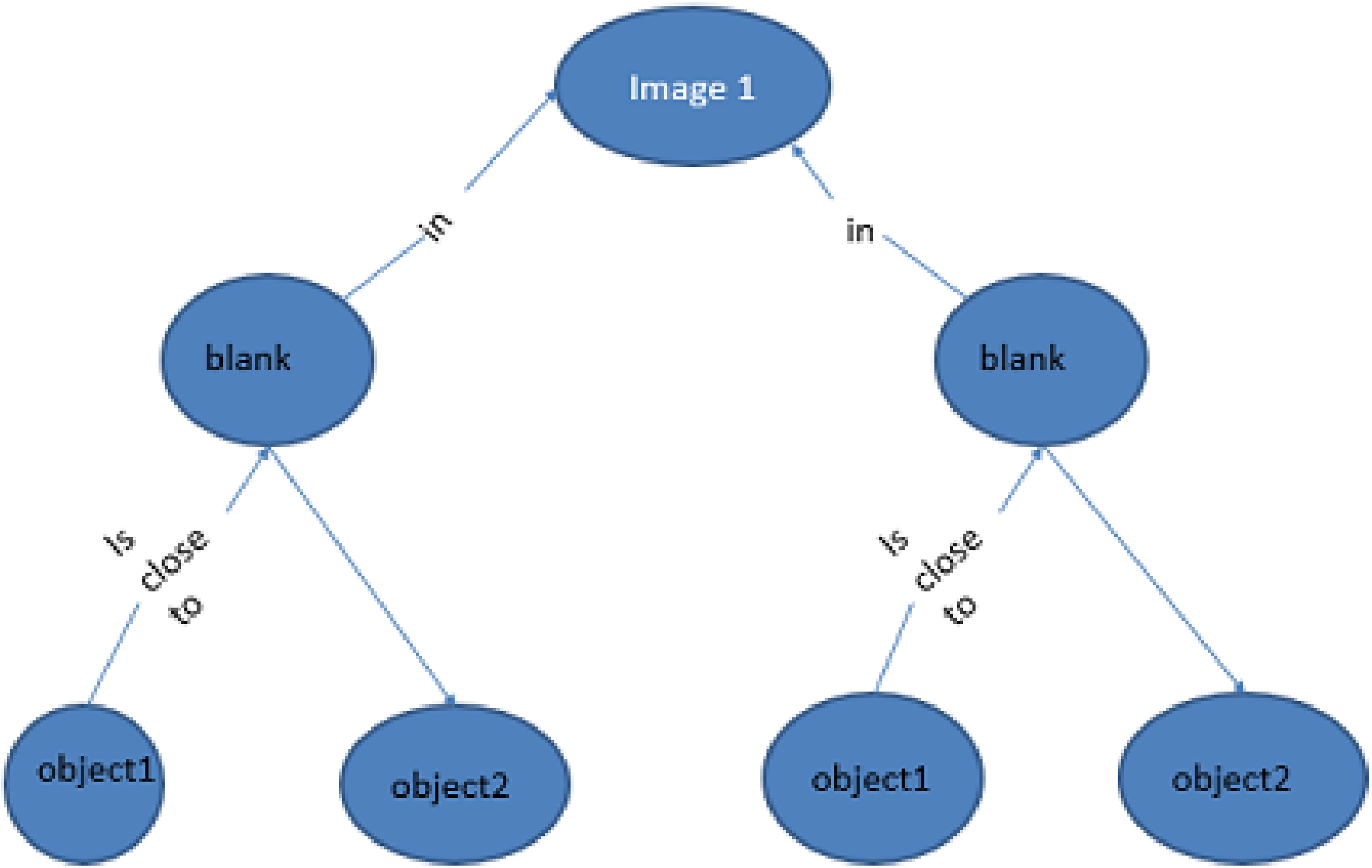
/ has on the top / Traffic



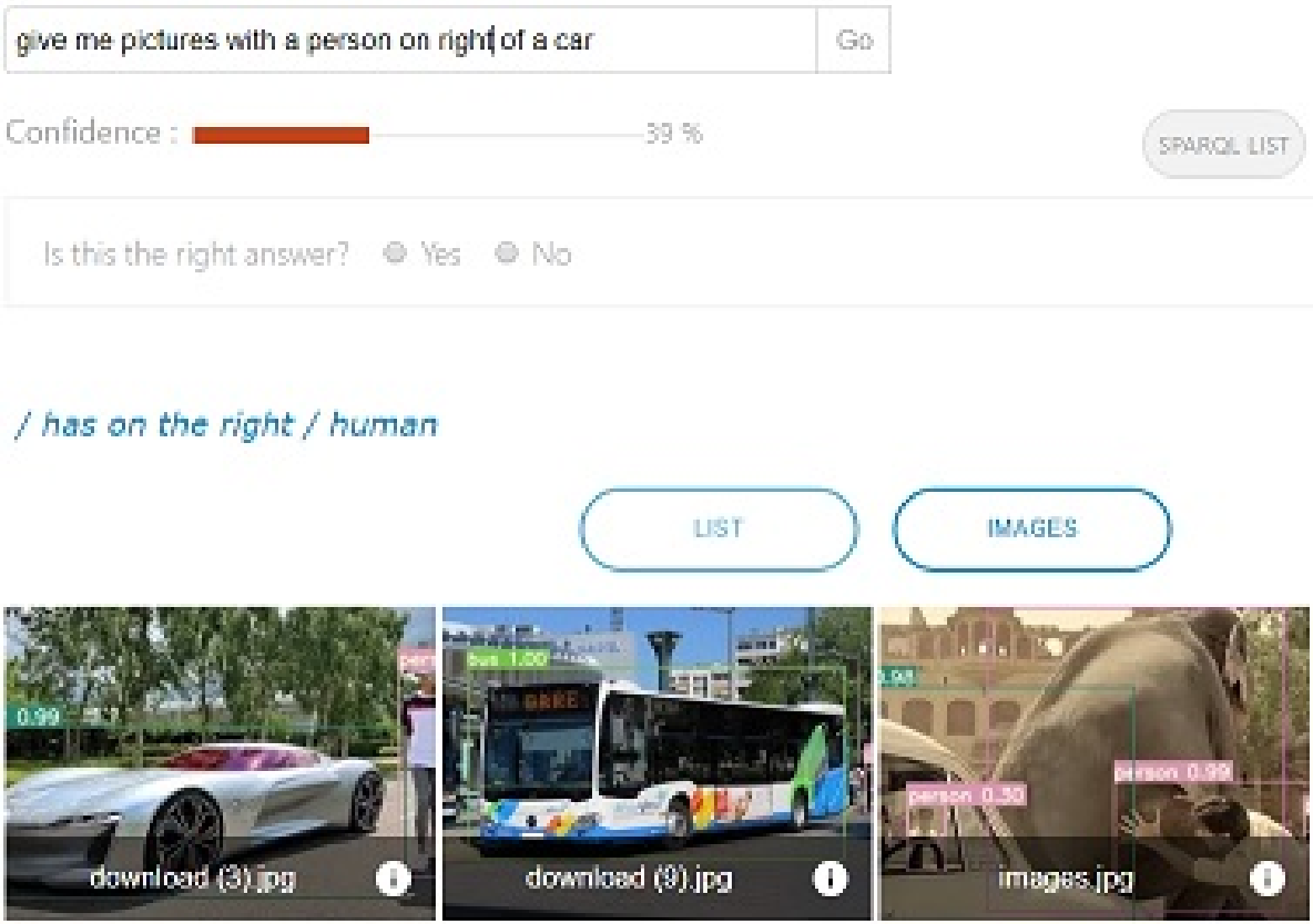
Object-Object Relation

Object	relation	property value
	left of	object
	right of	object
	top of	object
	buttom of	object
	close to	object
	far from	object
	overlaping wit	object
	greater than	object
	smaler than	object
	%of image	value

Reified Triple



Reified Triple not being generated



OORelation algos ready to be used

Algorithm 4 is on the left and right of

1: **if** $X - centreOfObject_1 \leq X - centreOfObject_2$ **then**
2: $Object_1 IsOnTheLeft \leftarrow Object_2$
3: **else**
4: **if** $X - centreOfObject_1 \geq X - centreOfObject_2$ **then**
5: $Object_1 IsOnTheRight \leftarrow Object_2$
6: **end if**
7: **end if**

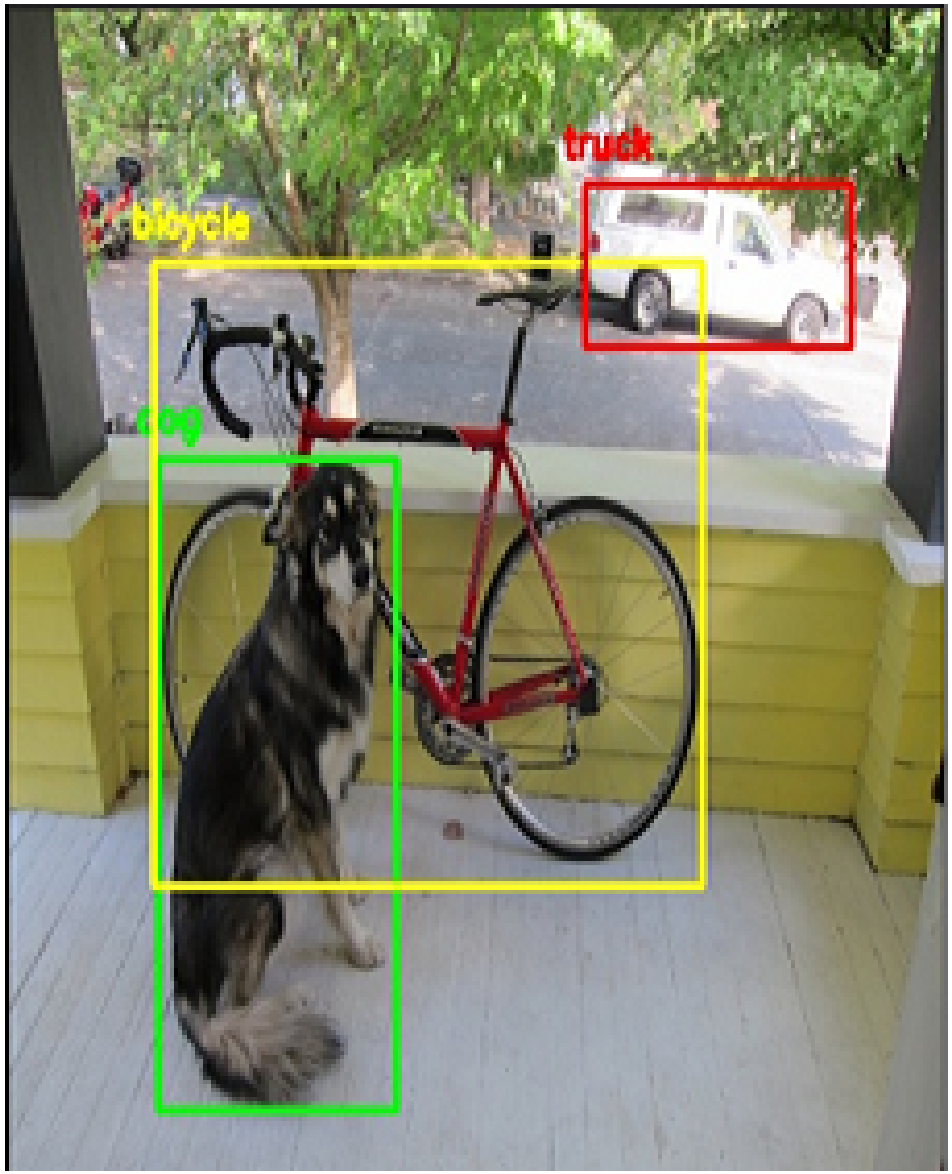
Algorithm 5 is on the top and bottom of

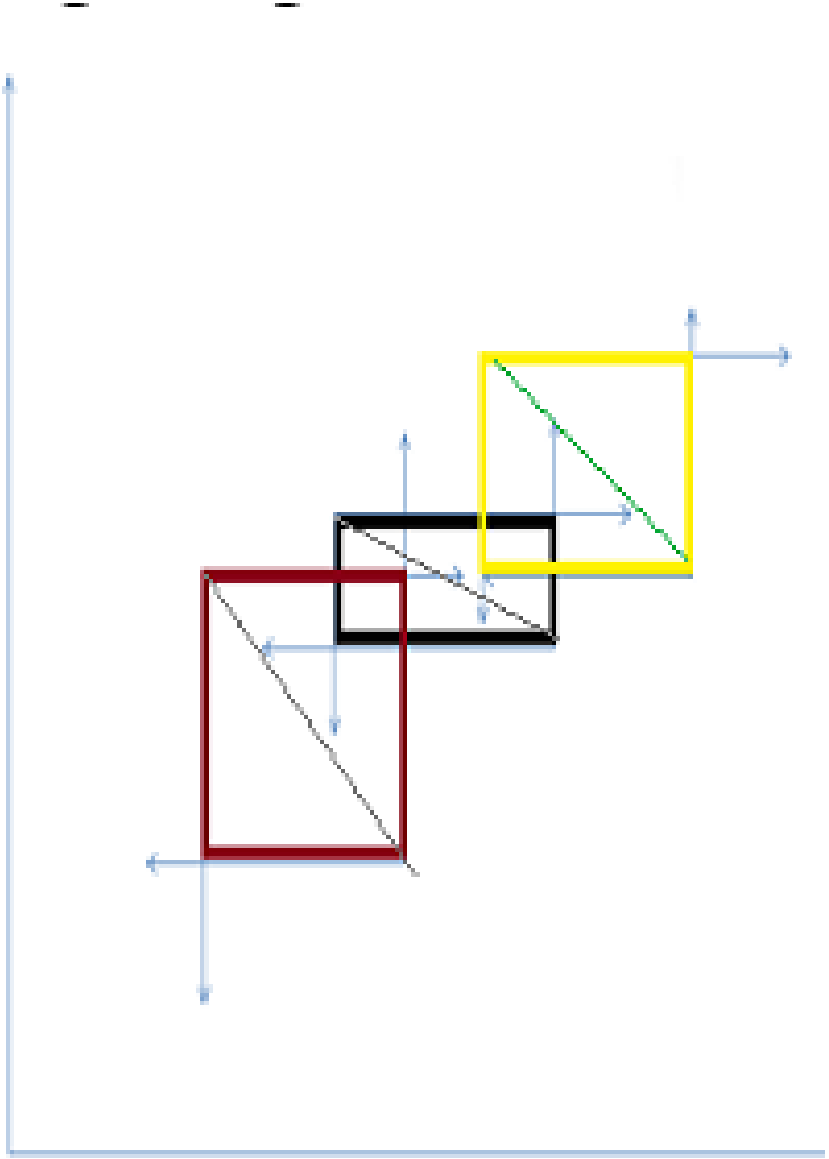
1: **if** $Y - centreOfObject_1 \leq Y - centreOfObject_2$ **then**
2: $Object_1 IsOnTheTop \leftarrow Object_2$
3: **else**
4: **if** $Y - centreOfObject_1 \geq Y - centreOfObject_2$ **then**
5: $Object_1 IsOnTheBottom \leftarrow Object_2$
6: **end if**
7: **end if**

Algorithm 6 close and far from

1: **if** $distance(Center1, Center2) \leq meansofdiagonalofthe2objects$ **then**
2: $Object_1 IsCloseTo \leftarrow Object_2$
3: **else**
4: **if** $distance(Center1, Center2) \geq meansofdiagonalofthe2objects$ **then**
5: $Object_1 IsFarFrom \leftarrow Object_2$
6: **end if**

Bounding Box





OORelation algos ready to be used, contd..

Greater and Smaller Than

Algorithm 7 greater and smaller than

1: **if** $AreaOfObject_1 \leq AreaOfObject_2$ **then**
2: $Object_1IsSmallerThan \leftarrow Object_2$
3: **else**
4: **if** $AreaOfObject_1 \geq AreaOfObject_2$ **then**
5: $Object_1IsGreaterThan \leftarrow Object_2$
6: **end if**
7: **end if**

OORelation algos ready to be used, contd..

Overlapping With

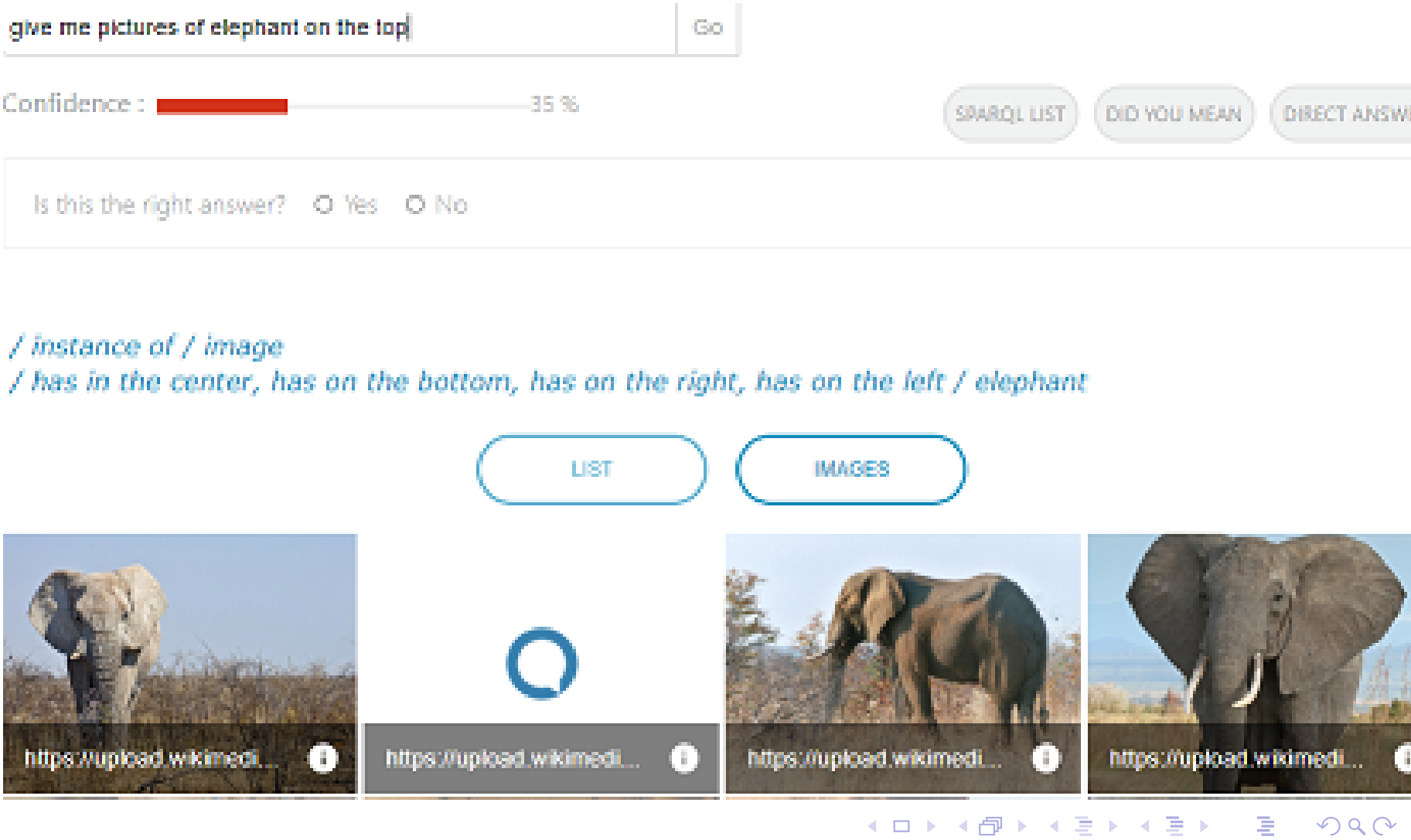
```
from shapely.geometry import Polygon
p1 = Polygon([(0,0), (1,1), (1,0)])
p2 = Polygon([(0,1), (1,0), (1,1)])
print(p1.intersects(p2))
```

```
True
```

QAnswer issues

Not getting the right query result

- The wrong interpretation made due to non-availability of data

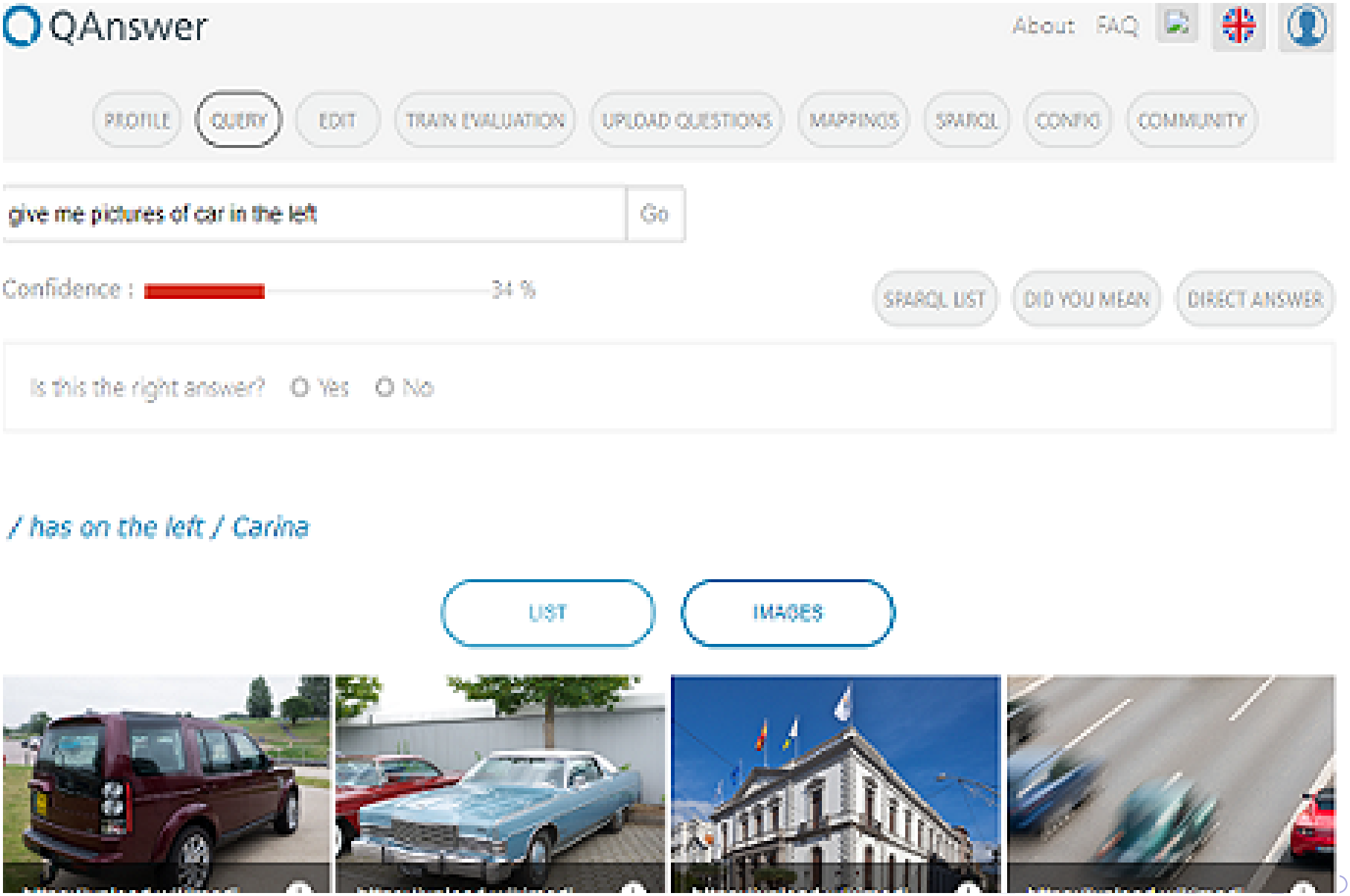


In the csv file snapshot, we can see that there's data available, but not for elephant

X1	Y1	X2	Y2	object	Image name	hasinthetop
367	934	2320	3663	elephant	African_Bush_Elephant.jpg	na
660	332	2170	1659	elephant	African_bush_elephant_In_San_Diego_Zoo.jpg	na
48	383	4239	3146	elephant	Asian_Elephant_10.jpg	na
1230	452	3745	3044	elephant	Barcelona_-_Mammoth_sculpture.JPG	na
2248	1390	4036	3079	elephant	Elefantes%2C_Ayutthaya%2C_Tailandia%2C_20	na
169	1495	1788	2820	elephant	Elefantes%2C_Ayutthaya%2C_Tailandia%2C_20	na
3975	1579	4466	2618	elephant	Elefantes%2C_Ayutthaya%2C_Tailandia%2C_20	na
1545	1037	2116	1412	umbrella	Elefantes%2C_Ayutthaya%2C_Tailandia%2C_20	umbrella
3252	1038	3825	1397	umbrella	Elefantes%2C_Ayutthaya%2C_Tailandia%2C_20	umbrella
2925	701	3505	1095	umbrella	Elefantes%2C_Ayutthaya%2C_Tailandia%2C_20	umbrella
2338	1155	3143	1527	bench	Elefantes%2C_Ayutthaya%2C_Tailandia%2C_20	bench
0	1297	5668	8517	elephant	Elefante_africano_de_sabana_%28Loxodonta_a	na
388	125	1382	881	elephant	Elephant_Kruger_2003.jpg	na
323	168	1039	1328	elephant	Etosha_elefant.jpg	na
88	373	2969	2483	elephant	Loxodonta_africana_-_drinking.jpg	na

Failed to interpret the question correctly

Carina



END

- Thank you for your attention, time and patience
- Please ask me any question that you have.
- Please provide your suggestion which can be used to make my work better