Part A

```
root@29188c161cc8: ~/ros2_ws
root@29188c161cc8:~/ros2_ws# ros2 run hw3 publisher
[INFO] [1678818656.048191229] [publisher]: Publishing: "1"
[INFO] [1678818658.047308451] [publisher]: Publishing: "2"
[INFO] [1678818659.995673978] [publisher]: Publishing: "3"
[INFO] [1678818662.980221045] [publisher]: Publishing: "4"
[INFO] [1678818663.997805729] [publisher]: Publishing: "5"
[INFO] [1678818665.995345068] [publisher]: Publishing: "6"
[INFO] [1678818668.002529138] [publisher]: Publishing: "7"
[INFO] [1678818670.000021608] [publisher]: Publishing: "8"
[INFO] [1678818671.998104983] [publisher]: Publishing: "9"
[INFO] [1678818673.995332134] [publisher]: Publishing: "10"
[INFO] [1678818682.150943357] [publisher]: Publishing: "11"
[INFO] [1678818684.000232810] [publisher]: Publishing: "12"
[INFO] [1678818686.280000102] [publisher]: Publishing: "13"
[INFO] [1678818688.000337136] [publisher]: Publishing: "14"
[INFO] [1678818689.998999681] [publisher]: Publishing: "15"
[INFO] [1678818692.009237530] [publisher]: Publishing: "16"
[INFO] [1678818693.997516097] [publisher]: Publishing: "17"
[INFO] [1678818695.999170651] [publisher]: Publishing: "18"
[INFO] [1678818697.999476955] [publisher]: Publishing: "19"
[INFO] [1678818699.994031477] [publisher]: Publishing: "20"
Your input type is not a numpy array
Your input type is not a numpy array
Your input type is not a numpy array
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Your input type is not a numpy array
Your input type is not a numpy array
```
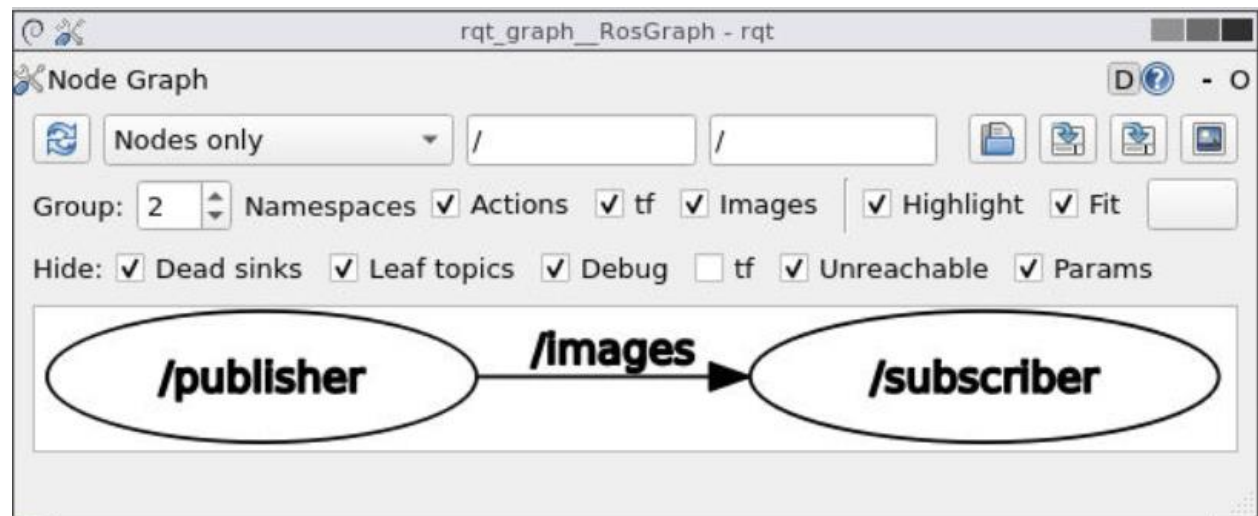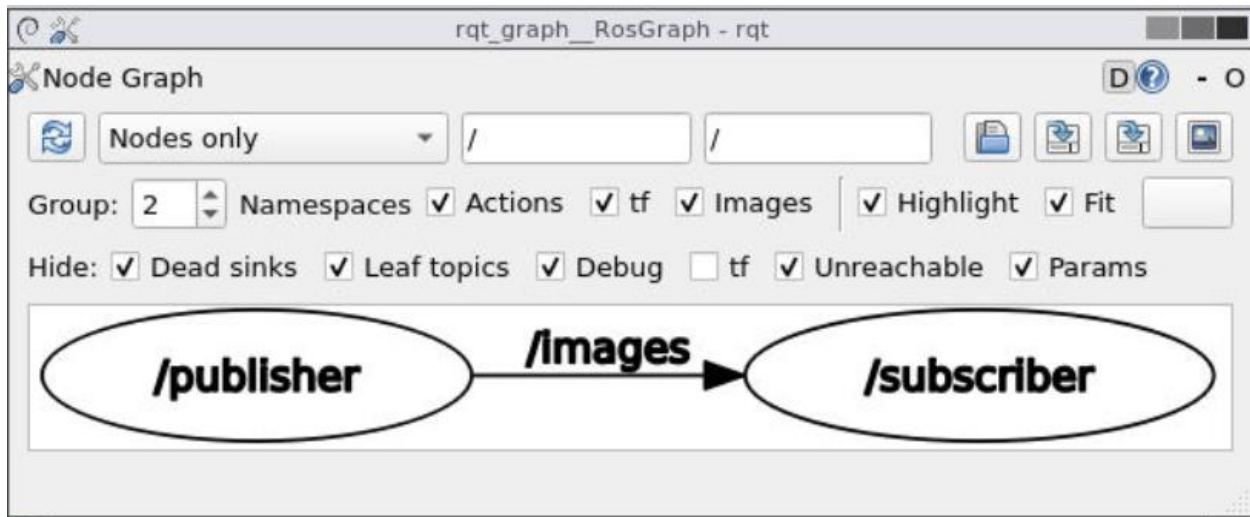
Part B

Objects found by mask RCNN:

```
root@29188c161cc8:~/ros2_ws# ros2 run hw3 subscriber
dog
bird
surfboard
bird
carrot
person
skateboard
bird
dog
handbag
bird
dog
dog
person
car
dog
dog
car
bowl
microwave
```

Objects found by resnet:

```
root@29188c161cc8:~/ros2_ws# ros2 run hw3 subscriber_vanilla
Labrador retriever
peacock
great white shark
electric ray
eft
triceratops
king snake
tarantula
wallaby
chiton
dowitcher
bluetick
Saluki
Labrador retriever
minivan
German shepherd
keeshond
car mirror
coffee mug
digital clock
```

Part C:

Topic name: /zed/zed_node/right_raw/image_raw_color

Content published: multiple images(599)

Topic Info:

- Type: sensor_msgs/msg/Image
- Publisher count: 1
- Subscription count: 1

rqt_graph__RosGraph - rqt

Node Graph

Nodes only | / | /

Group: 2 | Namespaces ✓ Actions ✓ tf ✓ Images | ✓ Highlight ✓ Fit

Hide: ✓ Dead sinks ✓ Leaf topics ✓ Debug ☐ tf ✓ Unreachable ✓ Params

/rosbag2_player → /zed/zed_node/right_raw/image_raw_color → /subscriber
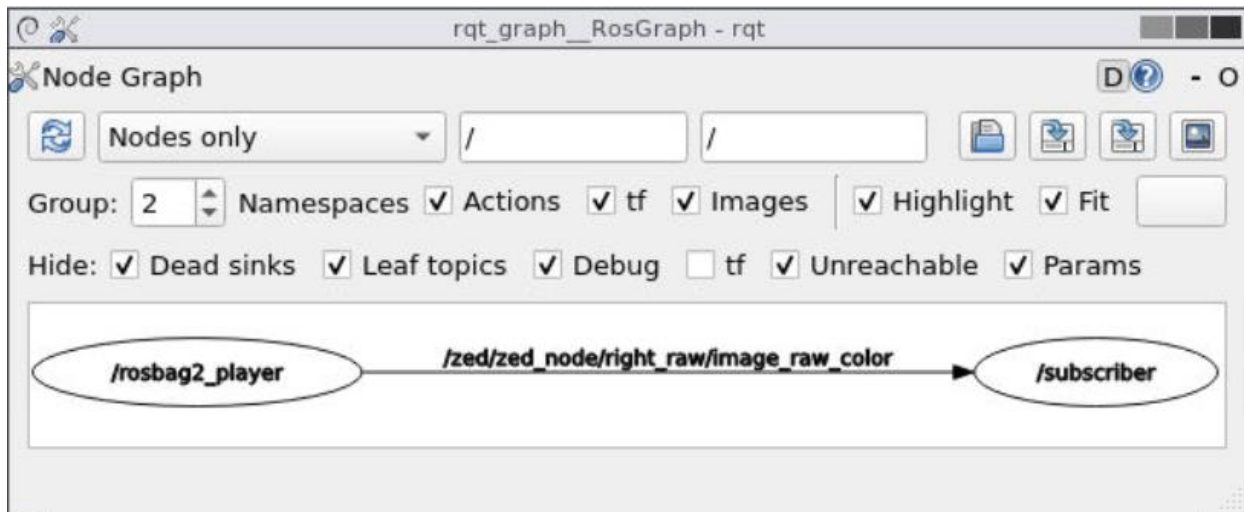
```
root@29188c161cc8: ~/ros2_ws
^Croot@29188c161cc8:~/ros2_ws# ros2 topic echo /zed/zed_node/right_raw/image_raw_color
header:
  stamp:
    sec: 1676662768
    nanosec: 727633960
  frame_id: zed_right_camera_optical_frame
height: 512
width: 896
encoding: bgra8
is_bigendian: 0
step: 3584
data:
- 10
- 10
- 10
- 255
- 13
- 13
- 13
- 255
- 10
- 10
- 10
- 255
- 9
- 9
- 9
- 255
- 9
- 9
- 9
- 255
- 10
- 10
- 10
- 255
- 7
- 7
- 7
```

```
root@29188c161cc8:~/recordings# ls -l
total 1074684
-rwxrwxrwx 1 root root        846 Mar 13 23:18 metadata.yaml
-rwxrwxrwx 1 root root 1100431360 Mar 13 23:19 rosbag2_2023_02_17-19_39_12_0.db3
-rwxrwxrwx 1 root root      32768 Mar 14 20:44 rosbag2_2023_02_17-19_39_12_0.db3-shm
-rwxrwxrwx 1 root root          0 Mar 13 23:19 rosbag2_2023_02_17-19_39_12_0.db3-wal
drwxrwxrwx 1 root root       4096 Mar 14 20:54 rosbag2_2023_02_17-20_05_26
```

```
root@29188c161cc8:~/ros2_ws# ros2 bag info /root/recordings/rosbag2_2023_02_17-19_39_12_0.db3

closing.

closing.
[INFO] [1678825558.971344570] [rosbag2_storage]: Opened database '/root/recordings/rosbag2_2023_02_17-19_39_12_0.db3' for READ_ONLY.

Files:              /root/recordings/rosbag2_2023_02_17-19_39_12_0.db3
Bag size:           1.0 GiB
Storage id:         sqlite3
Duration:           39.975s
Start:              Feb 17 2023 19:39:13.62 (1676662753.62)
End:                Feb 17 2023 19:39:53.38 (1676662793.38)
Messages:           599
Topic information: Topic: /zed/zed_node/right_raw/image_raw_color | Type: sensor_msgs/msg/Image | Count: 599 | Serialization Format: cdr
```

```
root@29188c161cc8:~/ros2_ws# ros2 bag play /root/recordings/rosbag2_2023_02_17-19_39_12_0.db3

closing.

closing.
[INFO] [1678826694.938607416] [rosbag2_storage]: Opened database '/root/recordings/rosbag2_2023_02_17-19_39_12_0.db3' for READ_ONLY.
[INFO] [1678826695.215476117] [rosbag2_player]: Set rate to 1
[INFO] [1678826695.276212445] [rosbag2_player]: Adding keyboard callbacks.
[INFO] [1678826695.276591659] [rosbag2_player]: Press SPACE for Pause/Resume
[INFO] [1678826695.276844968] [rosbag2_player]: Press CURSOR_RIGHT for Play Next Message
[INFO] [1678826695.276976072] [rosbag2_player]: Press CURSOR_UP for Increase Rate 10%
[INFO] [1678826695.277175779] [rosbag2_player]: Press CURSOR_DOWN for Decrease Rate 10%

closing.

closing.
[INFO] [1678826695.280562498] [rosbag2_storage]: Opened database '/root/recordings/rosbag2_2023_02_17-19_39_12_0.db3' for READ_ONLY.
root@29188c161cc8:~/ros2_ws#
```

Objects detected by mask RCNN:

```
root@29188c161cc8: ~/ros2_ws
root@29188c161cc8:~/ros2_ws# ros2 run hw3 subscriber_bag
laptop
hair drier
bottle
hair drier
hair drier
hair drier
hair drier
hair drier
mouse
hair drier
mouse
mouse
toothbrush
mouse
mouse
mouse
toothbrush
toothbrush
person
person
person
toothbrush
toothbrush
toothbrush
toothbrush
toothbrush
toothbrush
toothbrush
toothbrush
toothbrush
toothbrush
toothbrush
toothbrush
toothbrush
toothbrush
bottle
bottle
toothbrush
bottle
toothbrush
bottle
```

Objects detected by resnet:

```
root@29188c161cc8: ~/ros2_ws
root@29188c161cc8:~/ros2_ws# ros2 run hw3 subscriber_bag_vanilla
desktop computer
loudspeaker
loudspeaker
loudspeaker
loudspeaker
loudspeaker
loudspeaker
loudspeaker
desktop computer
monitor
monitor
laptop
monitor
dining table
monitor
library
cab
cab
snowplow
snowplow
window shade
cab
electric fan
rubber eraser
modem
rubber eraser
pill bottle
rubber eraser
remote control
rubber eraser
pill bottle
rubber eraser
rubber eraser
rubber eraser
rubber eraser
rubber eraser
ballpoint
rubber eraser
rubber eraser
ballpoint
ballpoint
ballpoint
```