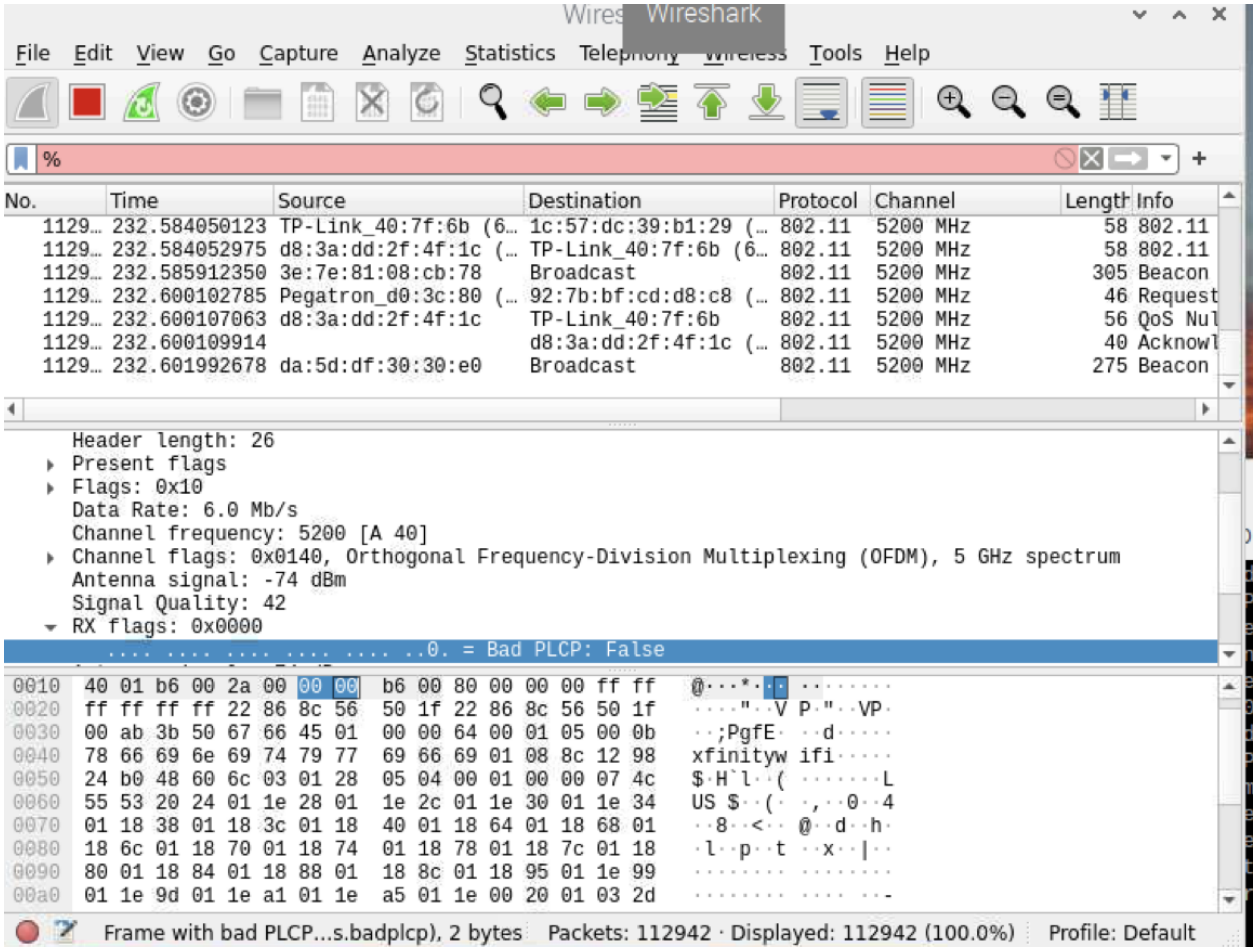
Prelab 1

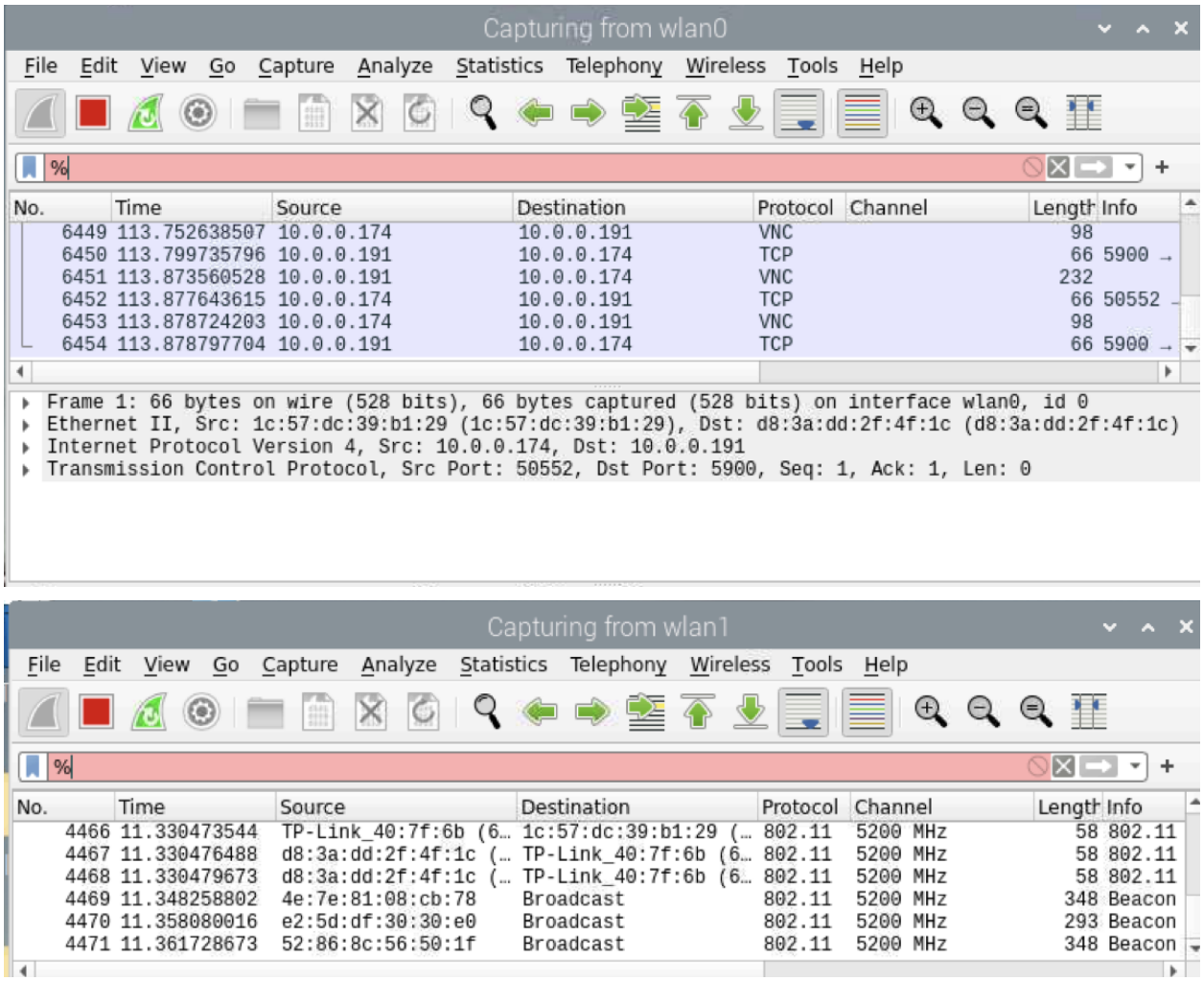



```
pi@raspberrypi:~ $ iw dev
phy#1
        Interface wlan1
                ifindex 4
                wdev 0x100000001
                addr 40:ed:00:ac:5a:0f
                type monitor
                channel 40 (5200 MHz), width: 80 MHz, center1: 5170 MHz
                txpower 20.00 dBm
```

Channel value is consistent with the iw-dev output

Prelab2

The difference Joey and I observe between the sniffed packets of the two interfaces wlan0 and wlan1 is that the protocol shows that it is not 802.11 packets. Another difference is the channel frequency is not shown. The source addresses in wlan0 seem to vary while in wlan1 the source addresses are constant.



Prelab 3

This is accurate because it detects the orientation of RPi, converts radians to degrees and in the video demonstrating each direction and velocity change, the yaw, pitch, roll matches accordingly.

Video:
https://youtube.com/shorts/zyUVPRJjTRc?feature=share

Code:

```
from sense_hat import SenseHat
import time
import math

sense = SenseHat()

while True:

    accel = sense.get_accelerometer_raw()
    mag = sense.get_compass_raw()


    pitch = math.atan2(accel['x'], math.sqrt(accel['y']**2 + accel['z']**2))
    roll = math.atan2(accel['y'], math.sqrt(accel['x']**2 + accel['z']**2))
    yaw = math.atan2(mag['y'], mag['x'])


    pitch = math.degrees(pitch)
    roll = math.degrees(roll)
    yaw = math.degrees(yaw)


    yaw += 90.0


    print(f"Pitch: {pitch:.2f} degrees")
    print(f"Roll: {roll:.2f} degrees")
    print(f"Yaw: {yaw:.2f} degrees")


    time.sleep(0.1)
```

Prelab 4

This is accurate because it detects the orientation of RPi, converts radians to degrees and in the video demonstrating each direction and velocity change, the yaw, pitch, roll matches accordingly. The yaw, pitch, roll changes according to the accelerator changes I made during the video.

Video:
https://youtu.be/Z2D7n1WiI1I

Code:

```
from sense_hat import SenseHat
import time
import math

sense = SenseHat()

while True:

    accel = sense.get_accelerometer_raw()
    mag = sense.get_compass_raw()


    pitch = math.atan2(accel['x'], math.sqrt(accel['y']**2 + accel['z']**2))
    roll = math.atan2(accel['y'], math.sqrt(accel['x']**2 + accel['z']**2))
    yaw = math.atan2(mag['y'], mag['x'])


    pitch = math.degrees(pitch)
    roll = math.degrees(roll)
    yaw = math.degrees(yaw)


    yaw += 90.0


    print(f"Pitch: {pitch:.2f} degrees")
```

```
print(f"Roll: {roll:.2f} degrees")
print(f"Yaw: {yaw:.2f} degrees")
print(accel['x'])
print(accel['y'])
print(accel['z'])


time.sleep(0.1)
```

Prelab 5

https://github.com/prithbalaji/CS437-Prelab3/

Plots and CSV files in Github:

	Timestamp	Raw X	Raw Y	Raw Z	Smoothed X	Smoothed Y	Smoothed Z
2	1696341684.029021	0.036124441772699356	-0.47883340716362	0.6959982514381409	0.0036124441772699355	-0.04427089653909207	0.025328928604722023
3	1696341684.1406703	0.04315537214279175	-0.48365792632102966	0.8119979500770569	0.0296444658190012	-0.01872132681310177	0.06247846819460392
4	1696341684.2592058	0.04291292652487755	-0.4841403663158417	0.8112668395042419	0.06676976084709167	0.018355724215507508	0.09948240816593171
5	1696341684.3835812	0.04291292652487755	-0.4848640561103821	0.8132163882255554	0.10377370081841945	0.05167485103011131	0.18087983056902884
6	1696341684.5079892	0.043397821485996246	-0.4860701858997345	0.8154096603393555	0.11561978757381439	0.06269723176956177	0.19260399043560028
7	1696341684.6325328	0.04364026337862015	-0.48245176672935486	0.8173592686653137	0.1157682217657566	0.06323175244033337	0.1933817159384489
8	1696341684.7534165	0.043397821485996246	-0.48245176672935486	0.8190650939941406	0.11659481413662434	0.0640583448112011	0.19445125982165337
9	1696341684.86964	0.043397821485996246	-0.48317545652389526	0.8183339834213257	0.11746940314769745	0.0648120753467083	0.1952524922788143
10	1696341684.98127	0.04315537214279175	-0.48438161611557007	0.8210146427154541	0.11802706345915795	0.06522487550973892	0.19557151645421983