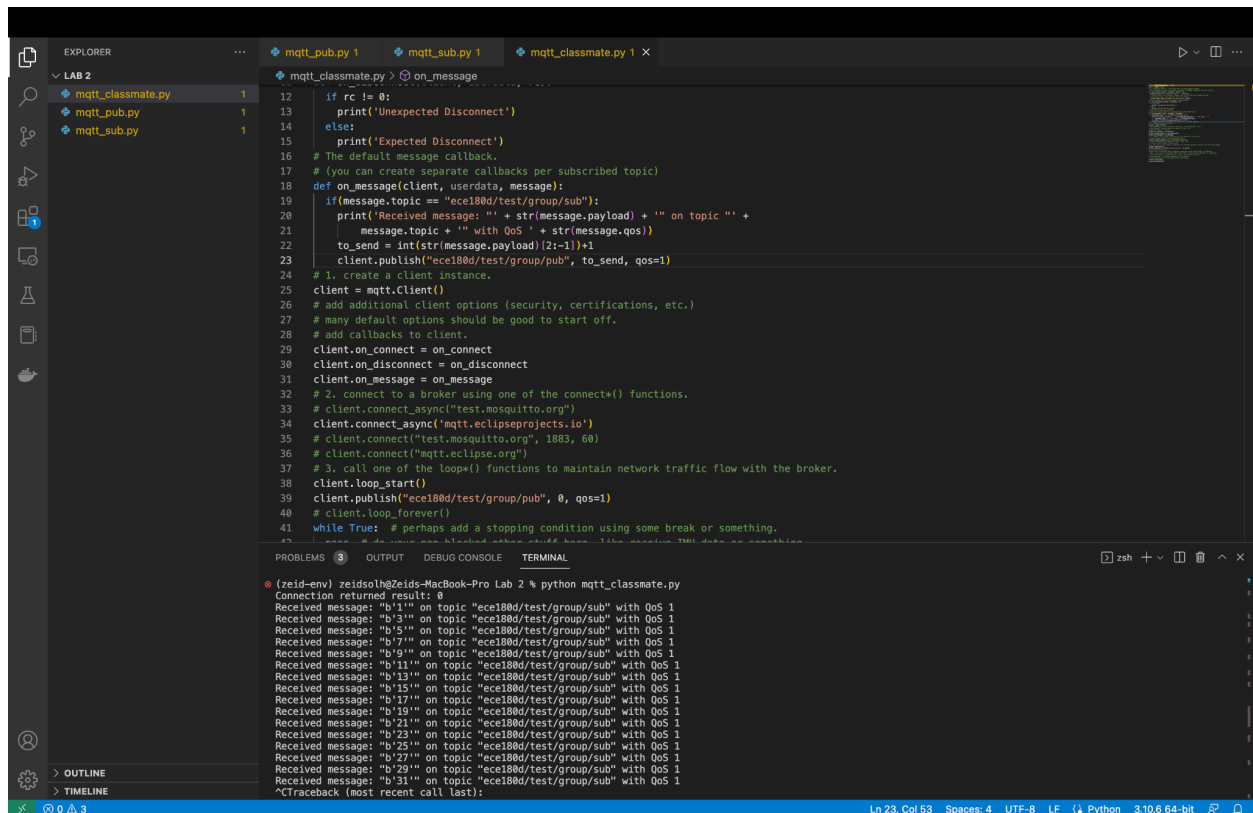


Zeid Solh
205323715
EC ENGR 180DA
Lab 2

Tasks:

1)

My classmate (Matt) and I ping ponged between us a counter that increments each time we receive a message (with a delay). We can see that I have the odd numbers.



The screenshot shows a VS Code editor with a file explorer on the left containing three files: `mqtt_classmate.py`, `mqtt_pub.py`, and `mqtt_sub.py`. The main editor window displays the code for `mqtt_classmate.py`, which includes an `on_message` callback and a `main` function that connects to an MQTT broker and publishes a message. The terminal at the bottom shows the output of running `python mqtt_classmate.py`, displaying a series of received messages with odd numbers (1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 25, 27, 29, 31) and their corresponding QoS values (all 1).

```
def on_message(client, userdata, message):
    if message.topic == "ece180d/test/group/sub":
        print('Received message: ' + str(message.payload) + ' on topic ' +
              message.topic + ' with QoS ' + str(message.qos))
        to_send = int(str(message.payload)[2:-1])+1
        client.publish("ece180d/test/group/pub", to_send, qos=1)

# 1. create a client instance.
client = mqtt.Client()
# add additional client options (security, certifications, etc.)
# many default options should be good to start off.
# add callbacks to client.
client.on_connect = on_connect
client.on_disconnect = on_disconnect
client.on_message = on_message
# 2. connect to a broker using one of the connect*() functions.
# client.connect_async("test.mosquitto.org")
client.connect_async("mqtt.eclipseprojects.io")
# client.connect("test.mosquitto.org", 1883, 60)
# client.connect("mqtt.eclipse.org")
# 3. call one of the loop*() functions to maintain network traffic flow with the broker.
client.loop_start()
client.publish("ece180d/test/group/pub", 0, qos=1)
# client.loop_forever()
while True: # perhaps add a stopping condition using some break or something.
    pass
```

```
(zeid-env) zeidsolh@Zeids-MacBook-Pro Lab 2 % python mqtt_classmate.py
Connection returned result: 0
Received message: "b'1'" on topic "ece180d/test/group/sub" with QoS 1
Received message: "b'3'" on topic "ece180d/test/group/sub" with QoS 1
Received message: "b'5'" on topic "ece180d/test/group/sub" with QoS 1
Received message: "b'7'" on topic "ece180d/test/group/sub" with QoS 1
Received message: "b'9'" on topic "ece180d/test/group/sub" with QoS 1
Received message: "b'11'" on topic "ece180d/test/group/sub" with QoS 1
Received message: "b'13'" on topic "ece180d/test/group/sub" with QoS 1
Received message: "b'15'" on topic "ece180d/test/group/sub" with QoS 1
Received message: "b'17'" on topic "ece180d/test/group/sub" with QoS 1
Received message: "b'19'" on topic "ece180d/test/group/sub" with QoS 1
Received message: "b'21'" on topic "ece180d/test/group/sub" with QoS 1
Received message: "b'23'" on topic "ece180d/test/group/sub" with QoS 1
Received message: "b'25'" on topic "ece180d/test/group/sub" with QoS 1
Received message: "b'27'" on topic "ece180d/test/group/sub" with QoS 1
Received message: "b'29'" on topic "ece180d/test/group/sub" with QoS 1
Received message: "b'31'" on topic "ece180d/test/group/sub" with QoS 1
^CTraceback (most recent call last):
```

For our project, we are considering using MQTT to send the scores in multiplayer to determine what player is going to win.

I think sending things other than text/numbers would be hard in MQTT, I wouldn't imagine sending entire frames using MQTT.

I think a reasonable lag time would be around $\frac{1}{2}$ second.

For the sake of our simple game, I think MQTT would be enough.

2)

For the speech recognition, I used the python library `speech_recognition`.

```

[{}
(zaid-env) zeidsolh@Zeids-MacBook-Pro Lab 2 %
(zaid-env) zeidsolh@Zeids-MacBook-Pro Lab 2 %
(zaid-env) zeidsolh@Zeids-MacBook-Pro Lab 2 %
(zaid-env) zeidsolh@Zeids-MacBook-Pro Lab 2 % python -m speech_recognition
A moment of silence, please...
Set minimum energy threshold to 181.11449584897341
Say something!
Got it! Now to recognize it...
result2:
{ 'alternative': [ { 'confidence': 0.97181396,
                    'transcript': 'sound and found'},
                  { 'transcript': 'sound & found'},
                  { 'transcript': 'sound and sound'}}],
  'final': True}
You said sound and found
Say something!
Got it! Now to recognize it...
result2:
[]
Oops! Didn't catch that
Say something!
Got it! Now to recognize it...
result2:
{ 'alternative': [ { 'confidence': 0.96955836,
                    'transcript': 'letter a letter b letter c letter d '
                    'letter e letter f letter g'},
                  { 'transcript': 'letter a letter b letter c letter d '
                    'letter e letter f letter t'},
                  { 'transcript': 'letter a letter b letter c letter d '
                    'letter e letter f letter letter g'},
                  { 'transcript': 'letter e letter b letter c letter d '
                    'letter e letter b letter c letter d '
                    'letter e letter f letter g'},
                  { 'transcript': 'letter a letter b letter c letter d '
                    'letter e letter f letter j'}}],
  'final': True}
You said letter a letter b letter c letter d letter e letter f letter g
Say something!
Got it! Now to recognize it...
result2:
[]
Oops! Didn't catch that
Say something!
Got it! Now to recognize it...
Traceback (most recent call last):
  File "/Users/zeidsolh/miniconda3/envs/zeid-env/lib/python3.10/runpy.py", line 196, in _run_module_as_main
    return _run_code(code, main_globals, None,
  File "/Users/zeidsolh/miniconda3/envs/zeid-env/lib/python3.10/runpy.py", line 86, in _run_code
    exec(code, run_globals)
  File "/Users/zeidsolh/miniconda3/envs/zeid-env/lib/python3.10/site-packages/speech_recognition/__main__.py", line 16, in <module>
    value = r.recognize_google(audio)
  File "/Users/zeidsolh/miniconda3/envs/zeid-env/lib/python3.10/site-packages/speech_recognition/_init__.py", line 894, in recognize_google
    response = urlopen(request, timeout=self.operation_timeout)
  File "/Users/zeidsolh/miniconda3/envs/zeid-env/lib/python3.10/urllib/request.py", line 216, in urlopen
    return opener.open(url, data, timeout)
  File "/Users/zeidsolh/miniconda3/envs/zeid-env/lib/python3.10/urllib/request.py", line 519, in open
    response = self._open(req, data)
  File "/Users/zeidsolh/miniconda3/envs/zeid-env/lib/python3.10/urllib/request.py", line 536, in _open
    result = self._call_chain(self.handle_open, protocol, protocol +
  File "/Users/zeidsolh/miniconda3/envs/zeid-env/lib/python3.10/urllib/request.py", line 496, in _call_chain
    result = Func(args)
  File "/Users/zeidsolh/miniconda3/envs/zeid-env/lib/python3.10/urllib/request.py", line 1377, in http_open
    return self.do_open(http.client.HTTPConnection, req)
  File "/Users/zeidsolh/miniconda3/envs/zeid-env/lib/python3.10/urllib/request.py", line 1352, in do_open
    r = h.getresponse()
  File "/Users/zeidsolh/miniconda3/envs/zeid-env/lib/python3.10/http/client.py", line 1374, in getresponse
    response.begin()
  File "/Users/zeidsolh/miniconda3/envs/zeid-env/lib/python3.10/http/client.py", line 318, in begin
    version, status, reason = self._read_status()
  File "/Users/zeidsolh/miniconda3/envs/zeid-env/lib/python3.10/http/client.py", line 279, in _read_status
    line = str(self.fp.readline(_MAXLINE + 1), "iso-8859-1")
  File "/Users/zeidsolh/miniconda3/envs/zeid-env/lib/python3.10/socket.py", line 705, in readinto
    return self._sock.recv_into(b)
ConnectionResetError: [Errno 54] Connection reset by peer
(zaid-env) zeidsolh@Zeids-MacBook-Pro Lab 2 % python -m speech_recognition
A moment of silence, please...
Set minimum energy threshold to 189.71716885349795
Say something!
Got it! Now to recognize it...
result2:
[]
Oops! Didn't catch that
Say something!
[{}
(zaid-env) zeidsolh@Zeids-MacBook-Pro Lab 2 %
(zaid-env) zeidsolh@Zeids-MacBook-Pro Lab 2 % python -m speech_recognition
A moment of silence, please...
Set minimum energy threshold to 96.59276471884458
Say something!
Got it! Now to recognize it...
result2:
{ 'alternative': [ { 'confidence': 0.9684423,
                    'transcript': 'I really like electrical engineering '
                    'and computer science and I really '
                    'enjoyed the scaps on course and I '
                    'love school and went through 2823 is '
                    'going to be great'},
                  { 'transcript': 'I really like electrical engineering '
                    'and computer science and are really '
                    'enjoyed the scaps on course and I '
                    'love school and went through 2823 is '
                    'going to be great'},
                  { 'transcript': 'I really like electrical engineering '
                    'and computer science and I really '
                    'enjoyed the scaps on course and I '
                    'love school and went through 28-23 '
                    'is going to be great'},
                  { 'transcript': 'I really like electrical engineering '
                    'and computer science and are really '
                    'enjoyed the scaps on course and I '
                    'love school and went through 28-23 '
                    'is going to be great'}}],
  'final': True}
You said I really like electrical engineering and computer science and I really enjoyed the scaps on course and I love school and went through 2823 is going to be great
Say something!
Got it! Now to recognize it...
result2:
[]
Oops! Didn't catch that
Say something!
Got it! Now to recognize it...
result2:
[]
Oops! Didn't catch that
Say something!

```

It gave me some fairly accurate results.

As we can see here it was able to separate letters A, B, C, D, E, F, G as well as separate sound and found. So performance is great.

```

result = func(args)
File "/Users/zeidsolh/miniconda3/envs/zeid-env/lib/python3.10/urllib/request.py", line 1377, in http_open
    return self.do_open(http.client.HTTPConnection, req)
File "/Users/zeidsolh/miniconda3/envs/zeid-env/lib/python3.10/urllib/request.py", line 1352, in do_open
    r = h.getresponse()
File "/Users/zeidsolh/miniconda3/envs/zeid-env/lib/python3.10/http/client.py", line 1374, in getresponse
    response.begin()
File "/Users/zeidsolh/miniconda3/envs/zeid-env/lib/python3.10/http/client.py", line 318, in begin
    version, status, reason = self._read_status()
File "/Users/zeidsolh/miniconda3/envs/zeid-env/lib/python3.10/http/client.py", line 279, in _read_status
    line = str(self.fp.readline(_MAXLINE + 1), "iso-8859-1")
File "/Users/zeidsolh/miniconda3/envs/zeid-env/lib/python3.10/socket.py", line 705, in readinto
    return self._sock.recv_into(b)
ConnectionResetError: [Errno 54] Connection reset by peer
(zaid-env) zeidsolh@Zeids-MacBook-Pro Lab 2 % python -m speech_recognition
A moment of silence, please...
Set minimum energy threshold to 189.71716885349795
Say something!
Got it! Now to recognize it...
result2:
[]
Oops! Didn't catch that
Say something!
[{}
(zaid-env) zeidsolh@Zeids-MacBook-Pro Lab 2 %
(zaid-env) zeidsolh@Zeids-MacBook-Pro Lab 2 % python -m speech_recognition
A moment of silence, please...
Set minimum energy threshold to 96.59276471884458
Say something!
Got it! Now to recognize it...
result2:
{ 'alternative': [ { 'confidence': 0.9684423,
                    'transcript': 'I really like electrical engineering '
                    'and computer science and I really '
                    'enjoyed the scaps on course and I '
                    'love school and went through 2823 is '
                    'going to be great'},
                  { 'transcript': 'I really like electrical engineering '
                    'and computer science and are really '
                    'enjoyed the scaps on course and I '
                    'love school and went through 2823 is '
                    'going to be great'},
                  { 'transcript': 'I really like electrical engineering '
                    'and computer science and I really '
                    'enjoyed the scaps on course and I '
                    'love school and went through 28-23 '
                    'is going to be great'},
                  { 'transcript': 'I really like electrical engineering '
                    'and computer science and are really '
                    'enjoyed the scaps on course and I '
                    'love school and went through 28-23 '
                    'is going to be great'}}],
  'final': True}
You said I really like electrical engineering and computer science and I really enjoyed the scaps on course and I love school and went through 2823 is going to be great
Say something!
Got it! Now to recognize it...
result2:
[]
Oops! Didn't catch that
Say something!
Got it! Now to recognize it...
result2:
[]
Oops! Didn't catch that
Say something!

```

As for really long sentences:

```
((zeid-env) zeidsolh@Zeids-MBP Lab 2 % python -m speech_recognition
A moment of silence, please...
Set minimum energy threshold to 75.11011806702331
Say something!
Got it! Now to recognize it...
result2:
{ 'alternative': [ { 'confidence': 0.93811421,
                    'transcript': 'I really like to see La and this '
                                'quarter I am taking an electrical '
                                'engineering Capstone course which is '
                                'super fun looking forward to more'},
                    { 'transcript': 'I really like UCLA and this quarter '
                                'I am taking an electrical '
                                'engineering Capstone course which is '
                                'super fun looking forward to more'},
                    { 'transcript': 'I really like you say la and this '
                                'quarter I am taking an electrical '
                                'engineering Capstone course which is '
                                'super fun looking forward to more'},
                    { 'transcript': 'I really like you say Ali and this '
                                'quarter I am taking an electrical '
                                'engineering Capstone course which is '
                                'super fun looking forward to more'},
                    { 'transcript': 'I really like to see Ali and this '
                                'quarter I am taking an electrical '
                                'engineering Capstone course which is '
                                'super fun looking forward to more'}}],
  'final': True)
You said I really like to see La and this quarter I am taking an electrical engineering Capstone course which is super fun looking forward to more
Say something!
Got it! Now to recognize it...
result2:
[]
Oops! Didn't catch that
Say something!
^C
((zeid-env) zeidsolh@Zeids-MBP Lab 2 %
((zeid-env) zeidsolh@Zeids-MBP Lab 2 %
((zeid-env) zeidsolh@Zeids-MBP Lab 2 %
((zeid-env) zeidsolh@Zeids-MBP Lab 2 %
((zeid-env) zeidsolh@Zeids-MBP Lab 2 %
((zeid-env) zeidsolh@Zeids-MBP Lab 2 %
```

It does a pretty good job, it was able to correctly transcribe what I said which is the second option: “ I really like UCLA and this quarter I am taking an electrical engineering capstone course which is super fun. Looking forward to more”

I think the length of a phrase is a good thing for “error correction” because the speech recognition software can make sense of the idea to determine what is the correct word if it is lost.

```

((zeid-env) zeidsolh@Zeids-MBP Lab 2 % python -m speech_recognition
A moment of silence, please...
Set minimum energy threshold to 208.42826149231445
Say something!
Got it! Now to recognize it...
result2:
{ 'alternative': [ { 'confidence': 0.97219557,
                    'transcript': 'I want to play football today I want '
                                'to play football today'},
                  { 'transcript': 'my mama wish I would have I want to '
                                'play football today I want to play '
                                'football today'}],
  'final': True}
You said I want to play football today I want to play football today
Say something!

```

When I play music in the background, it has a harder time figuring what I said, since it is also picking up the music. My original sentence is “I want to play football. I want to play football” but it also picked some sentences from the song like “my mama wish I would have...”

So when we have a lot of background noises, the software becomes less reliable. When we have noise, we can try and raise our voice, or have some close microphone instead of the computer laptop. This should improve performance.

We are thinking of using the speech recognition software in our project by selecting songs by saying their names and for a few simple commands like play, pause and settings.

We are thinking of having a relatively simple speech recognition for the sake of the project. Given that we don’t have much experience using speech recognition tools, we can’t expect to have very advanced speech recognition features so we will just stick to processing simple and distinguishable 1 word or 2 word utterances.

We need basic speech accuracy as I think we will have very separable words to make our task easier. We will need to detect a 1-2 second delay max which I think is manageable. A missed recognition wouldn't necessarily hurt the progress of the game because we are thinking of using it only for starting the game, choosing the song, and changing settings. I don't think we'll make use of it inside the game, so we shouldn't worry about it affecting the actual gameplay.

I don't think we actually need any hardware to make sure that it works well enough. I think we will rely on trial and error to see how well it performs. At the end of the day whether we use the speech recognition softwares by google or unity, i think they are pretty reliable for our very basic tasks.