Lab_0

April 4, 2025

1 EE 242 Lab 0 – Texts, Code, Plot and Play

In this lab exercise, basic python tools that will be required throughout this course to perform the various lab assignments.

1.1 Form Teams

All in-lab sessions will be conducted as a team of 2-4 students. We prefer teams of 3 over other combinations.

Write down the names and number of your team (assigned by the TA of the form "XXYY" where XX is your lab session code (AA, AB, AD, AE, AF) and YY is your team number. This will also be the team name in Canvas.

Team AE01: Yehoshua Luna, Aaron McBride, Ben Eisenhart

1.2 How to run lab 0 on a JuypterHub server:

- log in UW-IT JupyterHub: open https://jupyter.rttl.uw.edu/2024-spring-e-e-242-a
- open a python notebook: click Notebook → Python 3 (ipykernel)
- download the lab 0 jupyter notebook file from canvas
- drag the lab0 jupyter notebook file from local computer to the JupyterHub server. (on left side of the browser)

1.3 Playing with strings

1.3.1 Lab 0.1 - Palindromes

Write the python code for reading input from user and write a function to check whether the string is a palindrome using the following algorithm

- read input in a string a
- reverse the string b
- write a for loop to check from 1 → N if a[i]=b[i]
- if all characters match return True else return False

[28]:
```
#Python code goes here
a=input("Input A:")
def isPalindrome(input_string):
    for char_a, char_b in zip(input_string, reversed(input_string)):
        if char_a != char_b:
```

```
            return False;
    return True;

b=isPalindrome("Akshay Gadre");
print("Output B:"+str(b)) #Should be False
c=isPalindrome("Signals, Systems and Data I:I ataD dna smetsyS ,slangiS")
print("Output C:"+str(c)) #Should be True
d=isPalindrome(a)
print("Output D:"+str(d))
```

```
Input A:racecar
Output B:False
Output C:True
Output D:True
```

Questions to be answered in the report:

1. Is there a way to make this algorithm more efficient in time required and storage space? - No there is no way to make this algorithm more time or storage efficient as far as I know.

2. Are there cases where the above algorithm/code will fail? - The above algorithm will never fail - even if the two strings are of differing lengths.

1.3.2 Lab 0.2 - Teams

Write the python code for reading input from user and write a function to replace all vowels using the following encoding scheme: - Aa → @ - Ee → 3 - Ii → 1 - Oo → 0 - Uu → ^

Show the TA example with all of your names concatenated in the string.

[29]:
```
#python code goes here
a=input("Input A:")
def encode(input_string):
    input_string = input_string.replace("A", "@");
    input_string = input_string.replace("a", "@");
    input_string = input_string.replace("E", "3");
    input_string = input_string.replace("e", "3");
    input_string = input_string.replace("I", "1");
    input_string = input_string.replace("i", "1");
    input_string = input_string.replace("O", "0");
    input_string = input_string.replace("o", "0");
    input_string = input_string.replace("U", "^");
    input_string = input_string.replace("u", "^");


    output_string=input_string;
    return output_string;

b=encode("Akshay Gadre");
print("Output B:"+b) #Should be @ksha@y G@dr3
```

```
c=encode("Signals, Systems and Data I: This is my first lab session")
print("Output C:"+c) #Should be S1gn@ls, Syst3ms @nd D@t@ 1: Th1s 1s my f1rst␣
 ↪l@b s3ss10n
d=encode(a)
print("Output D:"+d)
```

```
Input A:Ben Eisenhart Aaron McBride Yehoshua Luna
Output B:@ksh@y G@dr3
Output C:S1gn@ls, Syst3ms @nd D@t@ 1: Th1s 1s my f1rst l@b s3ss10n
Output D:B3n 31s3nh@rt @@r0n McBr1d3 Y3h0sh^@ L^n@
```

Questions to be answered in the report:

1. What is the time complexity of the code if the length of the string is N? - The time complexity is N if the length of the string is N

2. How much storage does your function require if the length of the string is N? (1 char is 1 byte) - The function requires N bytes of storage space if the length of the string is N

1.4 Playing with Signals

1.4.1 Lab 0.3 - Reading, playing and writing audio files

Use scipy package to read the provided baby.wav file. **Refer to documentation (https://docs.scipy.org/doc/scipy/reference/io.html)**

Perform these 4 actions : - Load the wave file - Plot the wave file in time-domain **Refer to this demo for matplotlib (https://matplotlib.org/stable/plot_types/basic/plot.html#sphx-glr-plot-types-basic-plot-py)** - Write a new wave file called "babyhigh.wav" with a sample rate of 96000 - Write a new wave file called "babylow.wav" with a sample rate of 24000

Use IPython package to play the provided baby.wav file as well as the other two "babyhigh.wav" and "babylow.wav" files. **Refer to documentation (https://ipython.readthedocs.io/en/stable/api/generated/IPython.display.html)**

[30]:
```
!python install --user IPython
from scipy.io import wavfile
from matplotlib import pyplot
import IPython

#1. Read the baby.wav file.
baby_sample_rate, baby_data = wavfile.read("baby.wav")

#2. Plot the laugh sound (What are the two arrays that you see?)
pyplot.plot(baby_data)
print(baby_data.shape)
print(baby_sample_rate)

#3. Store the data with sample rate of 96000
```

```
wavfile.write("babyhigh.wav", 96000, baby_data)

#4. Store the data with sample rate of 24000
wavfile.write("babylow.wav", 24000, baby_data)

#5. Play all the files. Notice how the sound changes?
IPython.display.display(IPython.display.Audio(filename="babylow.wav"))
IPython.display.display(IPython.display.Audio(filename="babyhigh.wav"))
IPython.display.display(IPython.display.Audio(filename="baby.wav"))
```

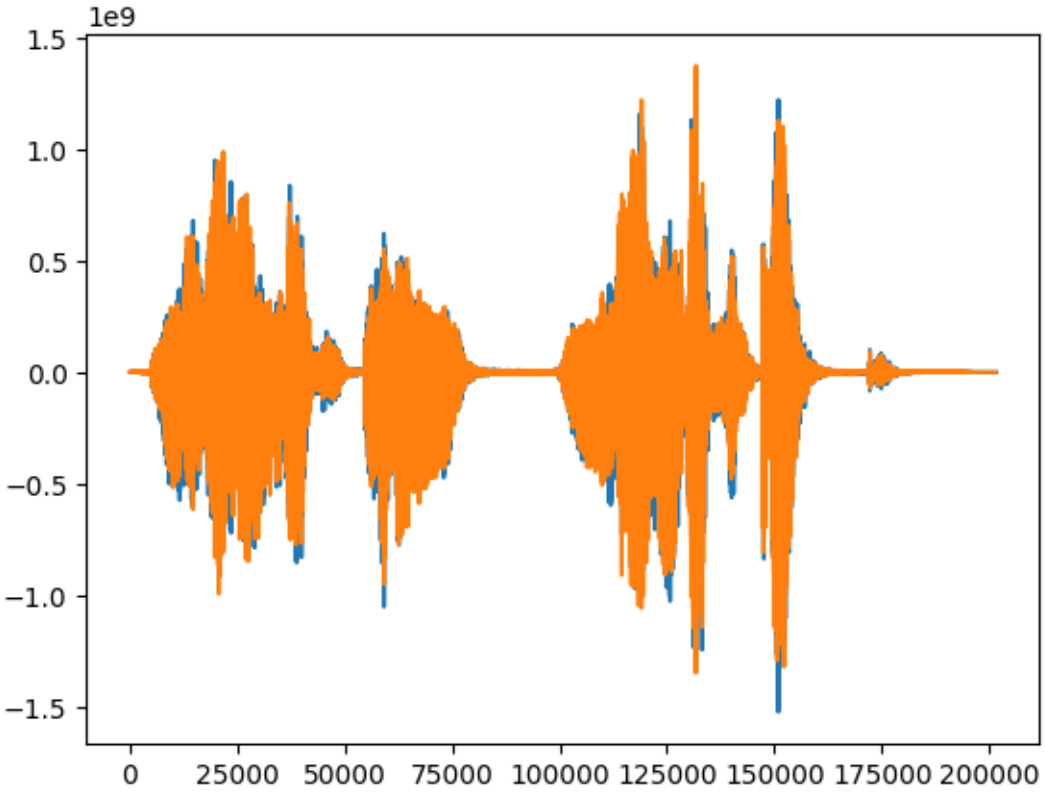
```
python3: can't open file '/content/install': [Errno 2] No such file or directory
(201600, 2)
48000
```

```
<ipython-input-30-5174e9a30aa3>:7: WavFileWarning: Chunk (non-data) not
understood, skipping it.
  baby_sample_rate, baby_data = wavfile.read("baby.wav")
```

```
<IPython.lib.display.Audio object>
```

```
<IPython.lib.display.Audio object>
```

```
<IPython.lib.display.Audio object>
```



Questions to be answered in this report:

1. Store the wavefile with a lower sampling rate and try to play it. Does it sound higher pitch or lower pitch? (Keep the IPython display open to show TA) * It sounded lower.

2. Store the wavefile with a higher sampling rate and try to play it. Does it sound higher pitch or lower pitch? (Keep the IPython display open to show TA) * It sounded higher.