SVKM's NMIMS
Mukesh Patel School of Technology Management & Engineering
Computer Engineering Department
Program: B. Tech/MBA Tech EXTC

Course: B. Tech/MBA. Tech (EXTC)
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Program : Btech	*Division:*
Batch:	*Date of Experiment:* 23_12_2021
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AIM: -To perform multivariate Statistical analysis on acquired multi-channel EEG data

Colab Link: https://colab.research.google.com/drive/1q9lW_SAuwh-JwJyTkoY07CkWlyu3PGdC?usp=sharing

Steps:

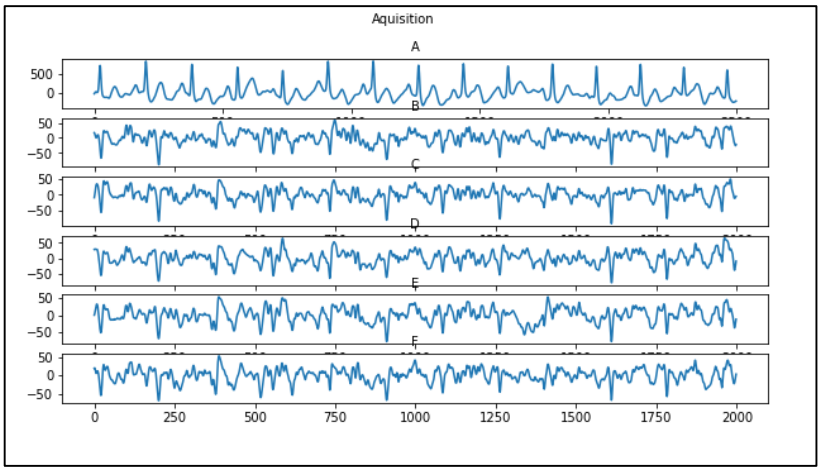
Instructions and Objective:

1. Open the data base of Neuromax Select any subjects between 3-9
2. Set the gain 30 µ V/mm, page speed 30 mm/sec, lower freq. 0.5 and higher 99 Hz enable the notch filter 50 HZ and Mont 3
3. Export the data from in excel for 10 secs, samples 2560 (both filtered and unfiltered)
4. Import the CSVs in google collab
5. Remove NaN values if any from the data
6. Perform various statistical analysis (for both dataset)
   a. Plot the waveform of all channels in subplots
   b. Find the average amplitude of even and odd channels compare the same by plots
   c. Plot the correlation matrix (heat maps) of even and odd channels

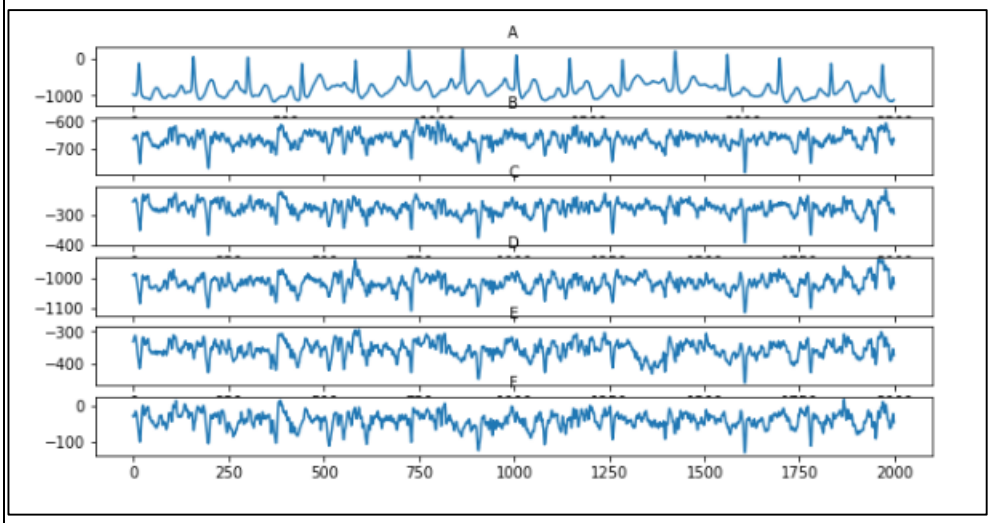
7.Add odd no. channel and even no. of channels perform the z-test

Output

Graphs



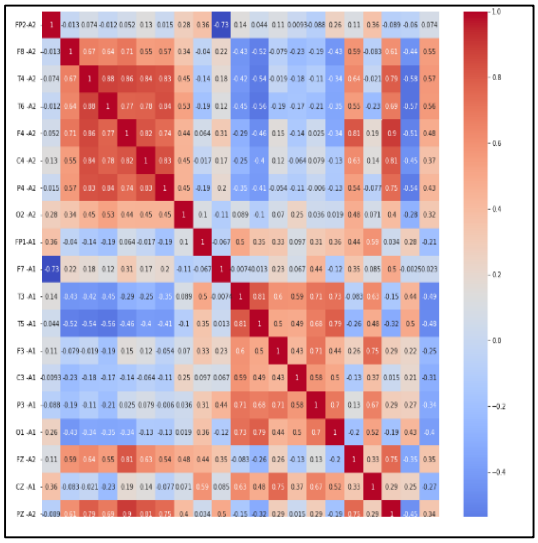
Plotting the Graphs for filtered data



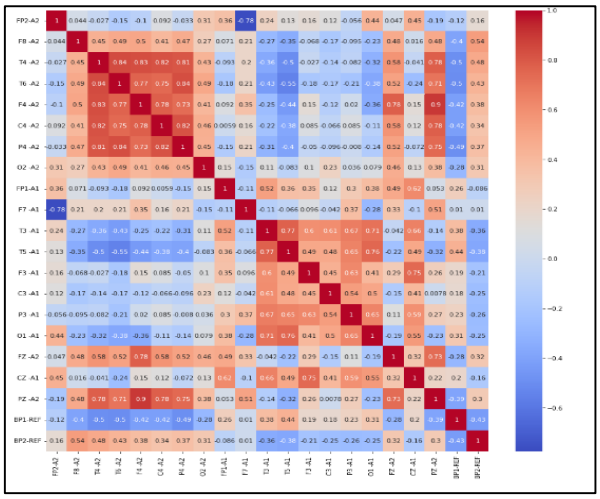
Plotting the Graphs for unfiltered data

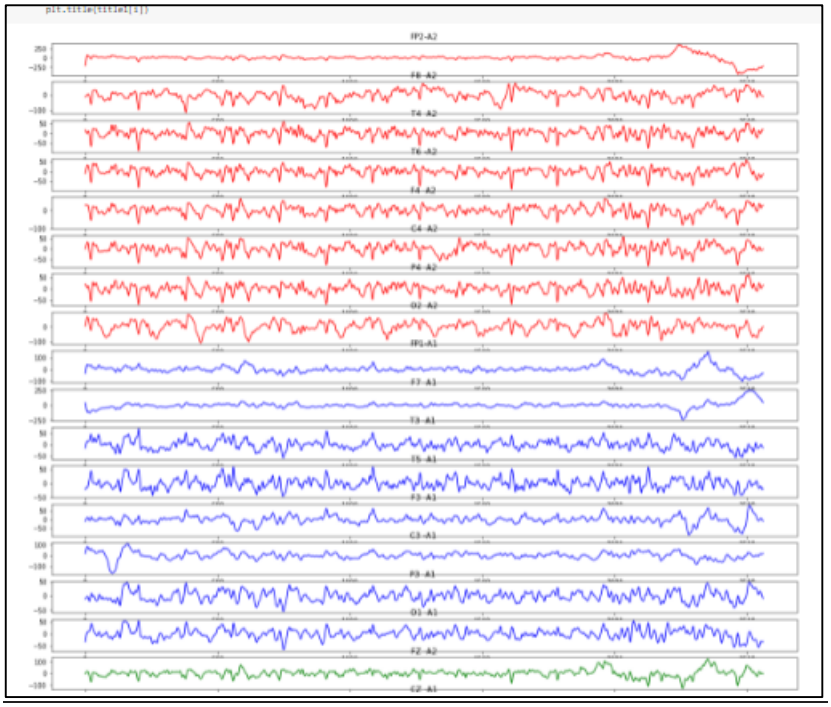
Heatmaps

Heatmap of filtered data

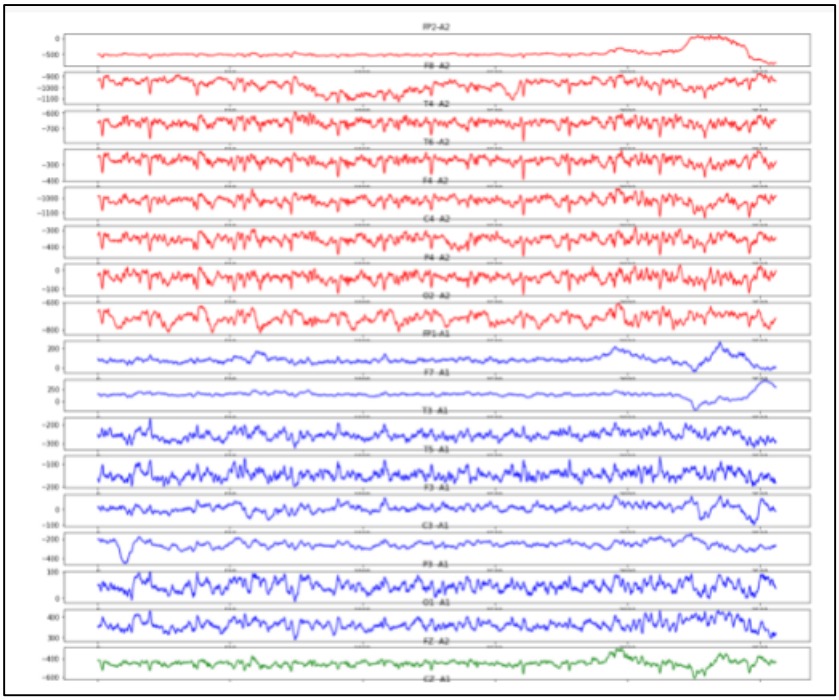


Heatmap of unfiltered data





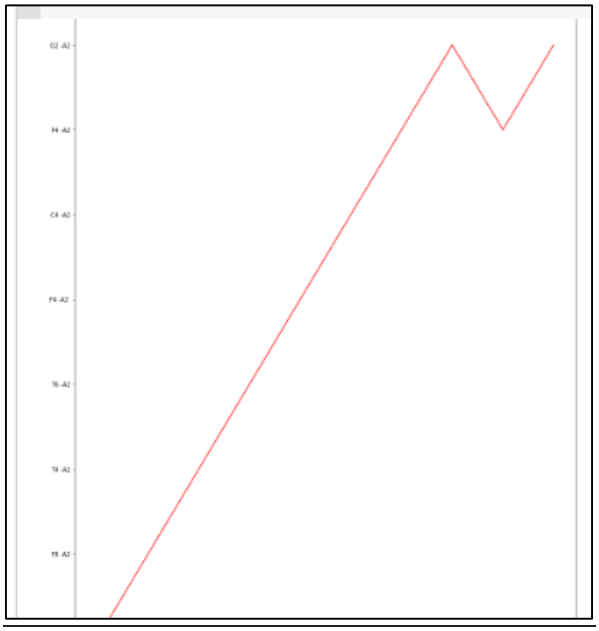
Filtered data odd and even



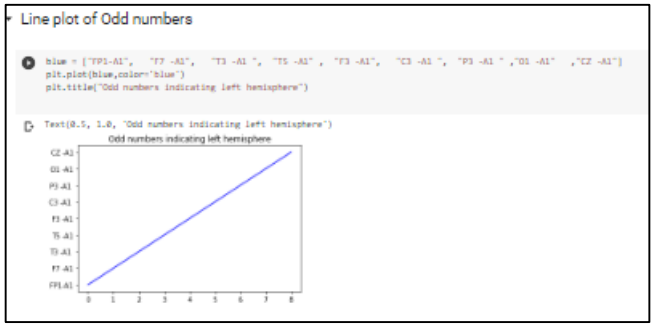
Unfiltered data odd and even

Line plots

Line plot of even numbers(red)



Line plot of odd numbers



Bar graphs

Bar plot of even numbers

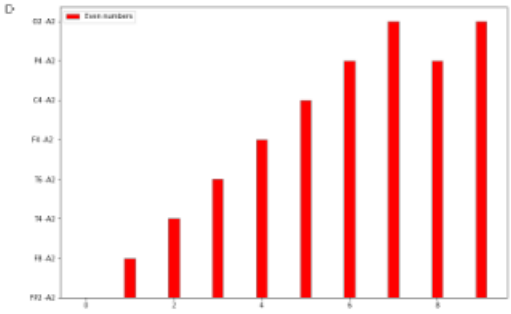
```
import numpy as np
import matplotlib.pyplot as plt

# set width of bar
barWidth = 0.25
fig = plt.subplots(figsize =(12, 8))

# set height of bar
red = ['FP2 -A2', 'F8 -A2', 'T4 -A2', 'T6 -A2', 'F4 -A2 ', 'C4 -A2', 'P4 -A2', 'O2 -A2', 'P4 -A2', 'O2 -A2']


# Set position of bar on X axis
br1 = np.arange(len(red))
br2 = [x + barWidth for x in br1]


# Make the plot
plt.bar(br1, red, color ='r', width = barWidth,
        edgecolor ='grey', label ='Even numbers')
plt.legend()
plt.show()
```



Bar plot of even numbers

Bar plot of odd numbers

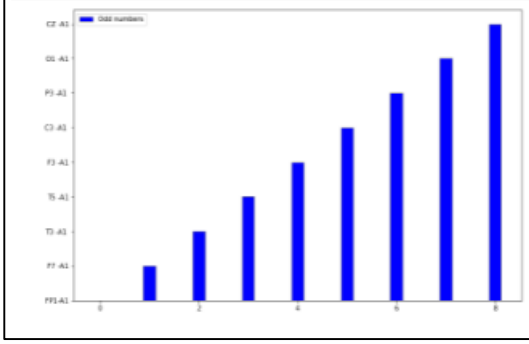
```
import numpy as np
import matplotlib.pyplot as plt

# set width of bar
barWidth = 0.25
fig = plt.subplots(figsize =(12, 8))

# set height of bar
blue = ['FP1-A1',   'F7 -A1',   'T3 -A1 ',  'T5 -A1' ,  'F3 -A1',   'C3 -A1 ',  'P3 -A1 ' ,'O1 -A1'   ,'CZ -A1']

# Set position of bar on X axis
br1 = np.arange(len(blue))
br2 = [x + barWidth for x in br1]


# Make the plot
plt.bar(br1, blue, color ='b', width = barWidth,
        edgecolor ='grey', label ='Odd numbers')
plt.legend()
plt.show()
```



Bar Plot of Odd numbers

Conclusion

- It produces a chart (an encephalogram) which shows how 'brain waves' vary by frequency (number of waves per second) and amplitude (height) of electrical output from the brain changes over time.
- An electroencephalogram (EEG) is a non-invasive test that records electrical patterns in your brain. The test is used to help diagnose conditions such as seizures, epilepsy, head injuries, dizziness, headaches, brain tumours and sleeping problems. It can also be used to confirm brain death.

What is a normal EEG result?

- Most waves of 8 Hz and higher frequencies are normal findings in the EEG of an awake adult. Waves with a frequency of 7 Hz or less often are classified as abnormal in awake adults, although they normally can be seen in children or in adults who are asleep.
- These patterns are visualized using multidimensional scaling (MDS), allowing a comparison of the spatial cortical activity patterns.
- These patterns are visualized using multidimensional scaling (MDS), allowing a comparison of the spatial cortical activity patterns.

- From this experiment we perform multivariate Statistical analysis on acquired multi-channel EEG data.
- We calculated the average
- Plot the graphs of filtered and unfiltered data and also the correlation matrix
- We found the odd and even signals. Plotted the graph of all odd and even signals.