Proposed Research Area:

1. Features Importance according to the bands (alpha, beta, theta, delta, gamma or Slow wave/Fast wave)
2. Statistics property analysis for all bands.
3. Statistical Changes in REM and NREM.
4. Accuracy Performance Dependency.

Dataset Distribution

NREM	72631
REM	16480
TOTAL	89111

Data Set: ALL

	Precision	Recall	F1-Score	Support
NREM	0.84	0.99	0.91	23930
REM	0.75	0.17	0.27	5472
Accuracy			0.83	29402
Macro AVG	0.79	0.58	0.59	29402
Weighted AVG	0.82	0.83	0.79	29402

Data Set: Delta (Slow Wave)

	Precision	Recall	F1-Score	Support
NREM	0.85	0.93	0.89	23930
REM	0.46	0.25	0.33	5472
				29402
Accuracy			0.81	29402
Macro AVG	0.65	0.59	0.61	29402
Weighted AVG	0.77	0.81	0.78	29402

Data Set: Theta (Slow wave)

	Precision	Recall	F1-Score	Support
NREM	0.82	0.98	0.89	23930
REM	0.47	0.07	0.13	5472
Accuracy			0.81	29402
Macro AVG	0.65	0.53	0.51	29402
Weighted AVG	0.76	0.81	0.75	29402

Data Set: Alpha (Fast Wave)

	Precision	Recall	F1-Score	Support
NREM	0.83	0.97	0.89	23930
REM	0.46	0.11	0.18	5472
Accuracy			0.81	29402
Macro AVG	0.64	0.54	0.54	29402
Weighted AVG	0.76	0.81	0.76	29402

Data Set: Beta (Fast Wave)

	Precision	Recall	F1-Score	Support
NREM	0.83	0.97	0.90	23930
REM	0.52	0.12	0.20	5472
Accuracy			0.82	29402
Macro AVG	0.68	0.55	0.55	29402
Weighted AVG	0.77	0.82	0.77	29402

Data Set: Gamma (Ultra)

	Precision	Recall	F1-Score	Support
NREM	0.83	0.98	0.89	23930
REM	0.43	0.06	0.11	5472
Accuracy			0.81	29402
Macro AVG	0.63	0.52	0.50	29402
Weighted AVG	0.75	0.81	0.75	29402

Data Set: Slow Waves (Delta and Theta)

	Precision	Recall	F1-Score	Support
NREM	0.83	0.93	0.90	23930
REM	0.52	0.10	0.17	5472
Accuracy			0.82	29402
Macro AVG	0.67	0.54	0.53	29402
Weighted AVG	0.77	0.82	0.76	29402

Data Set: Fast Wave (Alpha and Beta)

	Precision	Recall	F1-Score	Support
NREM	0.83	0.98	0.90	23930
REM	0.61	0.12	0.21	5472
Accuracy			0.82	29402
Macro AVG	0.72	0.55	0.55	29402
Weighted AVG	0.79	0.82	0.77	29402

Significant Features:

Data Set: ALL

	Specs	Score
9	PeakF_Beta_O2	742.508011
23	Spectral Edge_Gamma_O2	426.030573
3	Spectral Edge_Alpha_O2	400.231243
21	MedianF_Gamma_O2	367.954960
2	MeanF_Alpha_O2	333.296001
19	PeakF_Delta_O2	308.181624
22	MeanF_Gamma_O2	273.170152
1	MedianF_Alpha_O2	218.817122
17	MeanF_Delta_O2	203.247854
4	PeakF_Alpha_O2	199.647720

Heat Map:
https://github.com/RafsanJany-44/Research-NREM-REM/blob/main/Feature_Selection_ALL_O2.ipynb

Data Set: Alpha

	Specs	Score
3	Spectral Edge_Alpha_O2	400.231243
2	MeanF_Alpha_O2	333.296001
1	MedianF_Alpha_O2	218.817122
4	PeakF_Alpha_O2	199.647720
0	MeanP_Alpha_O2	1.913752

Heat Map:
https://github.com/RafsanJany-44/Research-NREM-REM/blob/main/Feature_Selection_Alpha_O2.ipynb

Data Set: Beta

	Specs	Score
4	PeakF_Beta_O2	742.508011
1	MedianF_Beta_O2	92.469710
2	MeanF_Beta_O2	26.265081
3	Spectral Edge_Beta_O2	16.158986
0	MeanP_Beta_O2	1.333761

Heat Map:
https://github.com/RafsanJany-44/Research-NREM-REM/blob/main/Feature_Selection_Beta_O2.ipynb

Data Set: Delta

	Specs	Score
4	PeakF_Delta_O2	308.181624
2	MeanF_Delta_O2	203.247854
1	MedianF_Delta_O2	131.052054
3	Spectral Edge_Delta_O2	40.388604
0	MeanP_Delta_O2	22.173747

Heat Map:
https://github.com/RafsanJany-44/Research-NREM-REM/blob/main/Feature_Selection_Delta_O2.ipynb

Data Set: Theta

	Specs	Score
3	Spectral Edge_Theta_O2	77.763503
2	MeanF_Theta_O2	21.532595
4	PeakF_Theta_O2	13.311010
1	MedianF_Theta_O2	9.481055
0	MeanP_Theta_O2	4.758821

Heat Map:
https://github.com/RafsanJany-44/Research-NREM-REM/blob/main/Feature_Selection_Theta_O2.ipynb

Data Set: Gamma

	Specs	Score
3	Spectral Edge_Gamma_O2	426.030573
1	MedianF_Gamma_O2	367.954960
2	MeanF_Gamma_O2	273.170152
4	PeakF_Gamma_O2	2.231591
0	MeanP_Gamma_O2	0.856045

Heat Map:
https://github.com/RafsanJany-44/Research-NREM-REM/blob/main/Feature_Selection_Gamma_O2.ipynb

Data Set: Slow- Wave (Delta and Theta)

	Specs	Score
9	PeakF_Delta_O2	308.181624
7	MeanF_Delta_O2	203.247854
6	MedianF_Delta_O2	131.052054
3	Spectral Edge_Theta_O2	77.763503
8	Spectral Edge_Delta_O2	40.388604
5	MeanP_Delta_O2	22.173747
2	MeanF_Theta_O2	21.532595
4	PeakF_Theta_O2	13.311010
1	MedianF_Theta_O2	9.481055
0	MeanP_Theta_O2	4.758821

Heat Map:
https://github.com/RafsanJany-44/Research-NREM-REM/blob/main/Feature_Selection_Slow_Wave_O2.ipynb

Data Set: Fast-Wave (Alpha and Beta)

	Specs	Score
9	PeakF_Beta_O2	742.508011
3	Spectral Edge_Alpha_O2	400.231243
2	MeanF_Alpha_O2	333.296001
1	MedianF_Alpha_O2	218.817122
4	PeakF_Alpha_O2	199.647720
6	MedianF_Beta_O2	92.469710
7	MeanF_Beta_O2	26.265081
8	Spectral Edge_Beta_O2	16.158986
0	MeanP_Alpha_O2	1.913752
5	MeanP_Beta_O2	1.333761

Heat Map:
https://github.com/RafsanJany-44/Research-NREM-REM/blob/main/Feature_Selection_Fast_wave_O2.ipynb

Sectors Of Improvement:

1. Process to make the data ratio stable
2. Visual Presentation
3. Neural Network Model
4. Explainable
5. Co Relation between the features
6. Convenient statistical analysis