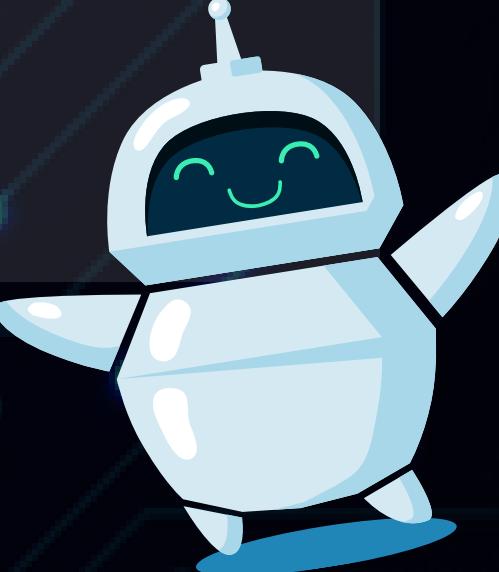


EIEG FEEDER SPEAKER

BY- Saanvi Singh

250934





AIM:

TO BUILD A BETTER P300 SPELLER

THE GOAL IS TO DETECT HUMAN EEG SIGNALS OF LETTERS WITH GREATER ACCURACY THAN IS CURRENTLY PRESENT.

P300 SIGNALS ARE VERY TINY POSITIVE SIGNALS TYPICALLY 300ms POST STIMULUS. RAW EEG DATA IS VERY NOISy, AND HAS TO BE FILTERED BEFORE P300 SIGNALS CAN BE DETECTED. AT PRESENT, WE HAVE IDENTIFIED THE MOST SUITABLE ML MODEL TO PREDICT P300 SIGNALS.

WE STILL HAVE TO IMPLEMENT IT IN REAL TIME USING SIGNALS FROM OpenViBE AND ON ACTUAL PEOPLE.



WORK COMPLETED



PREFROCESSING THE DATA

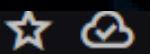
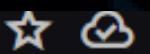
- FILTERING(TO REMOVE NOISE)
- DOWNSAMPLING(removing computational speed)

UNIMPORTANT SIGNALS TO INCREASE





Assignment_3.ipynb



File Edit View Insert Runtime Tools Help

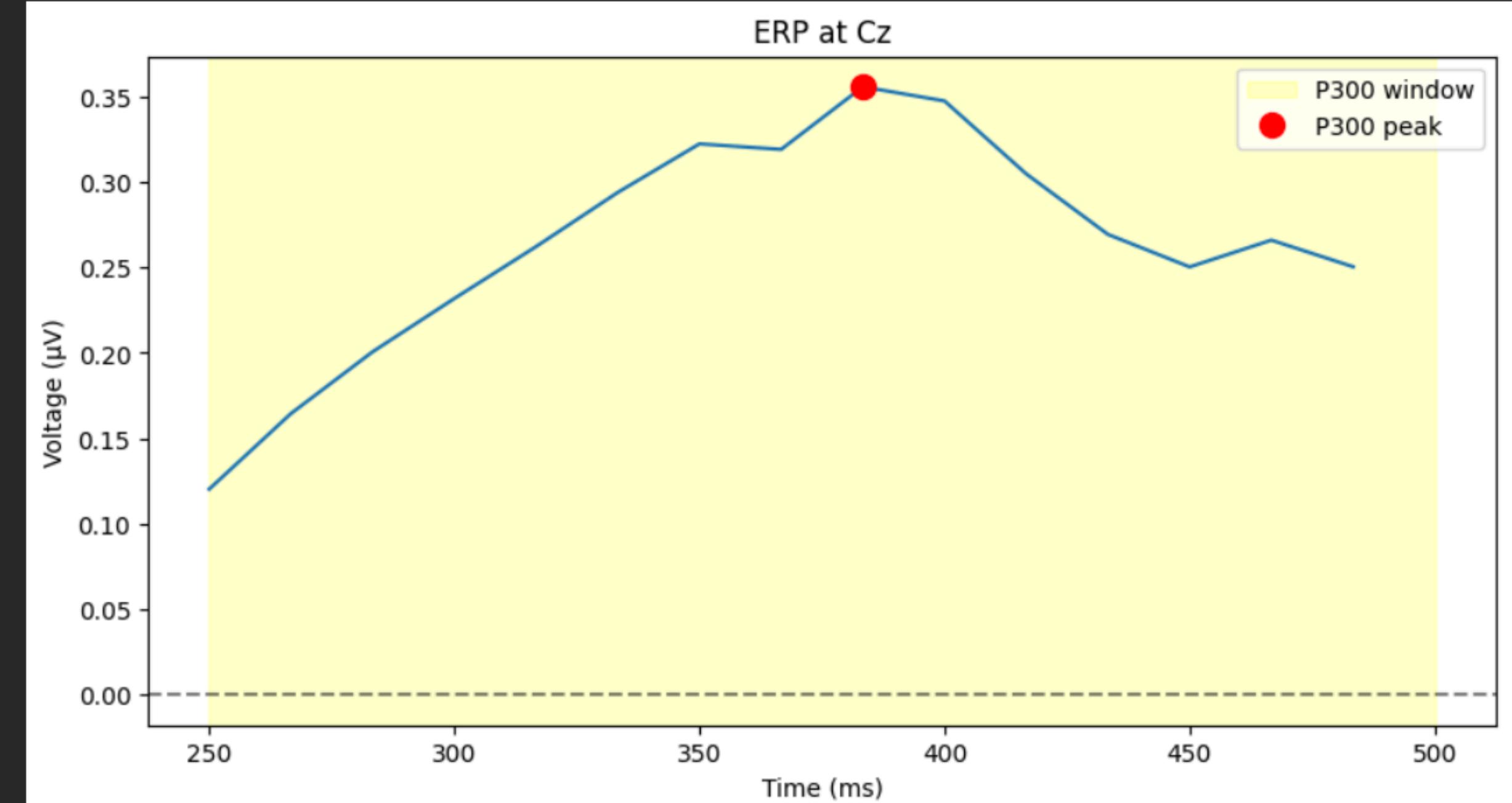
Commands

+ Code + Text

Run all

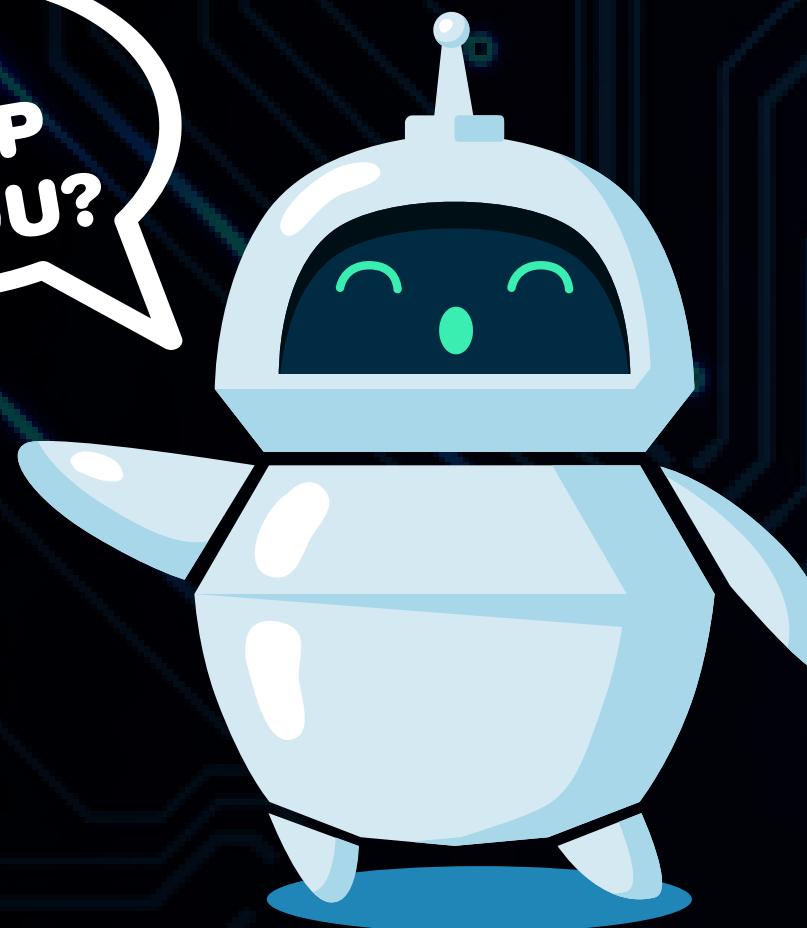
STEP 4: VISUALIZING ERP RESPONSES

--- Subject A ---



EXTRACTING FEATURES

CAN I
HELP
YOU?



- TRIED PCA WITH 20 AND 50 COMPONENTS,CSP AND TIME DOMAIN EXTRACTION TO SELECT BEST OUT OF THEM BASED ON F1 SCORES
- SELECTED PCA WITH 20 COMPONENTS



Assignment_3.ipynb

File Edit View Insert Runtime Tools Help

Commands

+ Code

+ Text

▶ Run all

```
...
=====
STEP 5: FEATURE EXTRACTION
=====

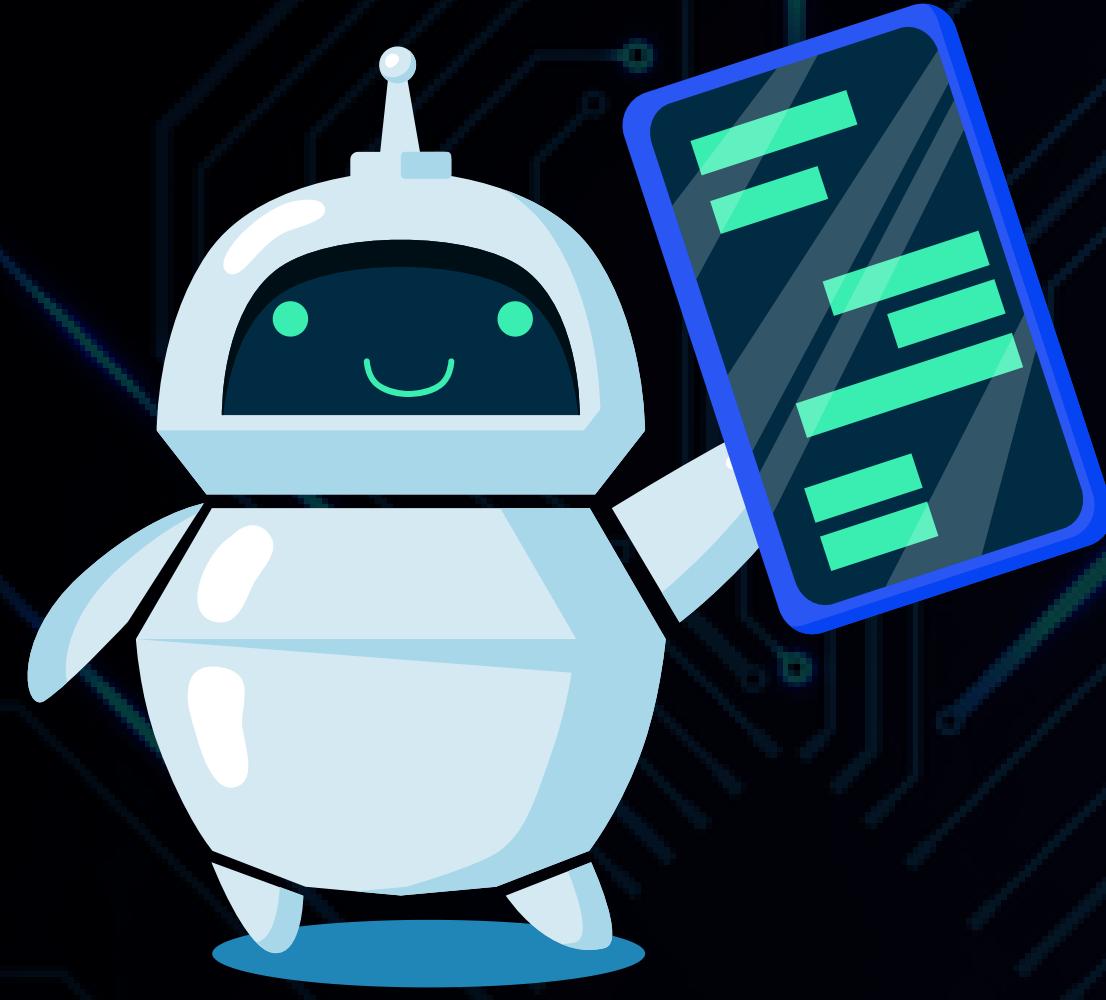
--- Subject A: Feature Comparison ---
CSP labels: [0. 1.]
Target epochs for CSP: 2537
Non-target epochs: 12678
Computing rank from data with rank=None
    Using tolerance 7.2e+02 (2.2e-16 eps * 48 dim * 6.8e+16  max singular value)
    Estimated rank (data): 48
    data: rank 48 computed from 48 data channels with 0 projectors
Reducing data rank from 48 -> 48
Estimating class=0 covariance using EMPIRICAL
Done.
Estimating class=1 covariance using EMPIRICAL
Done.

=====
FEATURE COMPARISON (Balanced classifiers)
=====

PCA (20 comp):      Accuracy=0.8332, F1=0.7576
PCA (50 comp):      Accuracy=0.8331, F1=0.7574
CSP (20 comp):      Accuracy=0.8333, F1=0.7575
Time-Domain (3072): Accuracy=0.7353, F1=0.7250

Best method selected: PCA20 (F1=0.7576)

Subject A splits: Training=12172, Validation=3043
```



ML

- TRAINED SVM,LOGISTIC REGRESSION,LDA,RANDOM FOREST AND GRADIENT BOOSTING ON DATA
- SVM TURNED OUT TO BE BEST FOR OUR PURPOSE

LINKS TO COLLABORATIVE NOTEBOOKS AND SCRIPTS

- https://github.com/singhsaanvi019/Winter-projects-25-26/blob/main/EEG-Based%20P300%20Speller/assignments/assignment_0/EEG_250934_Saanvi_Singh.ipynb
- https://github.com/singhsaanvi019/Winter-projects-25-26/blob/main/EEG-Based%20P300%20Speller/assignments/assignment_1/250934_Saanvi_Singh.pdf
- https://github.com/singhsaanvi019/Winter-projects-25-26/blob/main/EEG-Based%20P300%20Speller/assignments/assignment_2/preprocessingEEG_250934_SaanviSingh.ipynb
- https://github.com/singhsaanvi019/Winter-projects-25-26/blob/main/EEG-Based%20P300%20Speller/assignments/assignment_3/EEG_assignment5_Saanvi_Singh_250934.ipynb





THANK YOU

