Extensions and Application of the Robust Shared Response Model to Electroencephalography Data for Enhancing Brain-Computer Interface Systems

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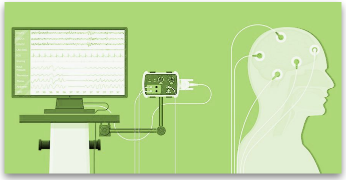
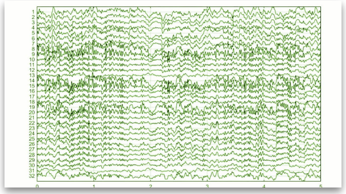
Acknowledgements: Dr. Tim Clark, Dr. Mohammad Sadnan Al Manir

Predict Behavior Using Electrical Activity in Brain

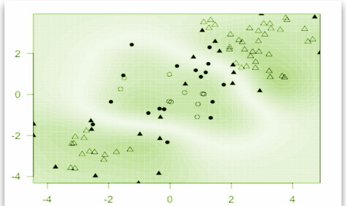
Record Trial



Process Data



Build Model



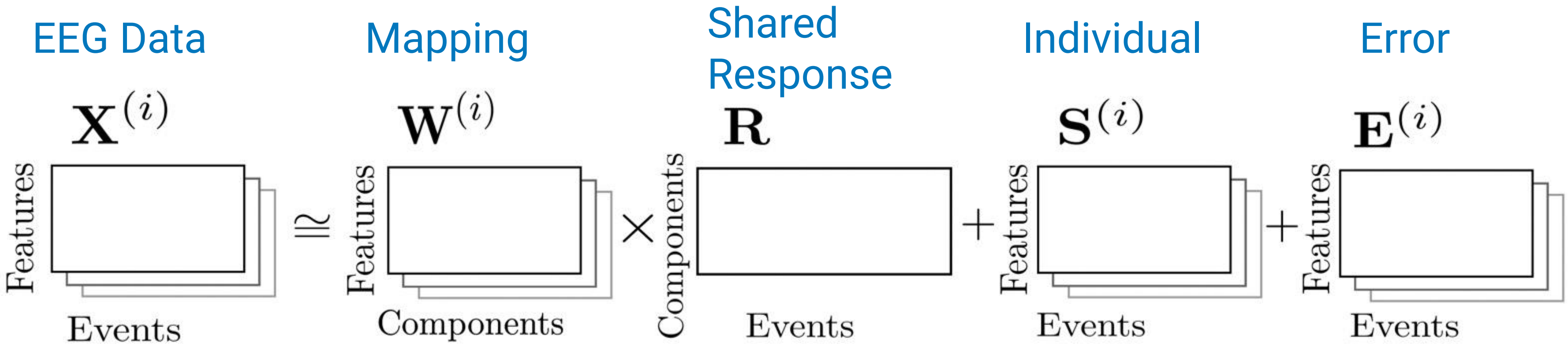
Predict

The Shared Response Model

Implementing:

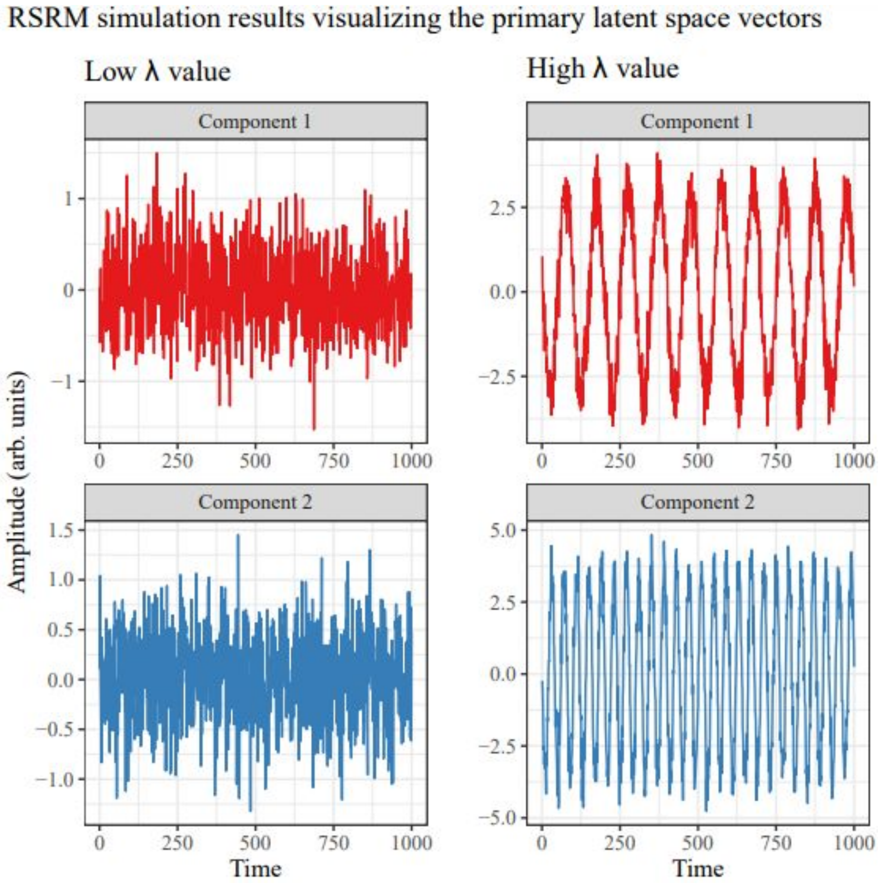
A Robust Shared Response Model [2]

Robust Shared Response Model



Experiment 1: Results

- 100 individuals
- 32 electrodes
- 10 Hz, 25 Hz sine-waves
- Gaussian noise perturbation

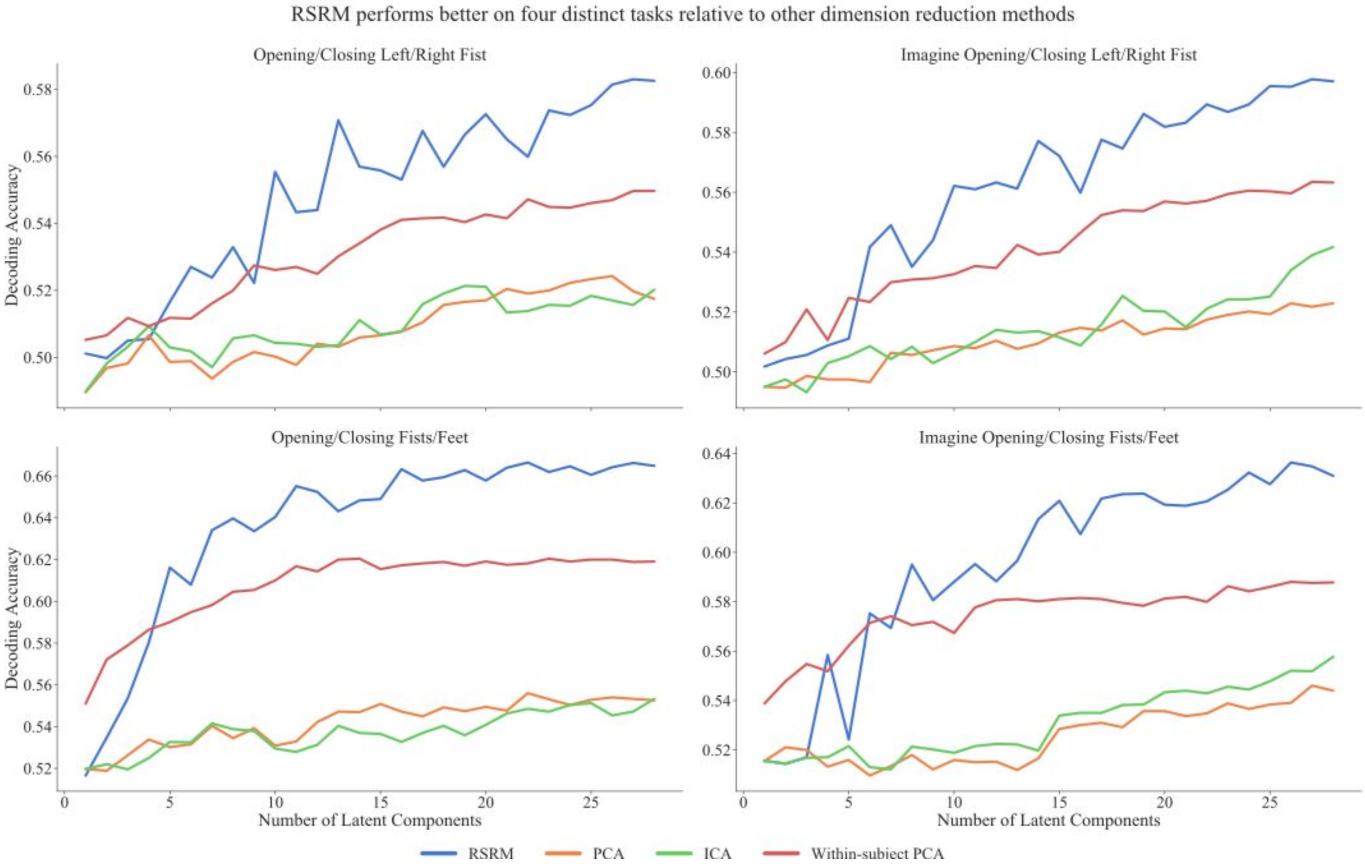


Experiment 2: EEG Dataset Description

Openly available Motor Movement/ Imagery dataset [5]

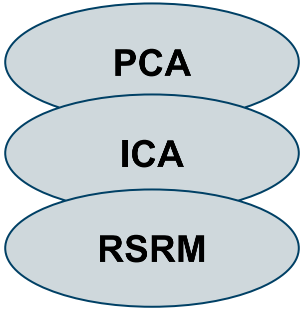
- Consists of 12 task-related two-minute recordings
- 4 tasks (all related to motor movement)
    - 109 subjects
    - 4110 classification labels for each task
- Test how RSRM functions as a dimension reduction step in feature engineering relative to other widely used methods.

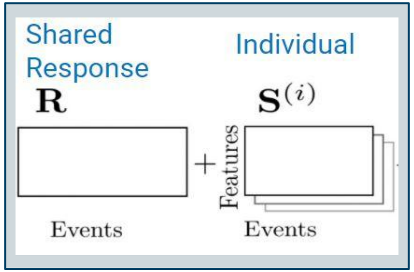
Experiment 2: Results

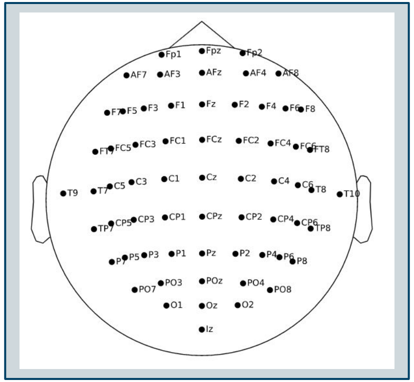


RSRM Summary

- A latent variable model for sequential data.
- Models common signals and individual differences.
- New evidence suggesting that it works well with EEG data.

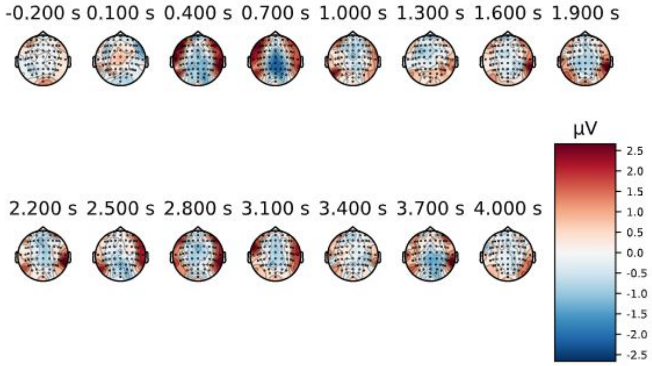


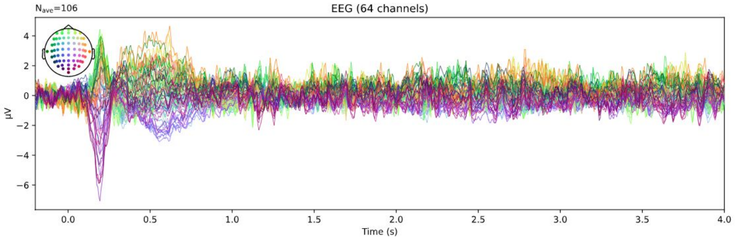




Conclusion

- Superior performance to other dimension reduction techniques.
- Faster modeling than individual modeling
- Reduced model training time and data needed
- Wide-range of other applications





References

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