

Background

- When we identify visual stimuli, our temporal is responsible for object recognition^{1,2}
- Semantic knowledge accessed in particular regions, anatomically-correlated to cognition, can be localized and decoded^{1,2}

MEG, and

- MNI space for fMRI,
- SPM & AFNI-SUMA³
- MNE⁴
- No open-source method for ECoG
- Electrocorticography (ECoG) spatiotemporal specificity



Can gender identification be successfully decoded with Naïve Bayes classification? What specific brain regions are indicative of such identification?

Methods

- Patient cohort
 - 11 patients with intractable epilepsy
 - Pre-operative MRI scans obtained via 3T scanner in the University of Pittsburgh Medical Center
- ECoG data from subdural electrodes (2 kHz sample rate) • Recordings from clinical coverage
- Visual emotion and 1-back tasks
- Facilitation of analysis and visualization with novel software
 - Approach to region identification via visualization
 - Accuracy and sensitivity index d' (d prime) weighting on electrodes

Surgery and fMRI Image Visualization



Visualization and Gender Decoding in the Temporal Lobe

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Data Results and MATLAB Toolbox





EVAG display of left basal medial temporal lobe activation



Further Regional Analysis

- No statistically significant dependencies on anteriorposterior axis
- Activation and decoded regional weights did however appear localized (cf. LBT15 in EVAG display)

Fusiform electrode inconsistency

- Only half the cohort demonstrated fusiform area correlates
- This area seems to be involved in gender processing
- Neural correlates demonstrated in some patients via successful decoding

Discussion

Conclusions

- Neither caudal-rostral nor lateral dependency in this region
- Mild implications for fusiform region • Software

Future Work

- Other ECoG Analysis
 - Larger data set for further analysis of fusiform regions
 - Exploration of coactivating regions
 - Adjusted 1-back decoding
 - Permutation statistics
- Software Analysis
 - Surface based comparison across subjects²
 - Refining interpolation for MATLAB toolbox release

References

¹Hirshorn, E.A, Li, Y., Ward, M.J., Richardson, R.M., Fiez, J.A., Ghuman, A.S., 2016. Decoding and disrupting left midfusiform gyrus activity during word reading. PNAS. ²Li, Y., Richardson, R.M., Ghuman, A.S., 2016. Multi-connection pattern analysis: Decoding the representational content of neural

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⁴Gramfort, A., Luessi, M., Larson, E., Engemann, D.A., Strohmeier, D., Brodbeck, C., Parkkonen, L., Hämäläinen, M.S., 2014. MNE software for processing MEG and EEG data. NeuroImage.



• Suggestive evidence in support of basal temporal role in gender decoding

• Suggestive for regions of interest and successful analysis expedition