

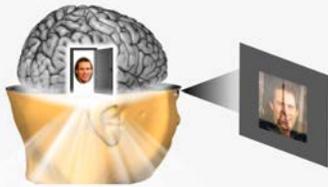
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## Introduction

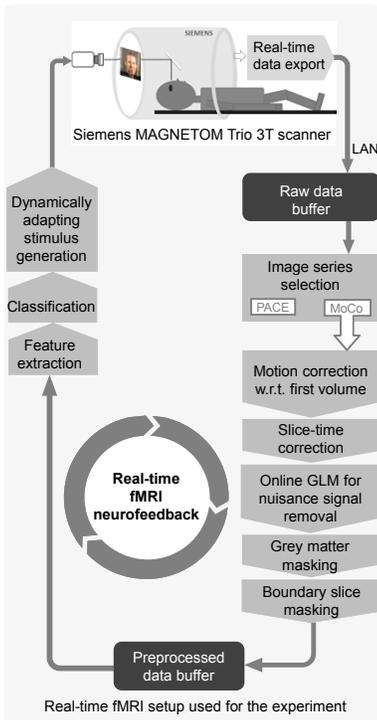
In our daily life, we are continuously flooded with information. Visual attention is used to selectively filter relevant information depending on current task demands and goals. This study used real-time functional magnetic resonance imaging (fMRI) for online decoding of attention to objects belonging to two different semantic categories. Superimposed pictures of a face and place were presented to subjects who had to attend to only one of the pictures. Decoding of the semantic category of the attended picture was performed on a TR-by-TR basis using a multivariate decoder and its performance was also compared offline to a univariate region-of-interest (ROI) based approach.

### Decoding semantic category of attended picture

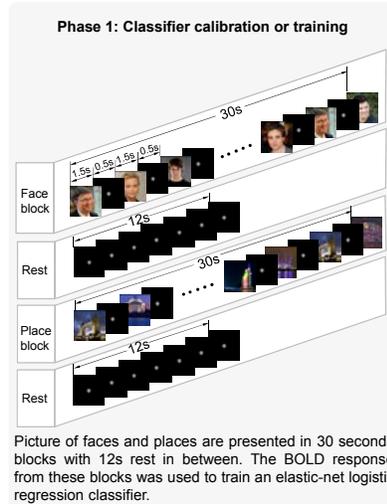


## Data Acquisition

- SIEMENS 3T scanner, 32 Channel head coil
- TR = 2000 ms, TE = 30 ms, Flip angle = 75 °
- 3 x 3 x 3.3 mm voxels with 10% distance factor
- 28 oblique axial slices
- Feedback updated every TR in prediction sessions
- 7 subjects

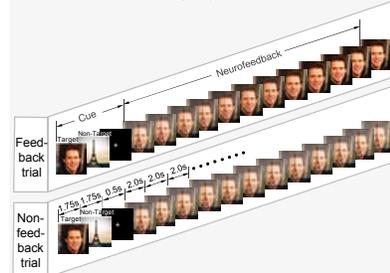


## Stimuli



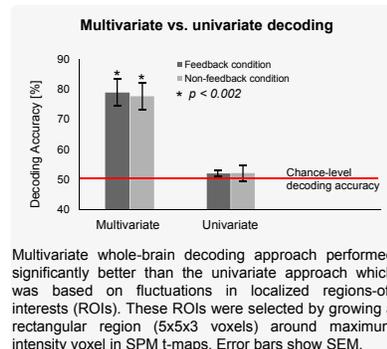
Picture of faces and places are presented in 30 seconds blocks with 12s rest in between. The BOLD response from these blocks was used to train an elastic-net logistic regression classifier.

## Phase2: Decoding object-based attention



Once classifier has been trained, it is used to decode the attended picture. Superimposed pictures of face and place are presented. In feedback trials, the contrast of the target and non-target pictures is adjusted every TR depending on the decoding results from the classifier. Whereas, in non-feedback trials, the target and non-target picture always remain at 50/50 contrast.

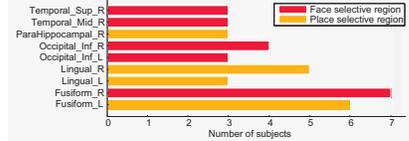
## Results



Multivariate whole-brain decoding approach performed significantly better than the univariate approach which was based on fluctuations in localized regions-of-interests (ROIs). These ROIs were selected by growing a rectangular region (5x5x3 voxels) around maximum intensity voxel in SPM t-maps. Error bars show SEM.

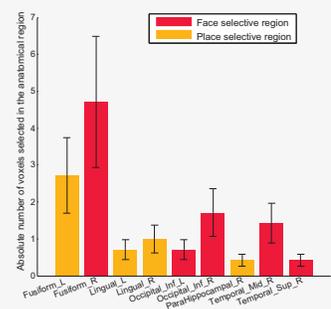
## Results (Cont.)

### Brain regions used by classifier for decoding



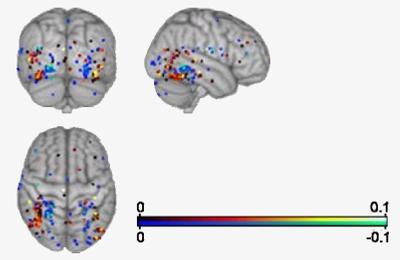
9 different brain regions were chosen by the multivariate decoder for predicting the attended picture. These regions include, among others, the FFA and the PPA.

### Sparingly distributed representation of face and scene



Voxels used for multivariate decoding of attention were found to be sparsely distributed.

### Classifier weights across group overlaid on MN152 template



## Conclusion

Optimal decoding of object-based requires a whole-brain multivariate decoding approach which can take distributed object representations into account.

For more info about this study please visit the website [www.analyze4d.com/misc\\_adnan/rfmri/decoding-attention](http://www.analyze4d.com/misc_adnan/rfmri/decoding-attention)

