

# Decoding the neural representations of conscious and unconscious perception

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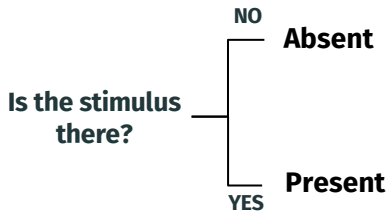


# Introduction

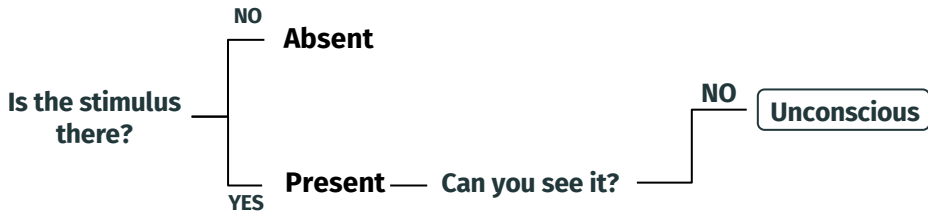
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## Introduction – what it means to be conscious (or not)

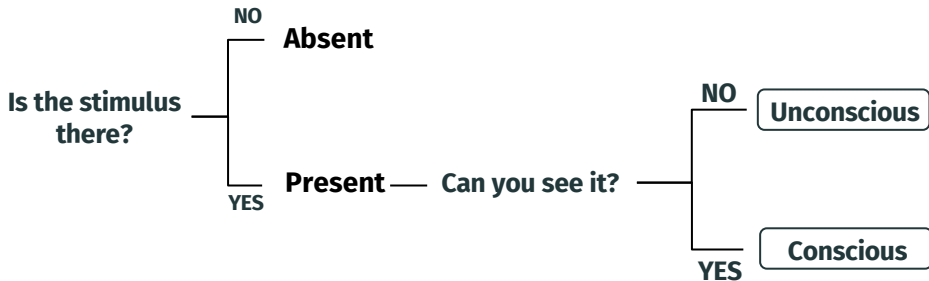
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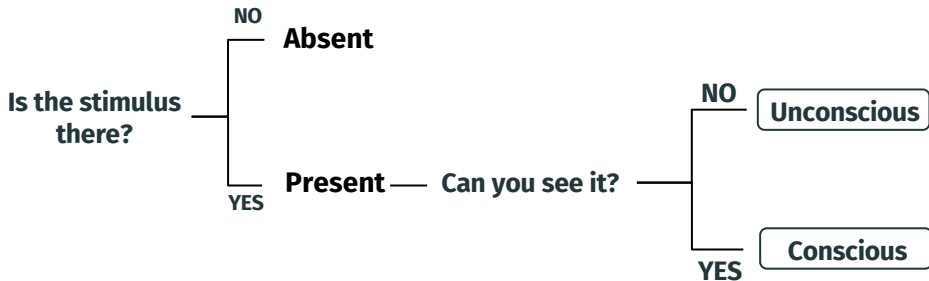
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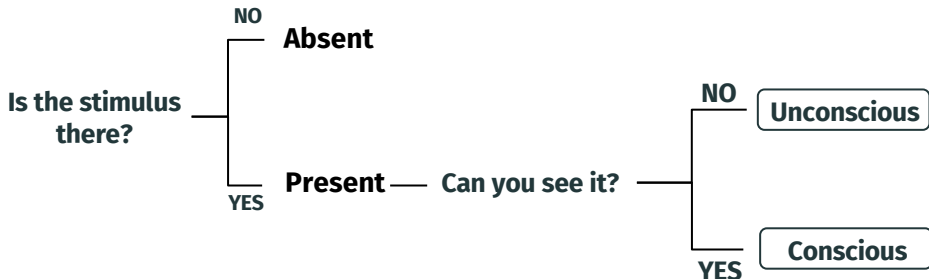
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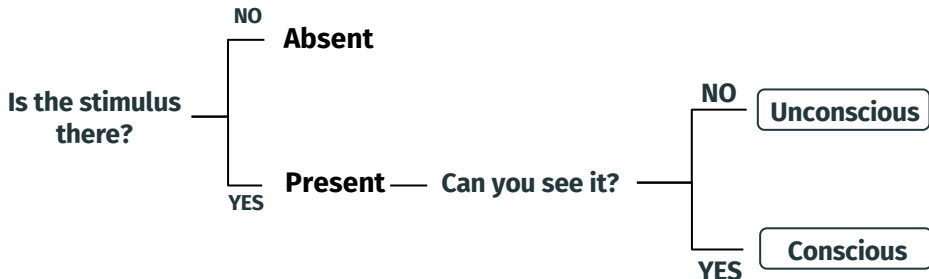


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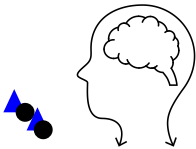


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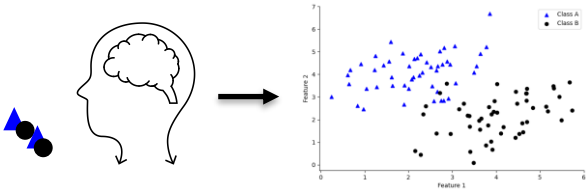
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2. Compare classification performance for voltage vs TF power
3. Create a pipeline to run these analyses in real time

# Introduction – MVPA and decoding

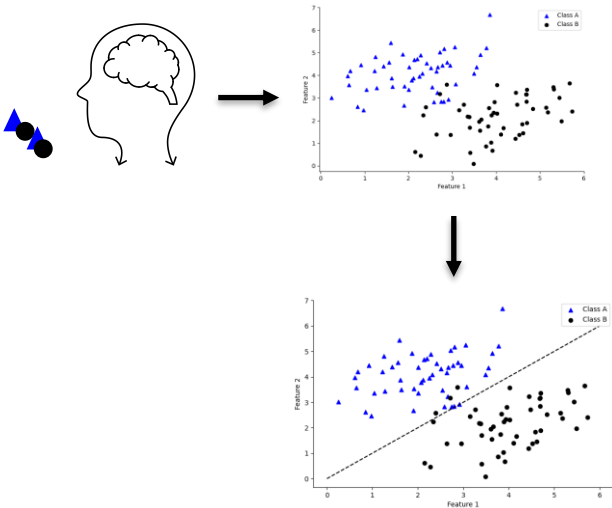
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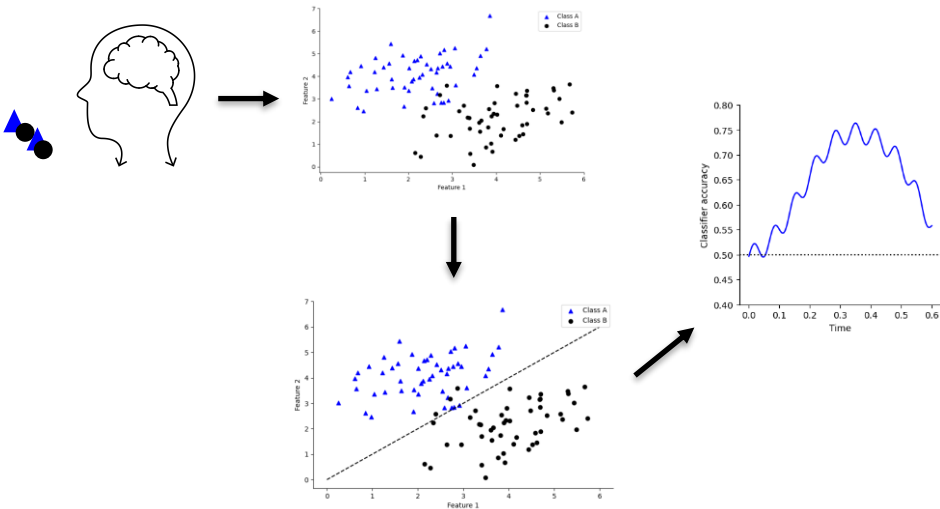
# Introduction – MVPA and decoding



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## Methods

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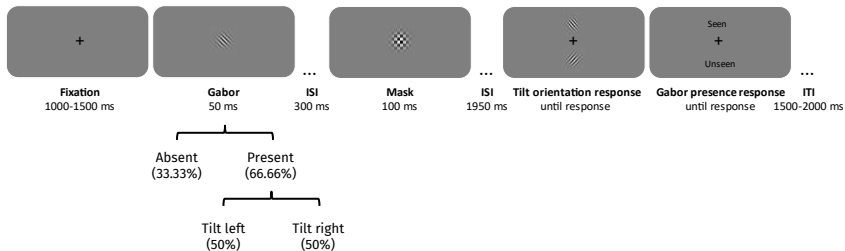
# Methods - Task

n = 30



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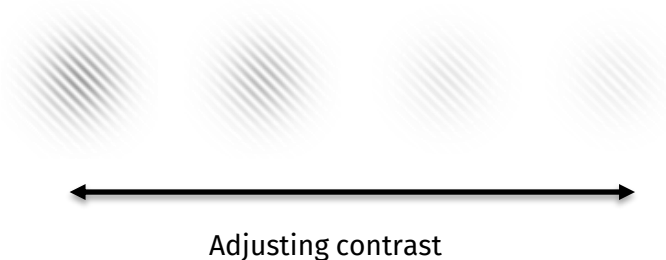
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3. **Experimental:** Gabor presented with the contrast selected during titration (10 blocks)



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- Decoding analyses
  - Linear SVC, 10-fold stratified cross-validation
  - Conditions: **Target presence** (Present/Absent), **Awareness** (Seen/Unseen), **Gabor tilt** (Left/Right)



## Results

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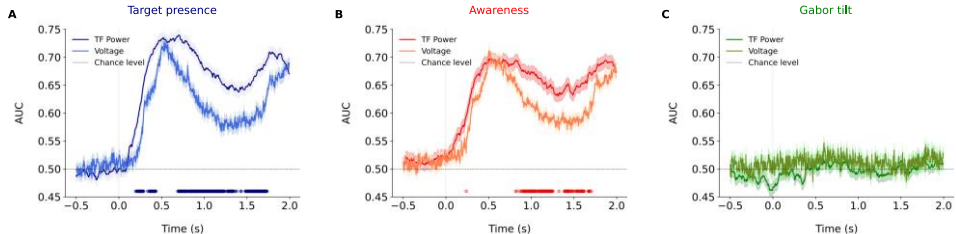
## Results – Temporal decoding

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## Direct comparison of AUC for voltage vs TF power

- Significant differences ( $q < .001$ )



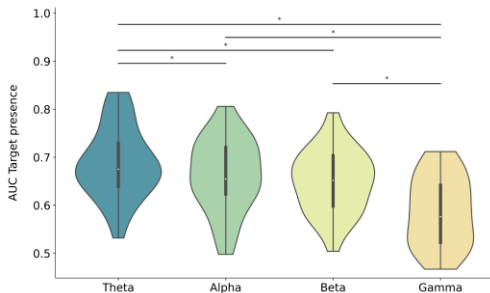
- Fitting the model with TF power improves classification performance in Target presence and Awareness
- No significant differences for Gabor tilt

## Results – Comparing frequency bands

In which frequency bands are decoding scores higher?



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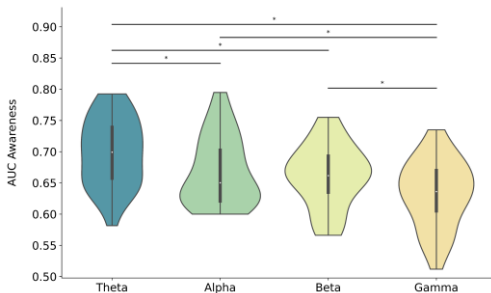
Theta



Alpha/Beta



Gamma

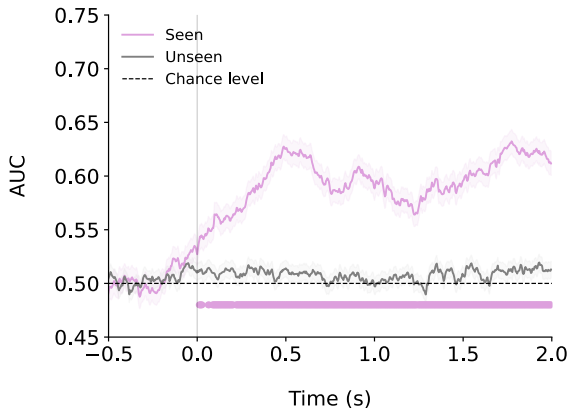


## Results – Cross-block analyses

Cross-decoding: trains on the localizer blocks, tests on the experimental trials (for seen and unseen trials)

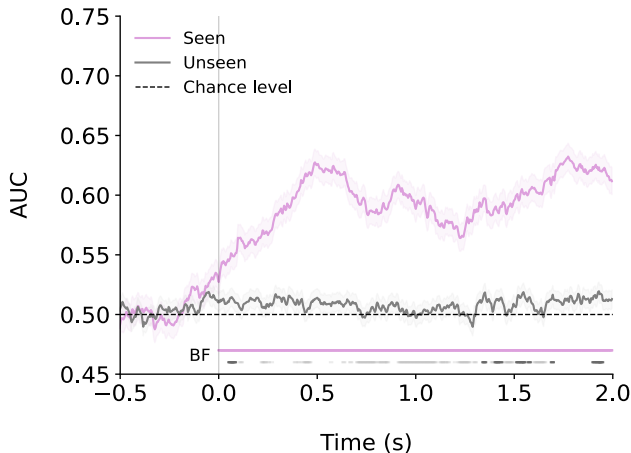
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- No significant decoding in unseen trials, but...

# Results – Cross-block analyses



- Bayesian tests show some significant time points, in an early (~100ms) and a late window (~1300ms)
- These were post-hoc analyses, so interpret with care!

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  - Early perceptual processing
  - Late response preparation
- Want to know more? Read the paper in Scientific Reports!

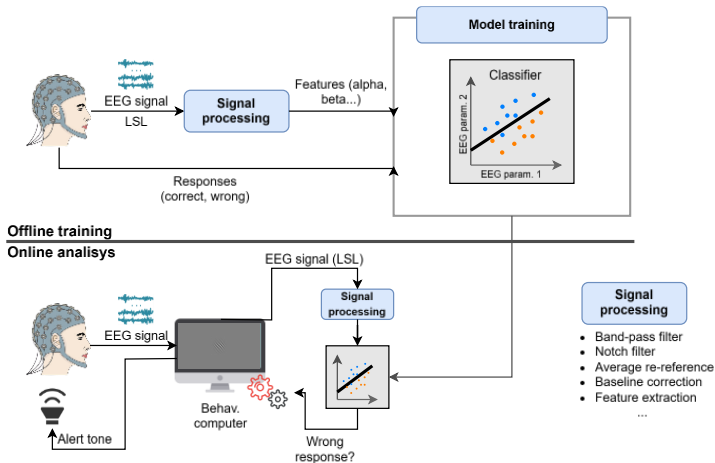


## Real-time decoding

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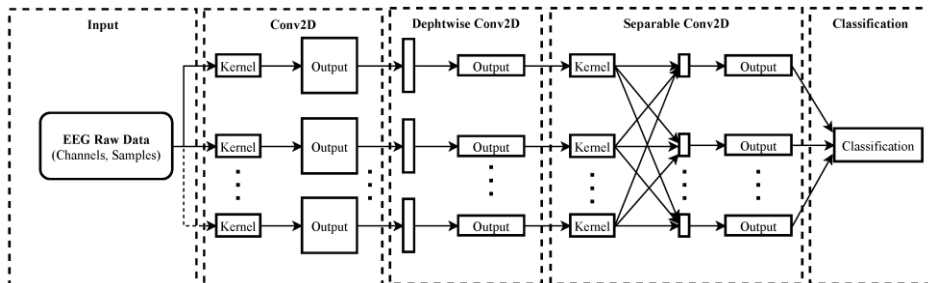
# Real-time decoding

Build a closed-loop system that can improve conscious perception through neurofeedback.



# Real-time decoding

DL models (EEGNet) instead of linear classifiers: more accurate, requires a lot (A LOT) of data for training. But...



# Real-time decoding

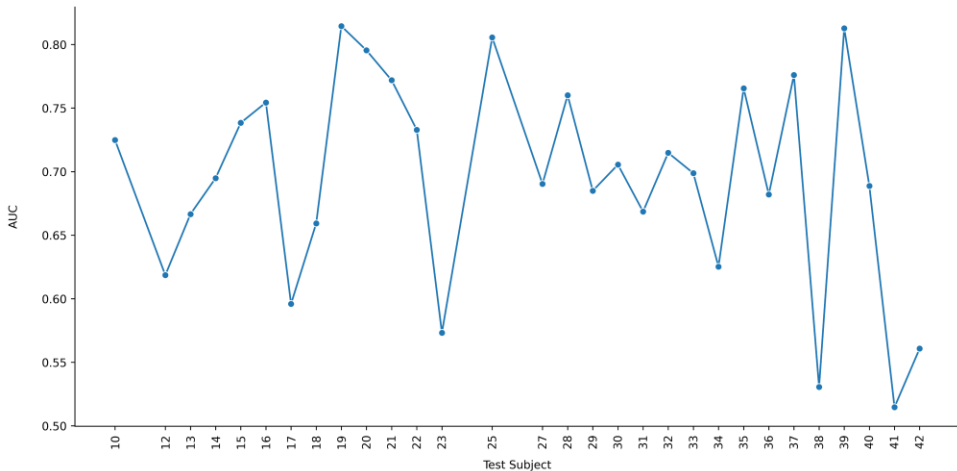
## Generalization to other participants

Training with group data → Pre-trained model → Evaluating new subjects

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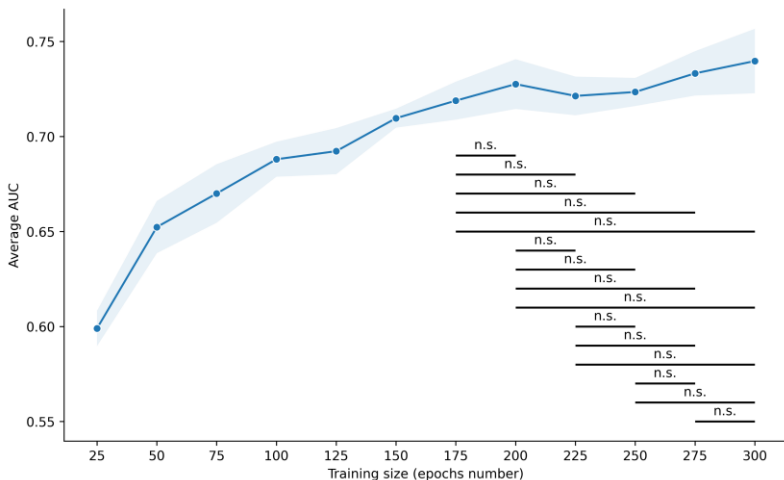
Training with 1st session → Pre-trained model → Evaluating on 2nd session



# Real-time decoding

## Cross-sessions training

Training with 1st session → Pre-trained model → Evaluating on 2nd session



# Thanks!



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Research Group**



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