Imagining Taylor Swift
Neural mechanisms for visual imagery

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Introduction

- Visual imagery is the mental ability to generate experiences in the 'mind's eye' (without visual input).

- Recent research supports the idea that perception and imagery share common neural mechanisms but it is unclear to what extent.[1,2]

  - **WHERE** in the brain can we find imagery content?
  - **WHEN** does successful imagery take place?
 - **HOW** similar are imagery and perceptual representations?

Methods

- Seventeen participants (18–23 years; 10 female) viewed 25 unfamiliar faces & 25 familiar faces; and they imagined 5 celebrity faces (with their eyes closed).
- Neural decoding (of pairwise face identity) relied on pattern analyses: temporally-cumulative/time-resolved classification & multivariate channel selection along with representational similarity analysis (RSA).[3,4]
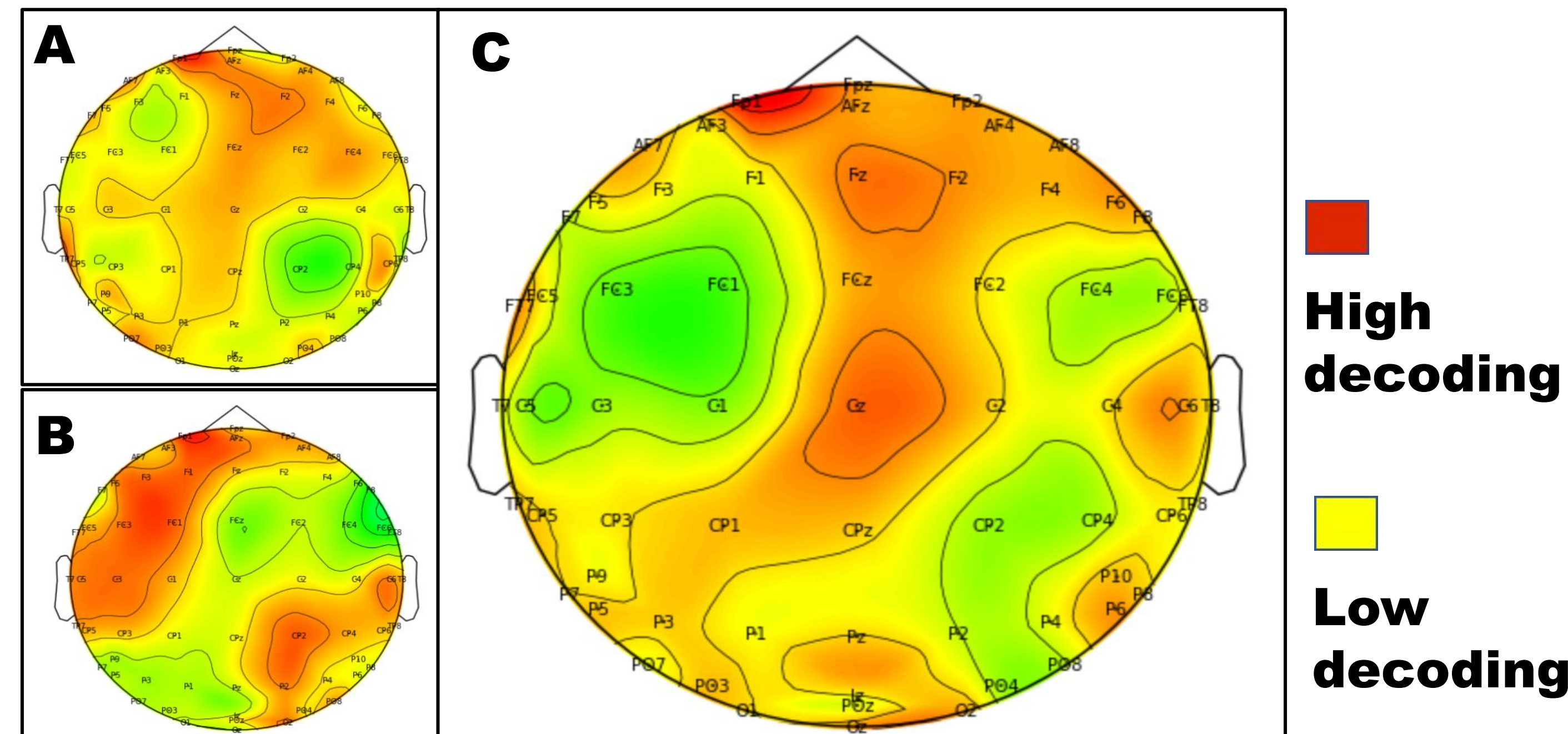
Perception trial


Imagery trial
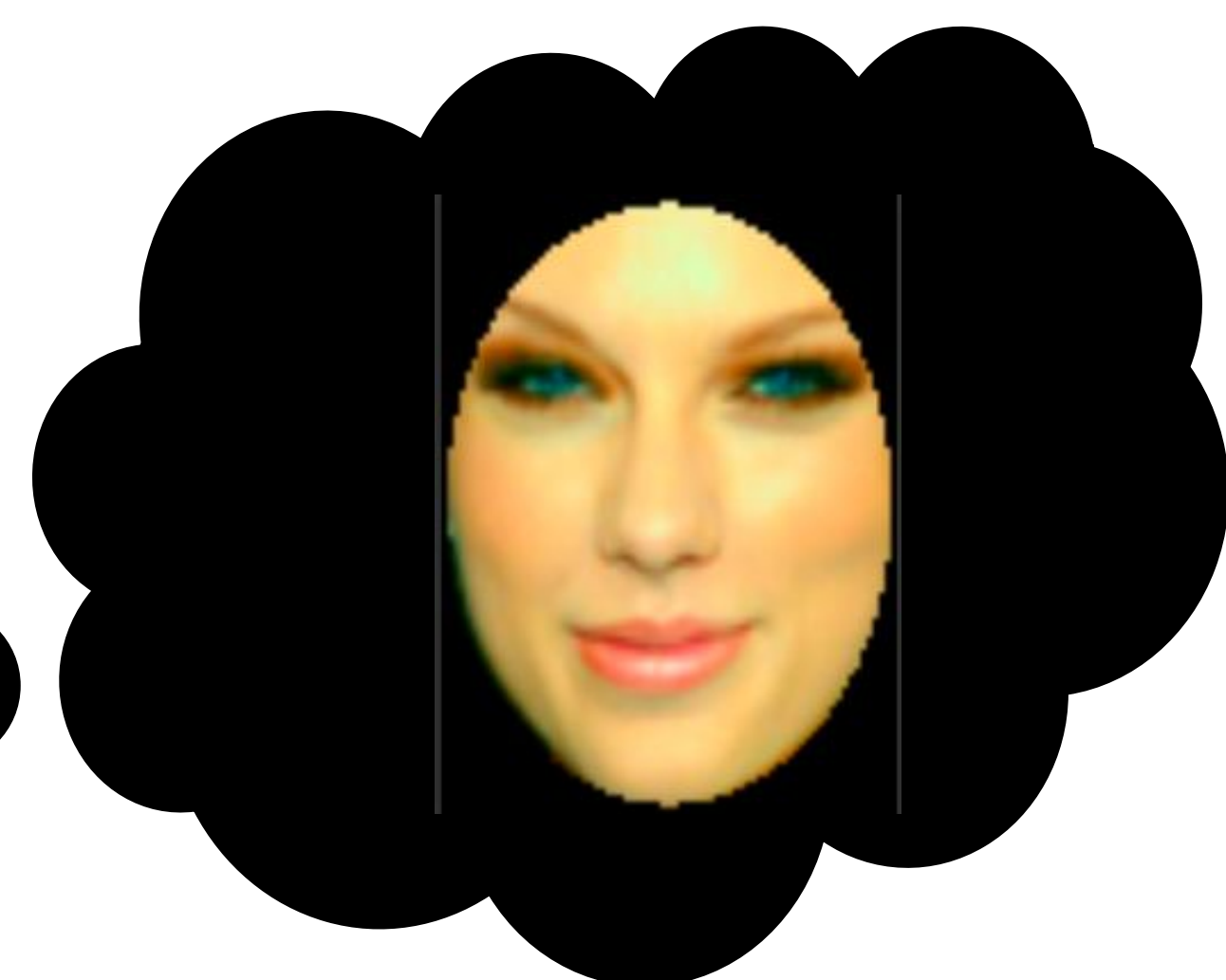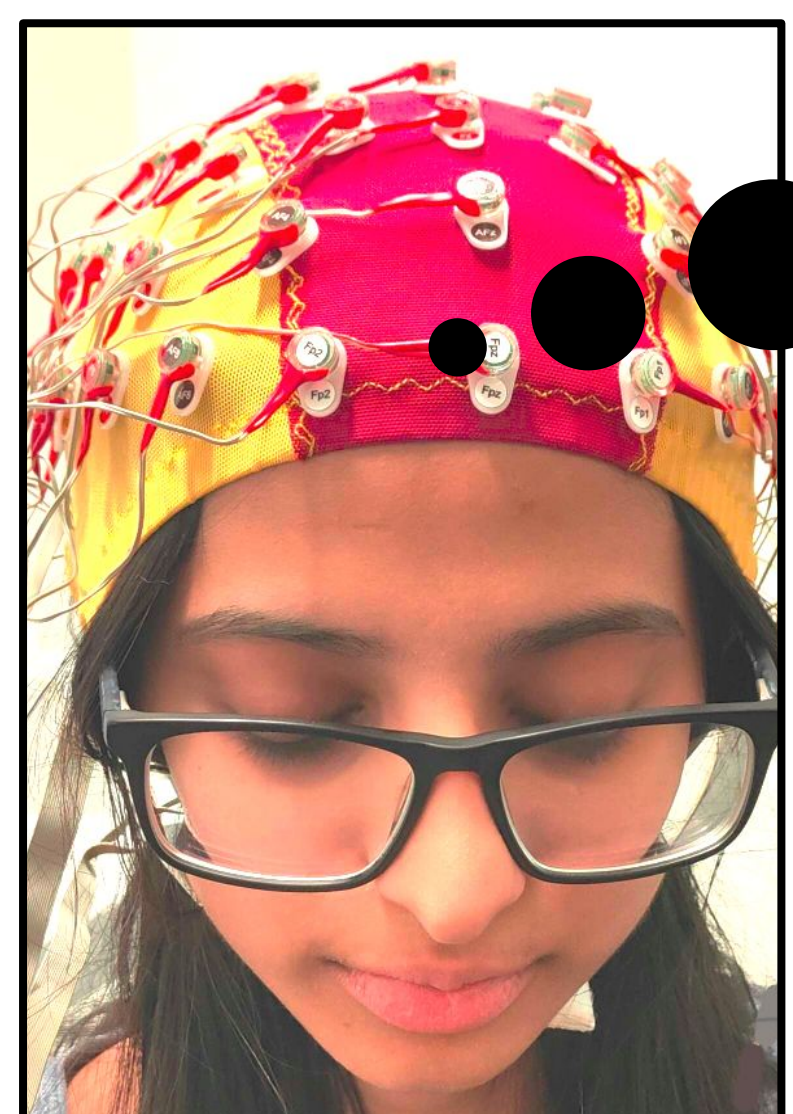
Taylor Swift

Results

### WHERE: Spatial profile of temporal processing.

Electrode ranks for: A) Perception - familiar faces and B) Perception - unfamiliar faces, C) Imagery Similar central & frontal channels support successful decoding of facial identity from imagery and perception of familiar faces. Interestingly, unfamiliar face perception relies on a complementary set of channels!!

High decoding

Low decoding
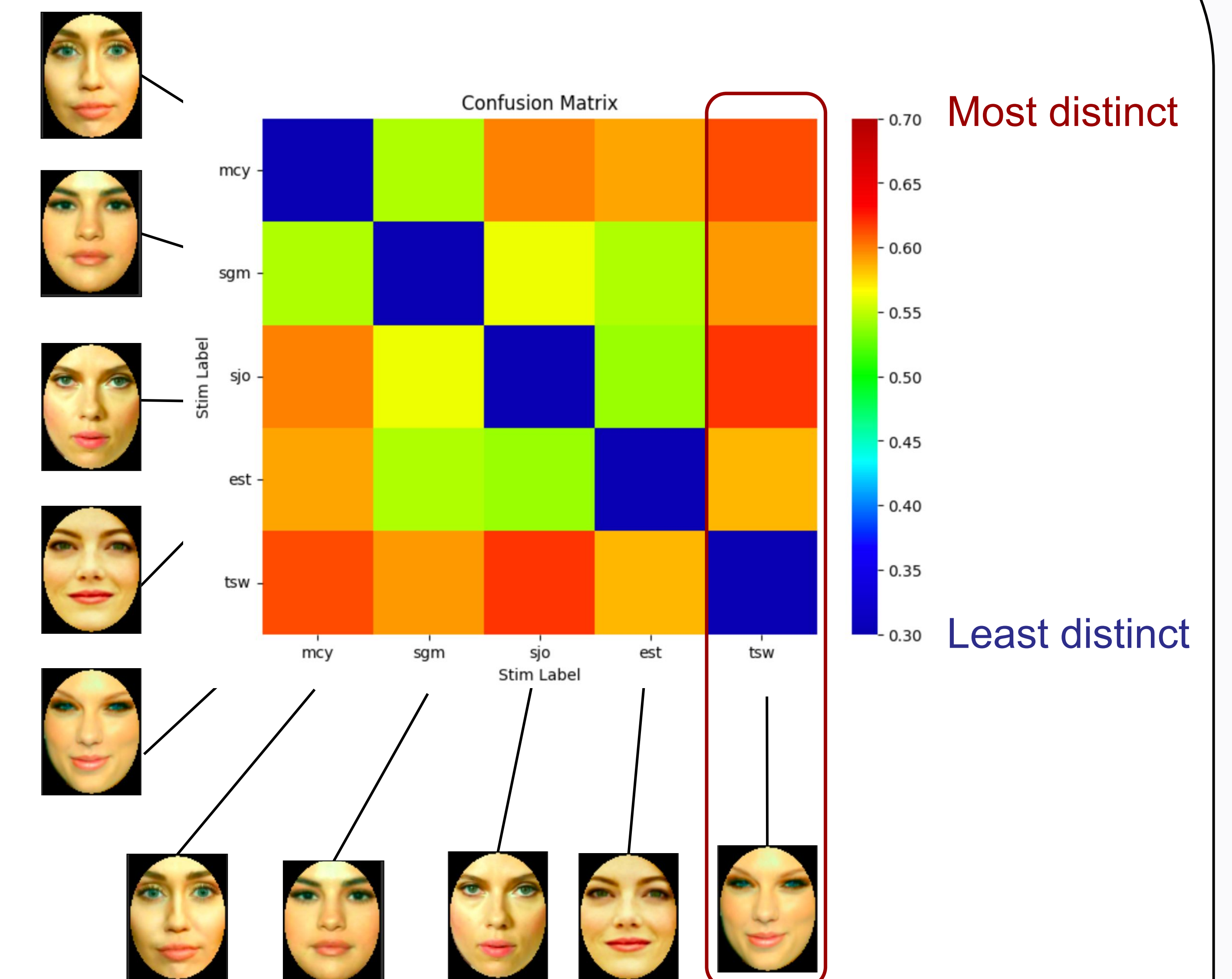
WHEN: Time-resolved decoding.

Perception
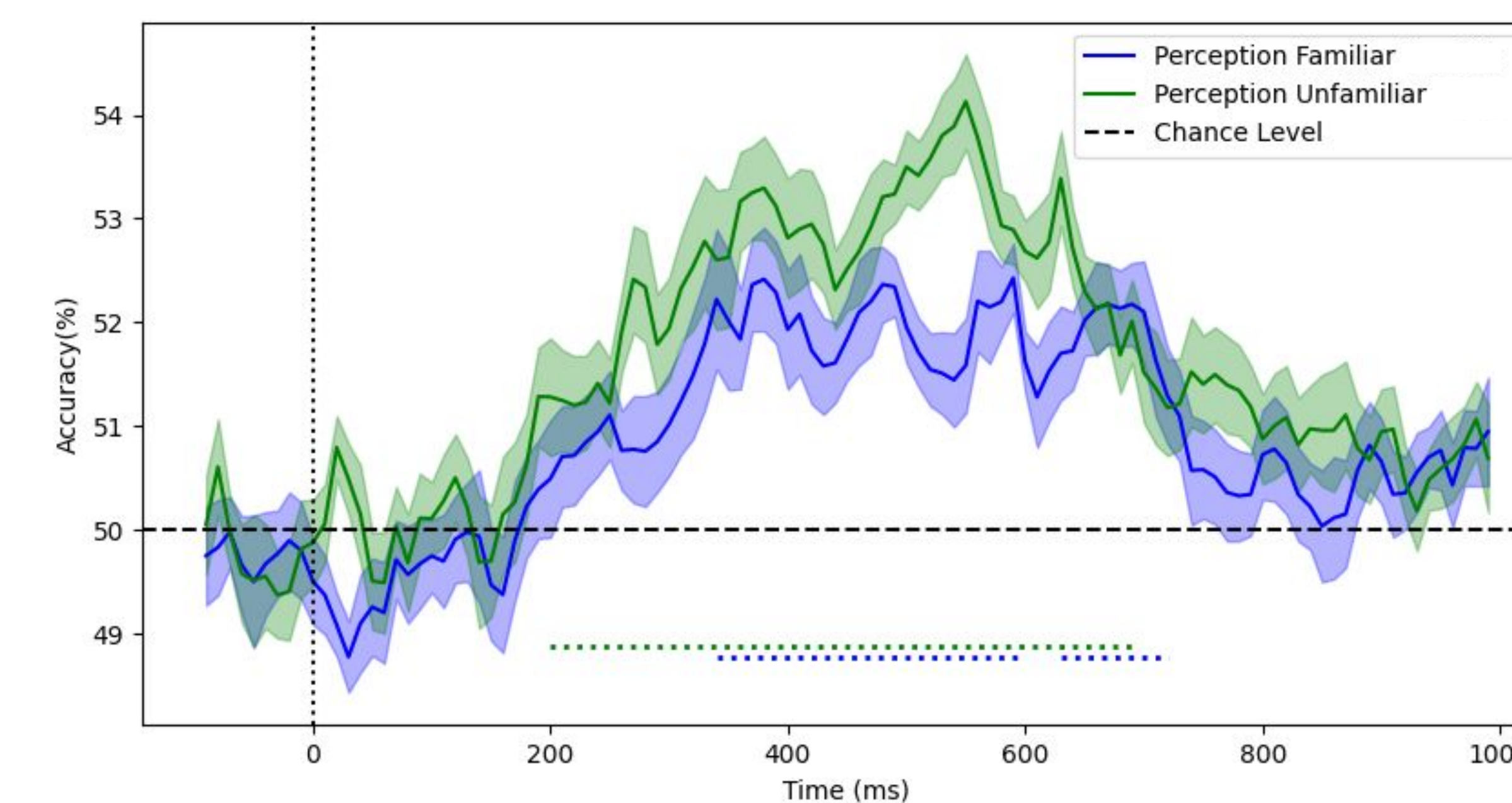
Imagery
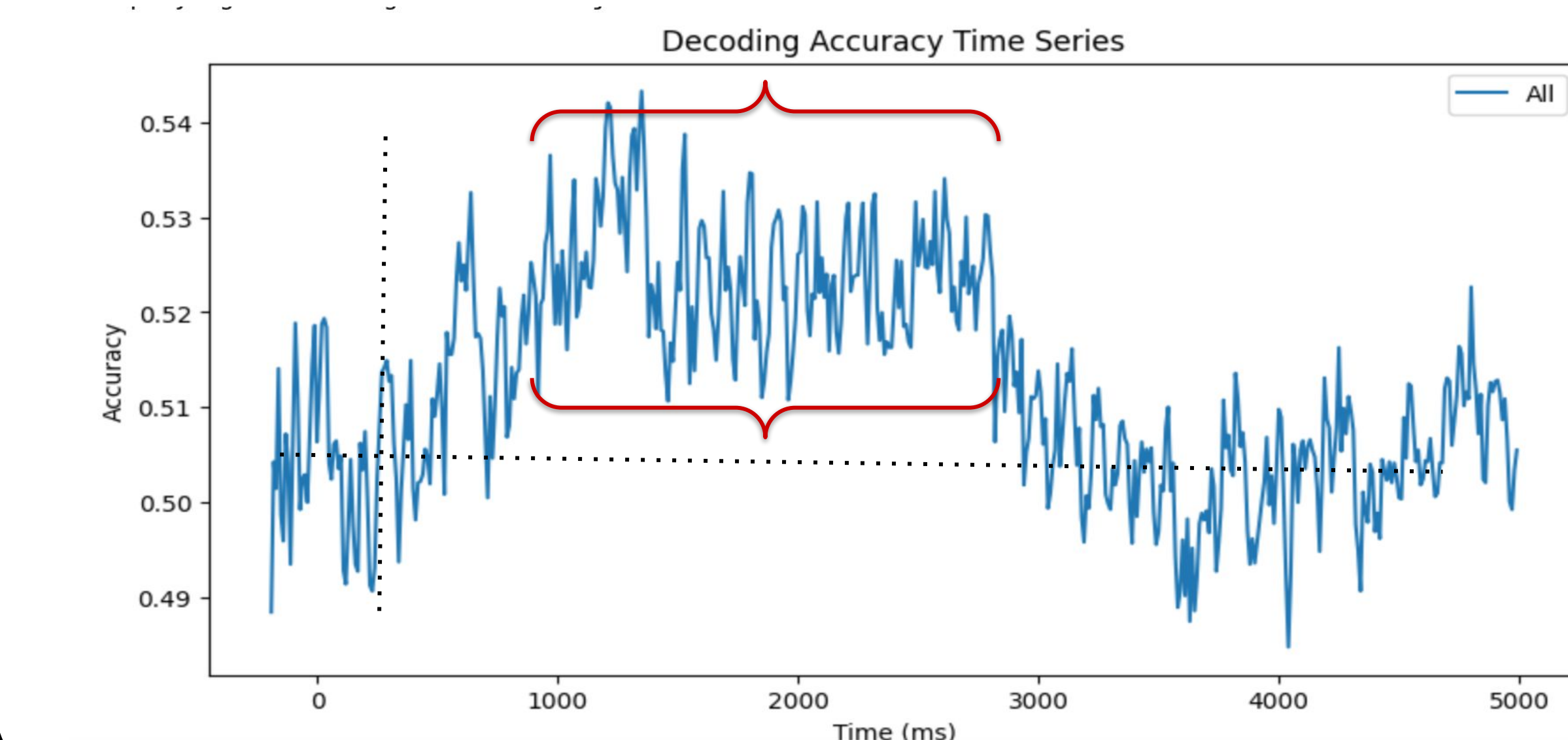
Perception-based decoding peaked at around 300-700ms. Imagery-based decoding was highest around 1-3 seconds after the imagery cue.

HOW: Imagery-based Representations.

Confusion Matrix

Most distinct

Least distinct

Taylor Swift was the most distinctive (while the least distinctive was Emma Stone). A similar matrix was obtained for perception of these 5 celebrities (correlation between perception and imagery: 0.75, p=0.012).

Summary

- We can reliably decode face imagery from EEG signals.

- Imagery and familiar (but not unfamiliar) face perception may rely on similar brain areas.

- Imagery is especially successful between 1-3s (while perception between 300- 700ms).

- Imagery representations reflects the perceptual content of different faces but, likely, also our degree of familiarity/interest in them.

References

[1]*Dijkstra et al (2019) Trends in cognitive sciences 23(5), 423–434;*
[2]*Li, S. et al (2023). Journal of Neuroscience, 43(38), 6508-6524;*
[3]*Nemrodov et al (2020) Psychophysiology 57(3), e13511.*
[4]*Schütt (2023) eLife, 12, e82566.*