

Introduction

- Naturalistic viewing (NV), or movie watching in the MRI scanner, has been increasingly used to study higher cognitive functions
- Complex narrative structure of NV can induce similar brain static connectivity across individuals [1].
- However, whole-brain FC patterns shared between participants, vary over the course of stimulus presentation.

What shared brain states tend to occur under NV conditions?
How do brain states change over time and across different movie clips?

Methods

Data

HCP 7T dataset [2]

178 subjects

14 movie clips

Data Analysis

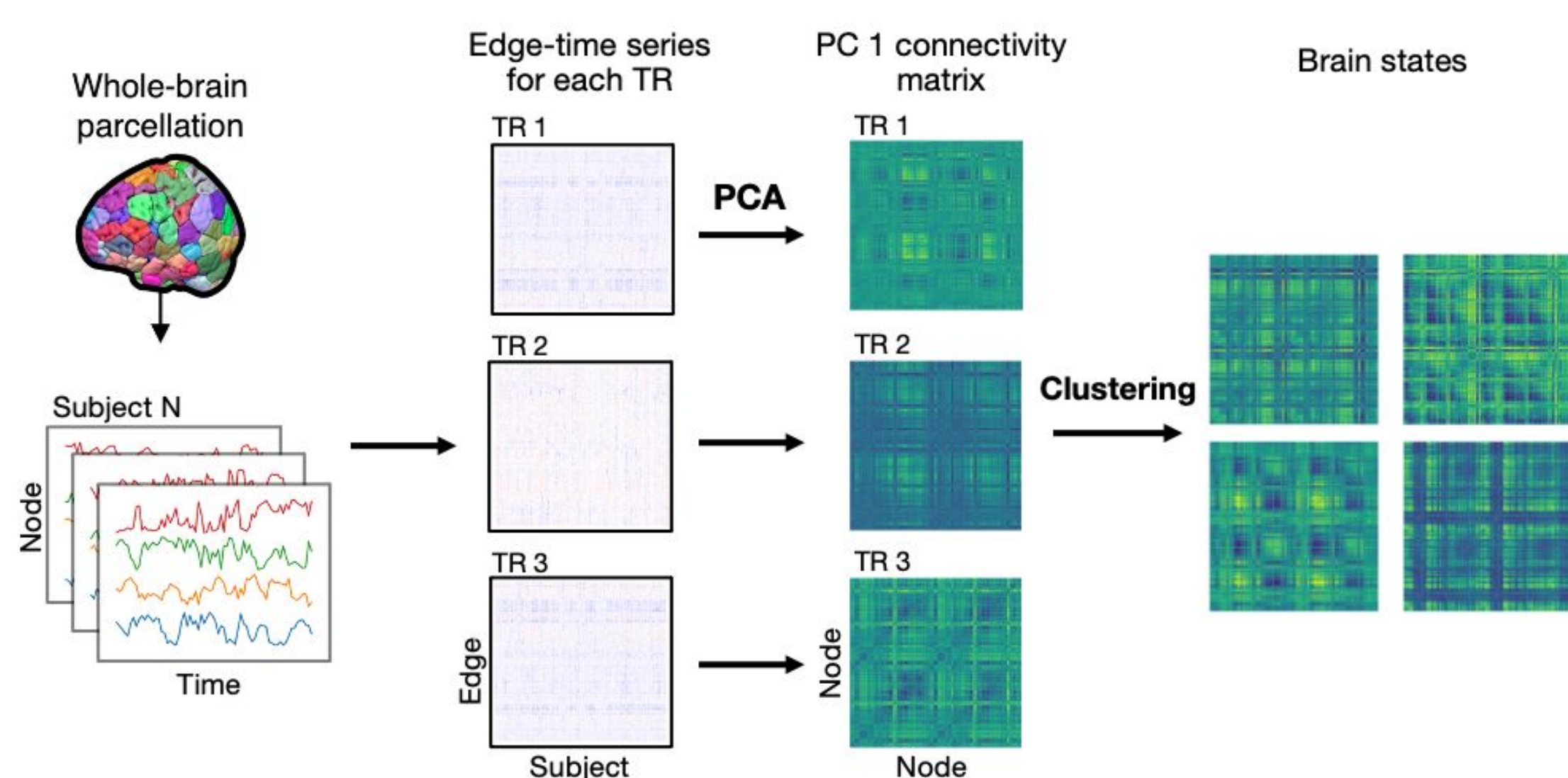
- Mean signal for each node of 400 Schaefer parcellation [3] for each participant
- Edge time series [4], representing moment-wise FC
- To obtain a 'shared' FC profile between subjects [5], we calculated the first principal component (PC1) across subjects

Data Analysis: TR selection

- Selected TRs with strongest inter-subject similarity (variance explained by PC1)
- Significance determined by comparing to resting state null-distribution

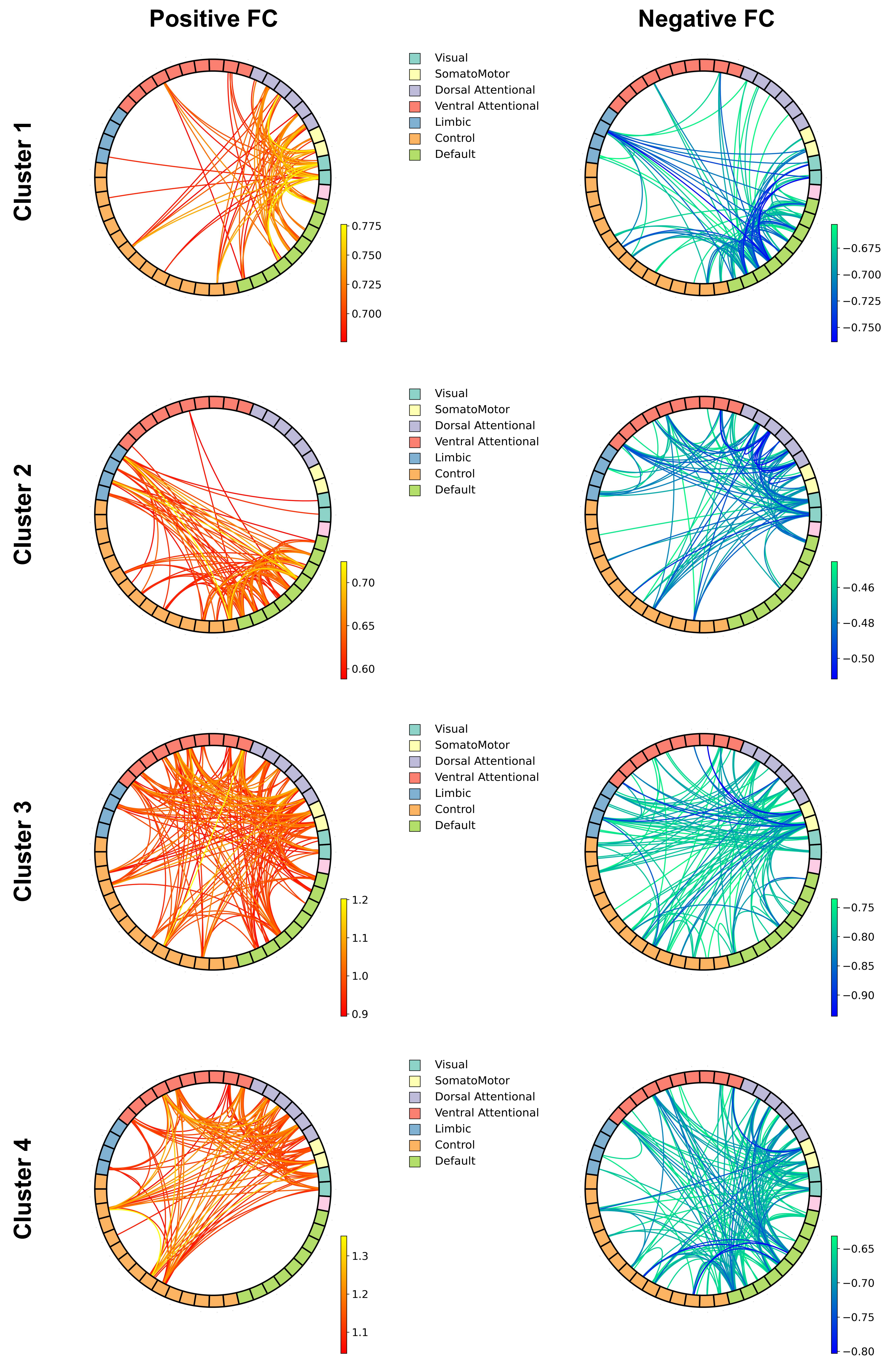
Data Analysis: Brain States

- Hierarchical clustering on the PC1 of selected TRs
- Obtained 4 identifiable clusters across all movie clips as recurring whole-brain FC patterns



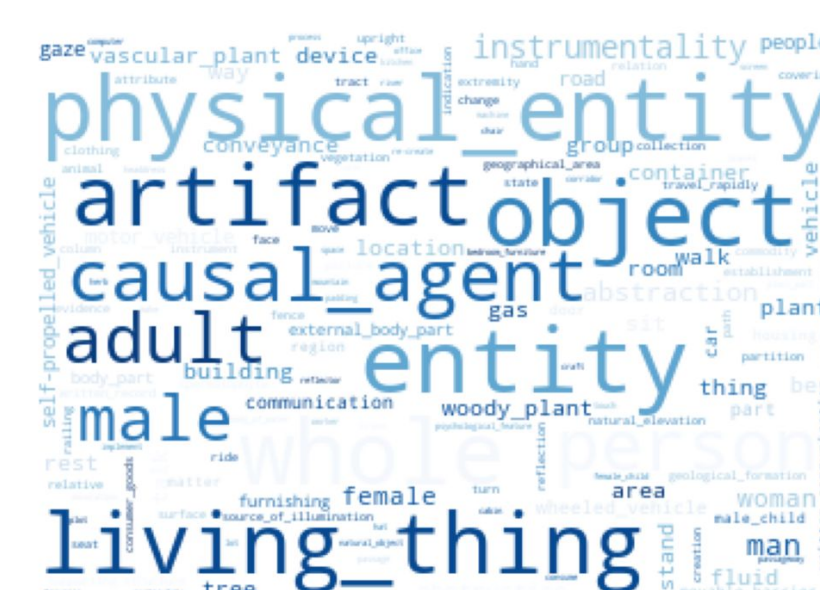
Results

- Observed 4 distinct clusters of FC patterns shared across participants
- Clusters represent 4 identifiable brain states across all movie clips: each showing distinct spatial patterns, related to specific sets of networks.



- Identified high-level semantic labels for TRs with high and low ISS values

High ISS



Low ISS



High – Low

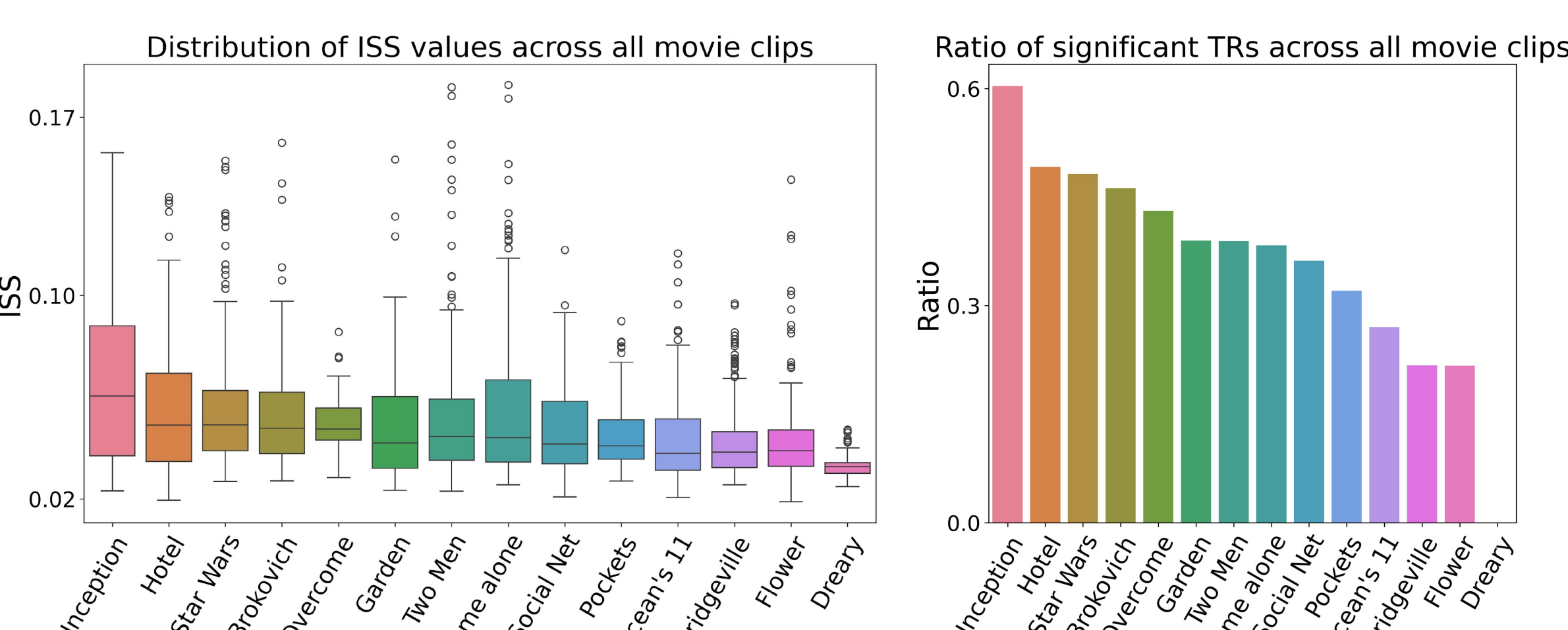


Low – High



Results

- We identified sections of the movie clips that elicited strongest ISS values
- Clips with the greatest proportion of significant TRs contained complex continuous narratives and dialog.



References:

- [1] Kröll J. P et al. NeuroImage (2023) 273:120083.
[2] Van Essen, D.C. Neuroimage (2013) 80, 62–79.
[3] Schaefer, A. et al. Cerebral cortex (2018) 28(9), 3095-3114.
[4] Faskowitz, J. et al. Nature neuroscience (2020) 23(12), 1644-1654.
[5] Li, X. et al. NeuroImage (2023) 120245.

Conclusion

- Different NV stimuli elicit dynamically changing shared FC responses segments of the movie clips tend to elicit "dominant" and recurring complex whole brain configurations
- Changes in network integration might indicate moment-wise attentional requirements, processing complexity, external and internal focus.
- These results provide an important basis for future research into features of the movie stimuli that elicit identified brain states.