

Make each visual stimulus count

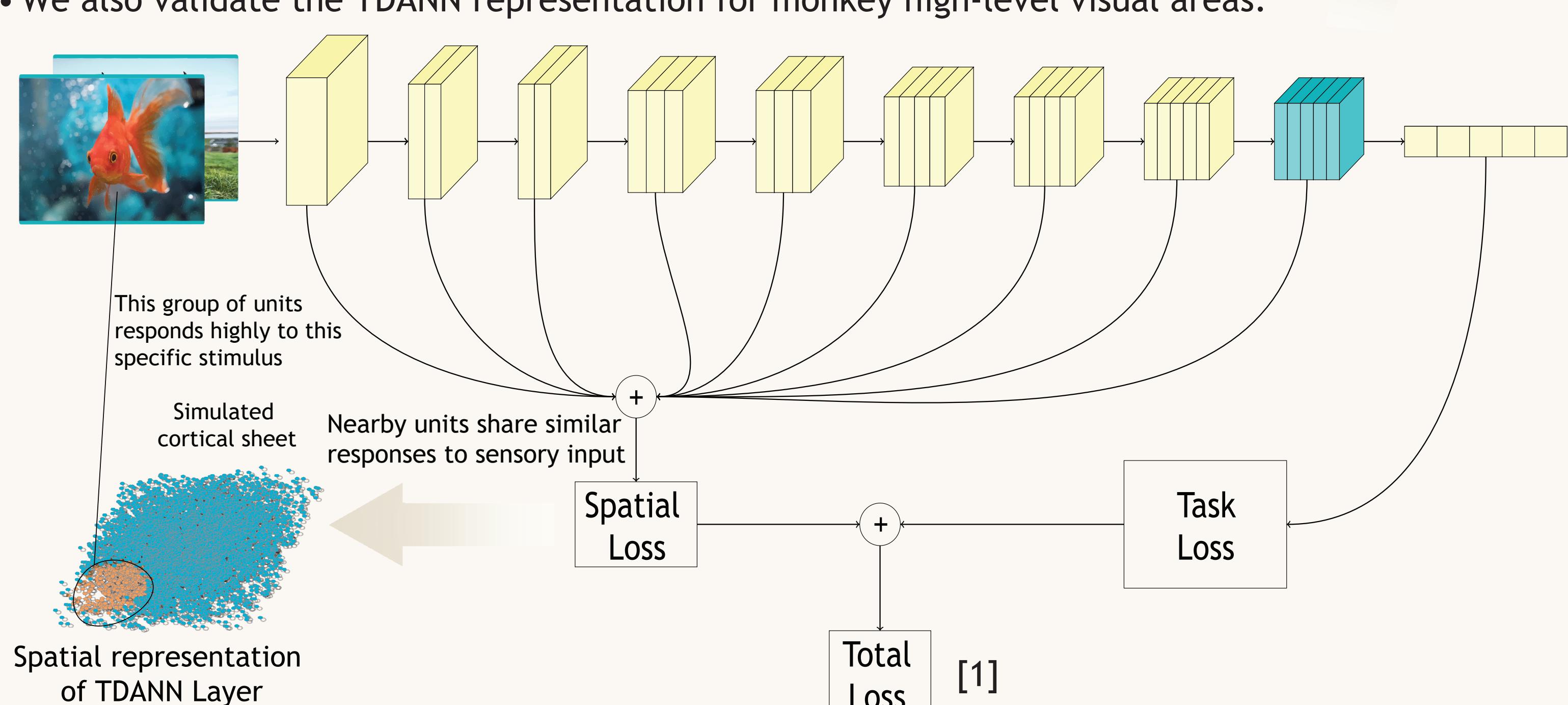
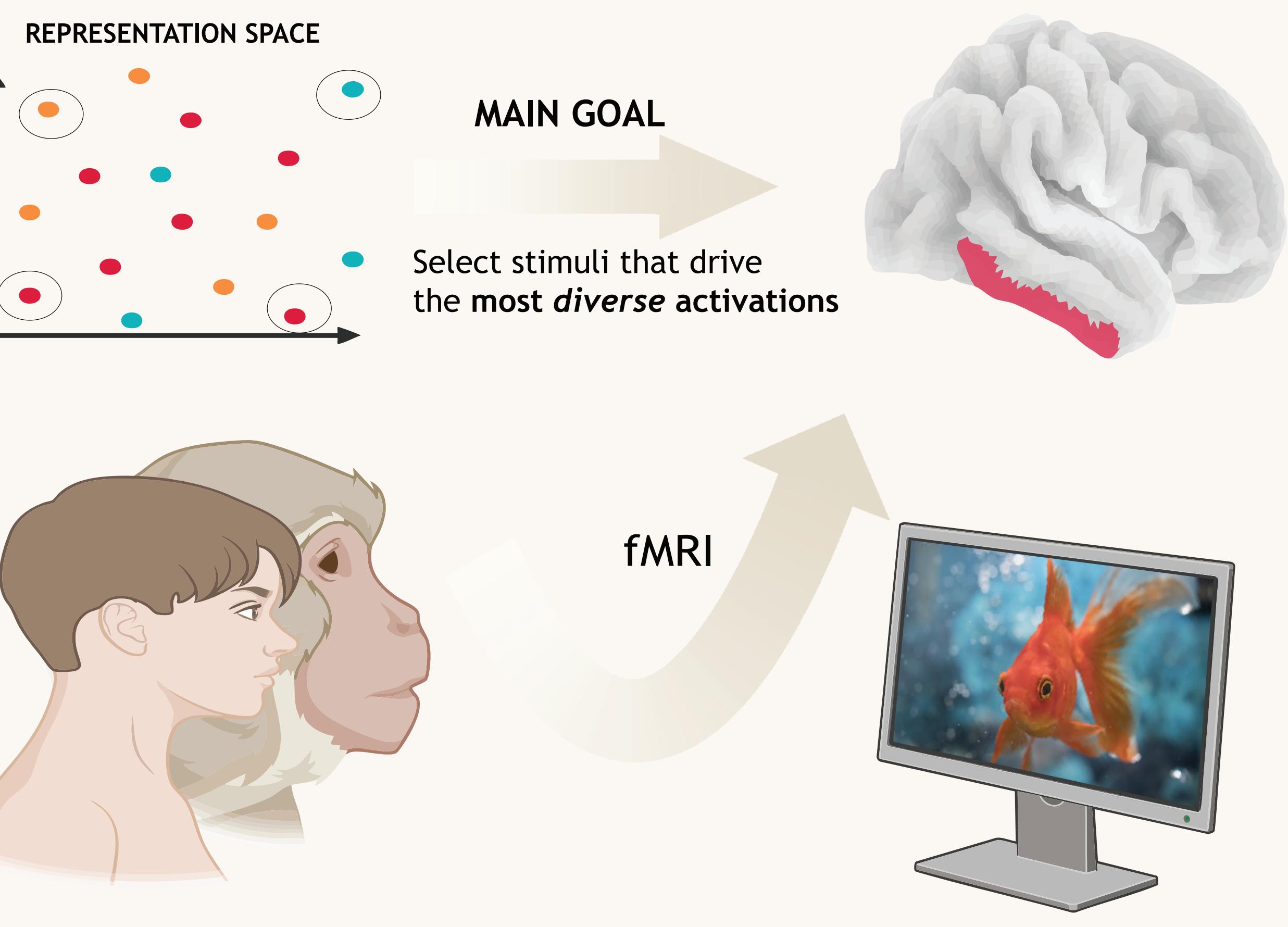
Optimizing stimuli selection for diverse activations in the IT Cortex

Yaiza Arnaiz Alcacer, Ulysse Boureau, Qi Zhu



INTRODUCTION

- Retrieving diverse activation patterns helps to maximize the information obtained from fMRI studies by enhancing neural variability.
- TDANN incorporates biologically inspired constraints, revealing similarities to the primate visual cortex, enabling its use for visual stimulus selection.
- We also validate the TDANN representation for monkey high-level visual areas.



Model validity



Can the representation space reproduce features of the high level processing areas in monkeys?

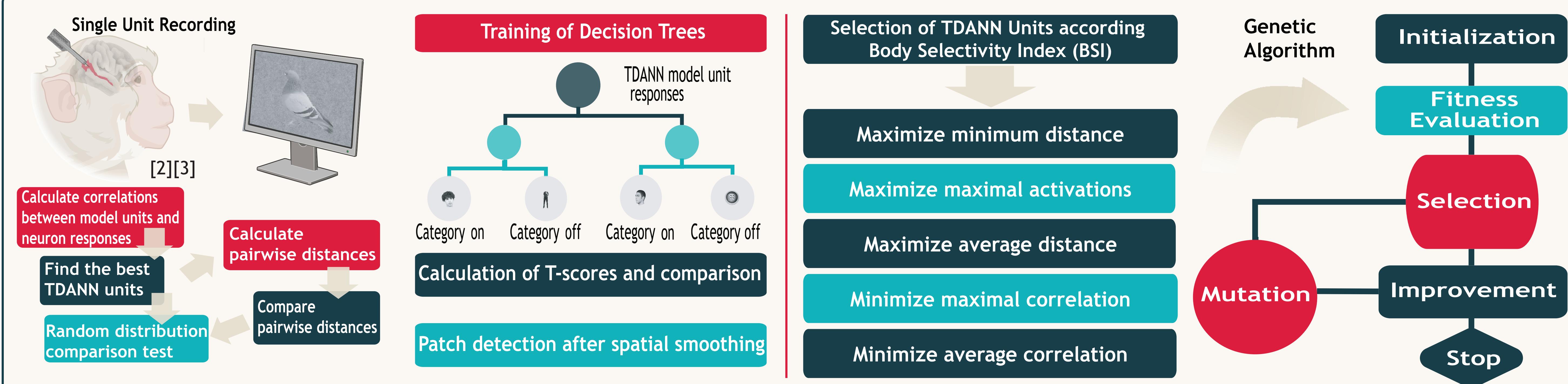
Are the TDANN model units capable of displaying category selectivity patches?



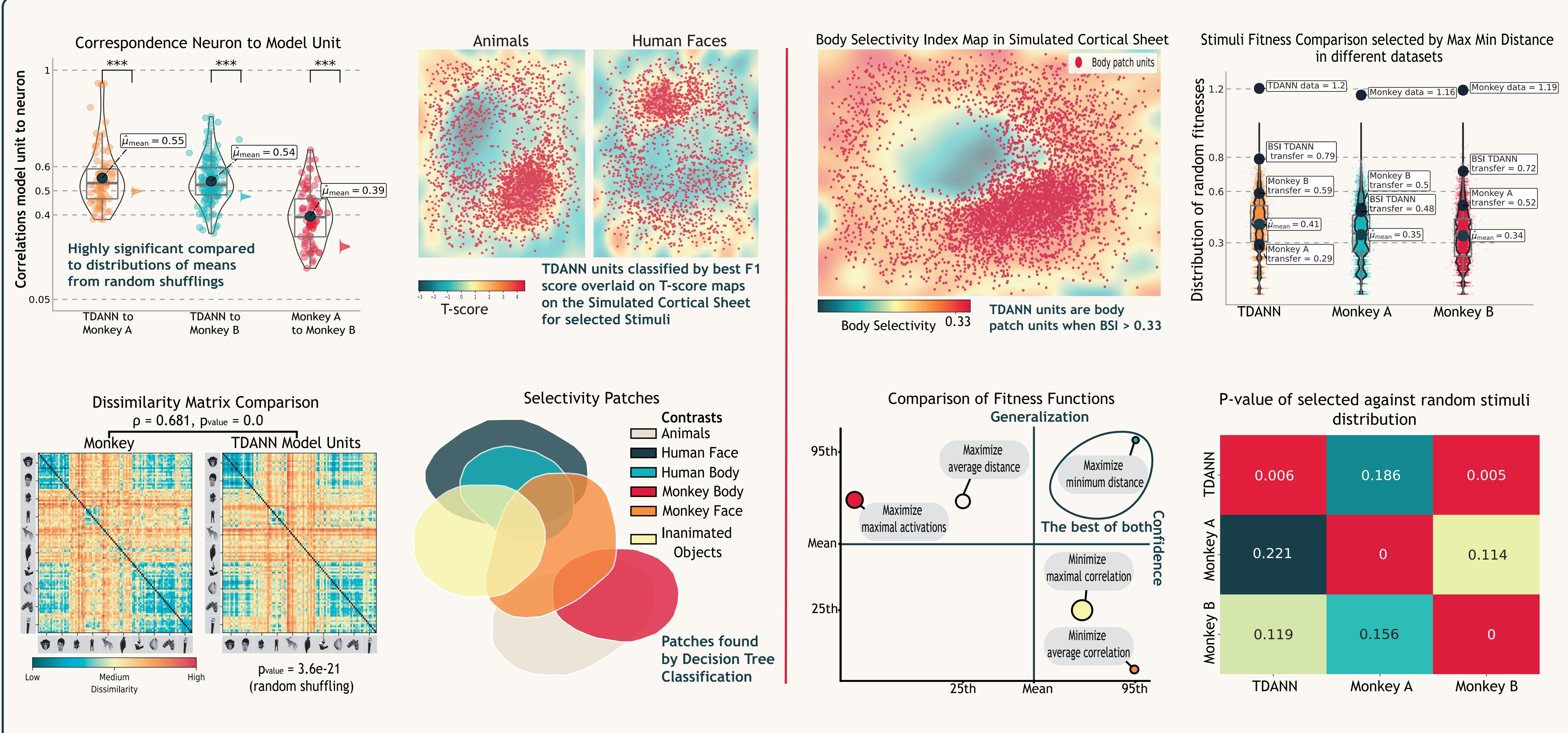
Selection of Stimuli

How do we select the stimuli?

METHODS



RESULTS



Discussion

- Selected TDANN units show similar activations to monkey neurons for the same stimuli. TDANN units are able to represent category-selective areas like high-level visual regions.
- Decision trees identify units most effective for predicting categories, which align with T-score-based units, indicating selectivity over simple discrimination.
- TDANN exhibits similar category-selective patches as those seen in the brain. However, human and monkey body and face stimuli activate distinct, non overlapping TDANN body and face patches, respectively. This finding contrasts with previous observations in the monkey inferior temporal (IT) cortex, indicating a need for further refinement of the TDANN model.
- "Maximize minimum distance" is the most reliable measure for diversity, offering better generalization and the lowest standard deviation.
- TDANN successfully supports a genetic algorithm in selecting diverse stimuli that lead to varied activation patterns in monkeys. TDANN may generalize better than monkey neurons, but this requires further validation with more subjects.

References

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- [2] Popivanov, I. D., Jastorff, J., Vanduffel, W., \ Vogels, R. (2014). Heterogeneous single-unit selectivity in an fMRI-defined body-selective patch. *Journal of Neuroscience*
- [3] Popivanov, I. D., Jastorff, J., Vanduffel, W., & Vogels, R. (2012). Stimulus representations in body-selective regions of the macaque cortex assessed with event-related fMRI. *Neuroimage*

Link

