



MAX-PLANCK-GESELLSCHAFT

Learning Structure from the Ground-Up— Hierarchical Representation Learning by Chunking



Max-Planck-Institut
für biologische Kybernetik

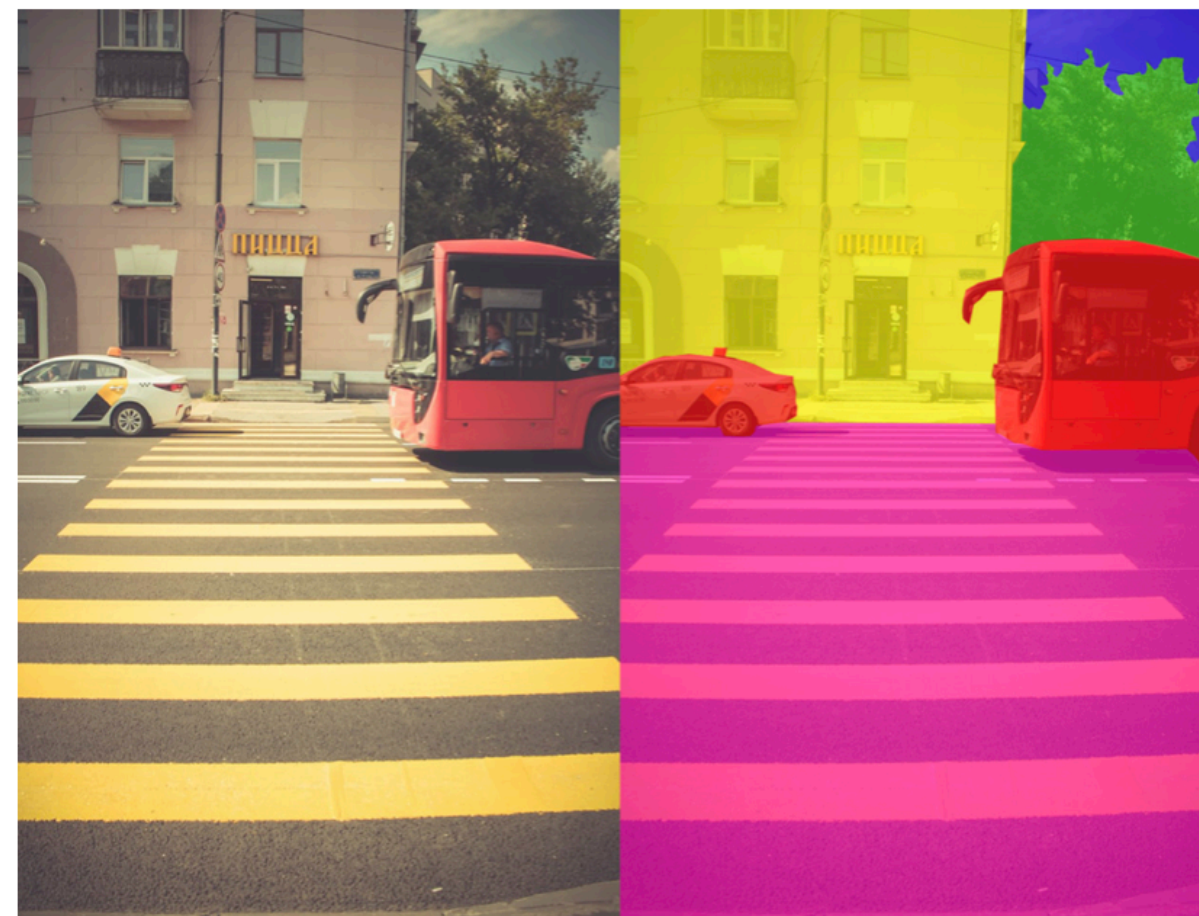
Language

... As you might know ...

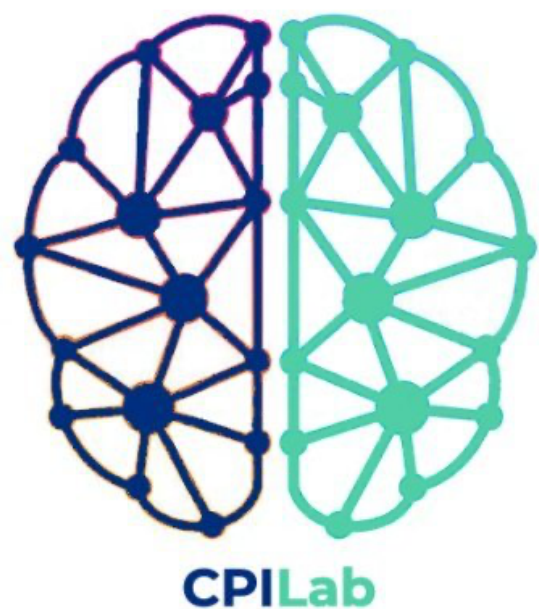
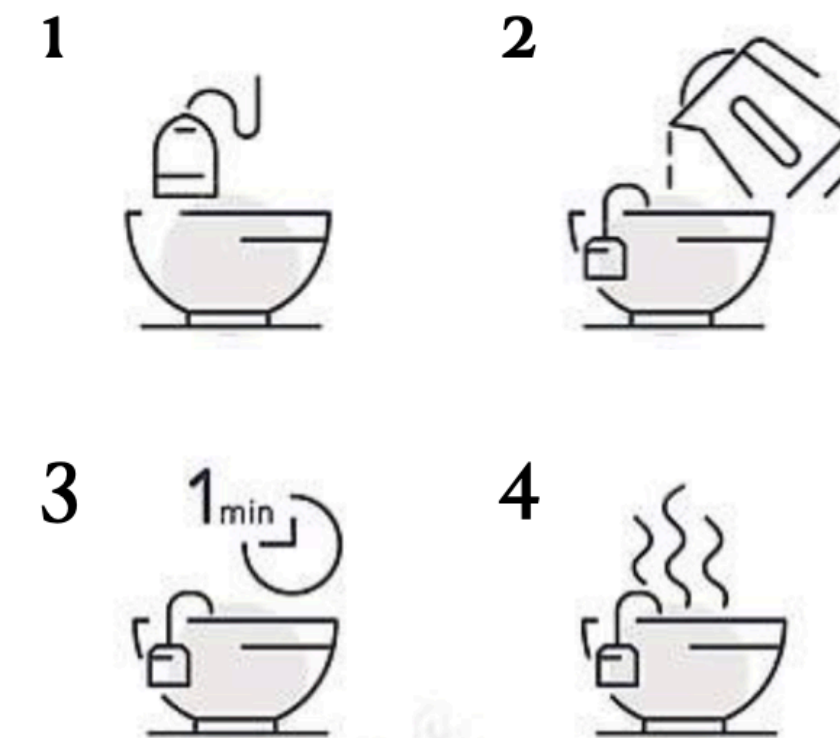
... the thing is ...

It is a bit like ...

Vision



Action



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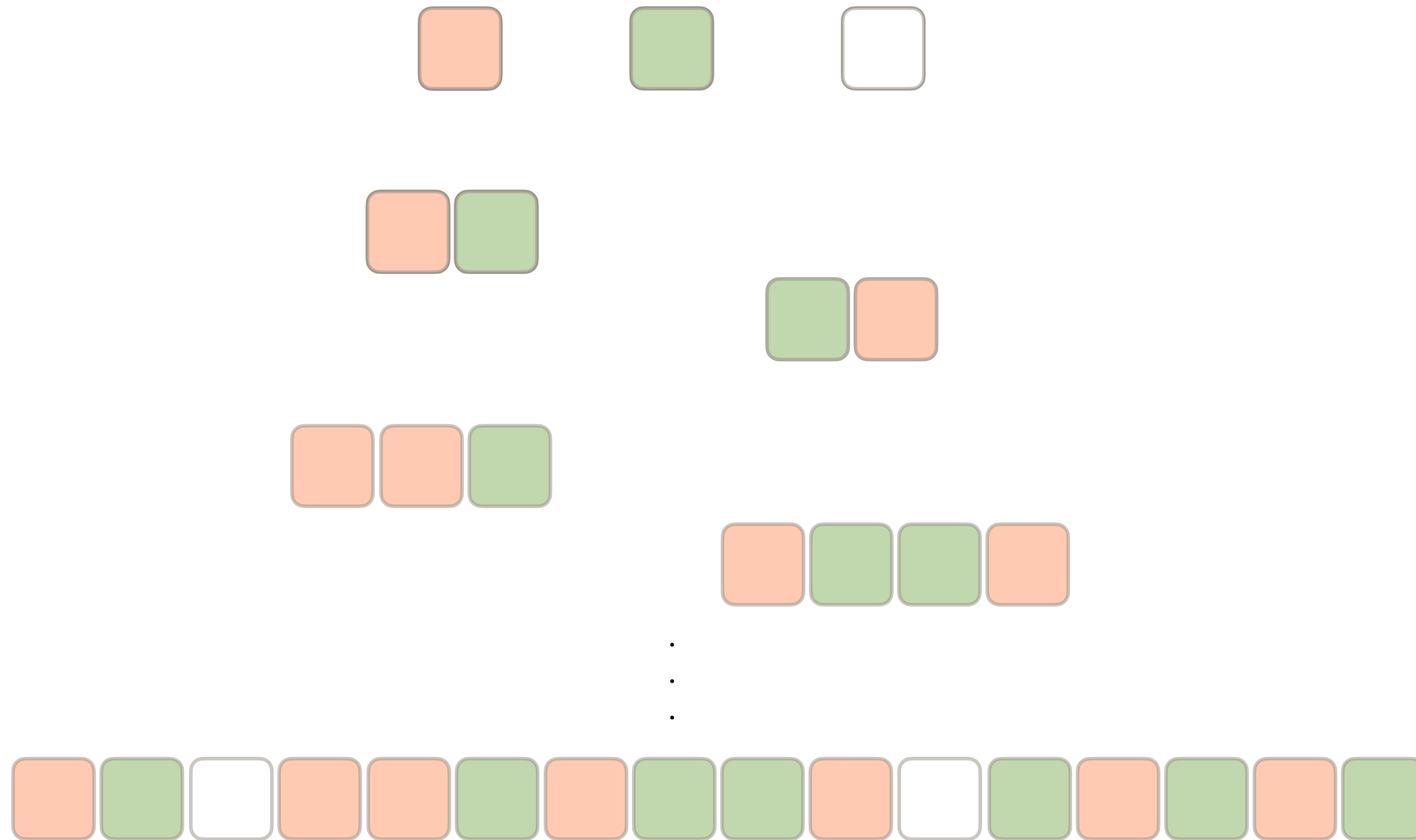
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1. Max Planck Institute for Biological Cybernetics

2. Google Deepmind

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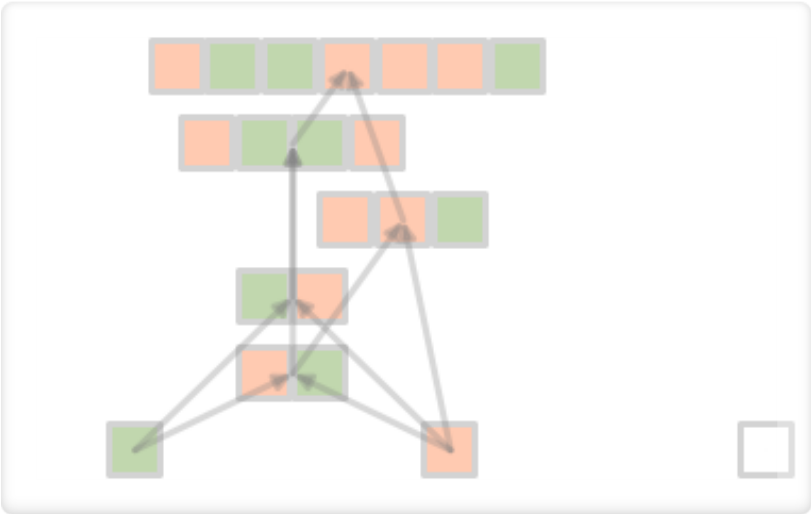
A Generative Model with Embedded Hierarchy



The Hierarchical Chunking Model (HCM) builds up representation as learning progresses



Final Chunk Hierarchy



t = 10



t = 20



t = 60



t = 100



t = 150

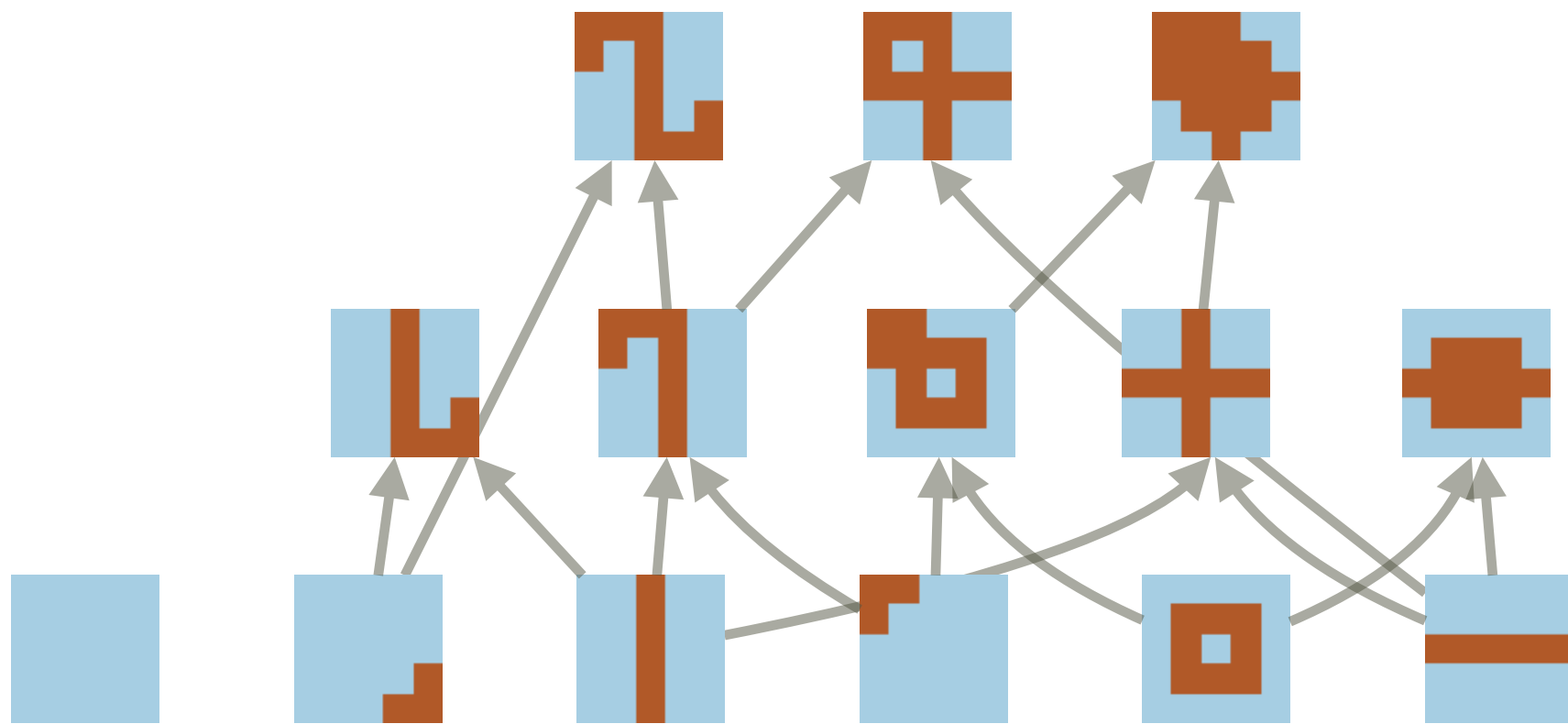


t = 200

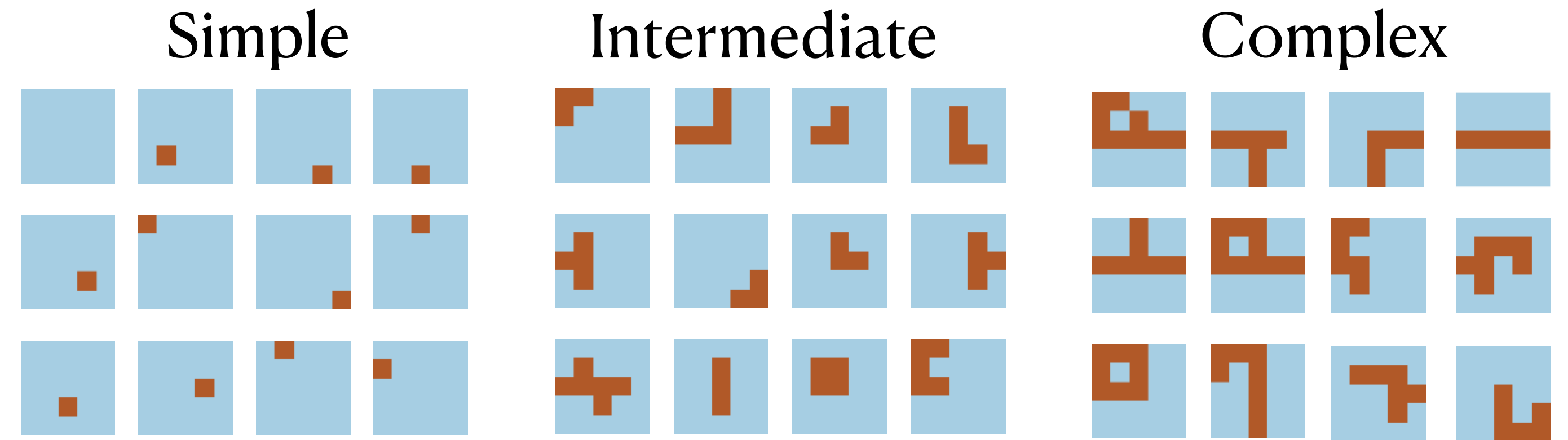


Generalizing Chunk Learning Principles to Visual-Temporal Domain

Visual Hierarchical Model



HCM Learns Compositional Structure in the Visual Domain

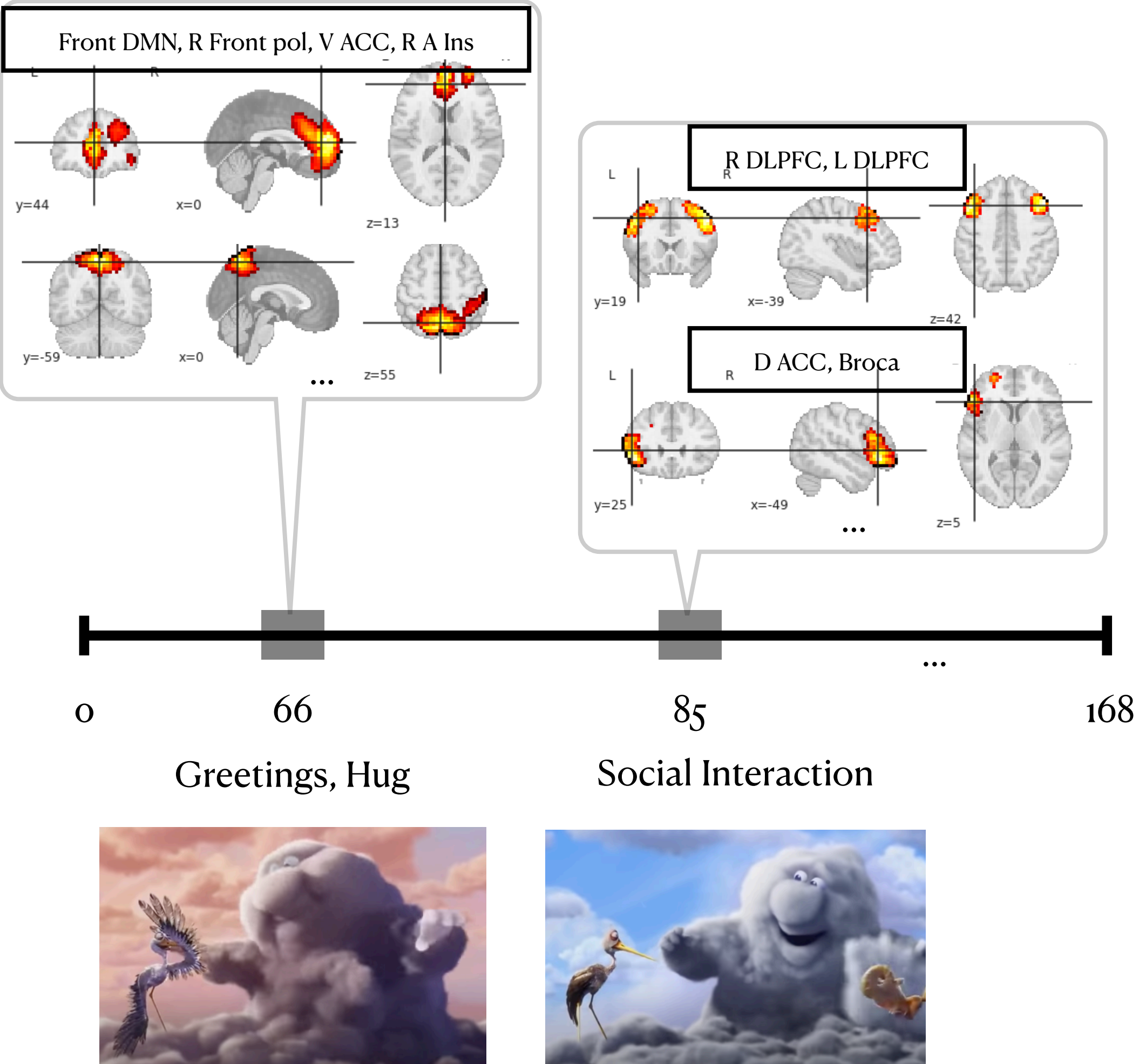


HCM Learns Part-whole Structure that Resembles Object Entities

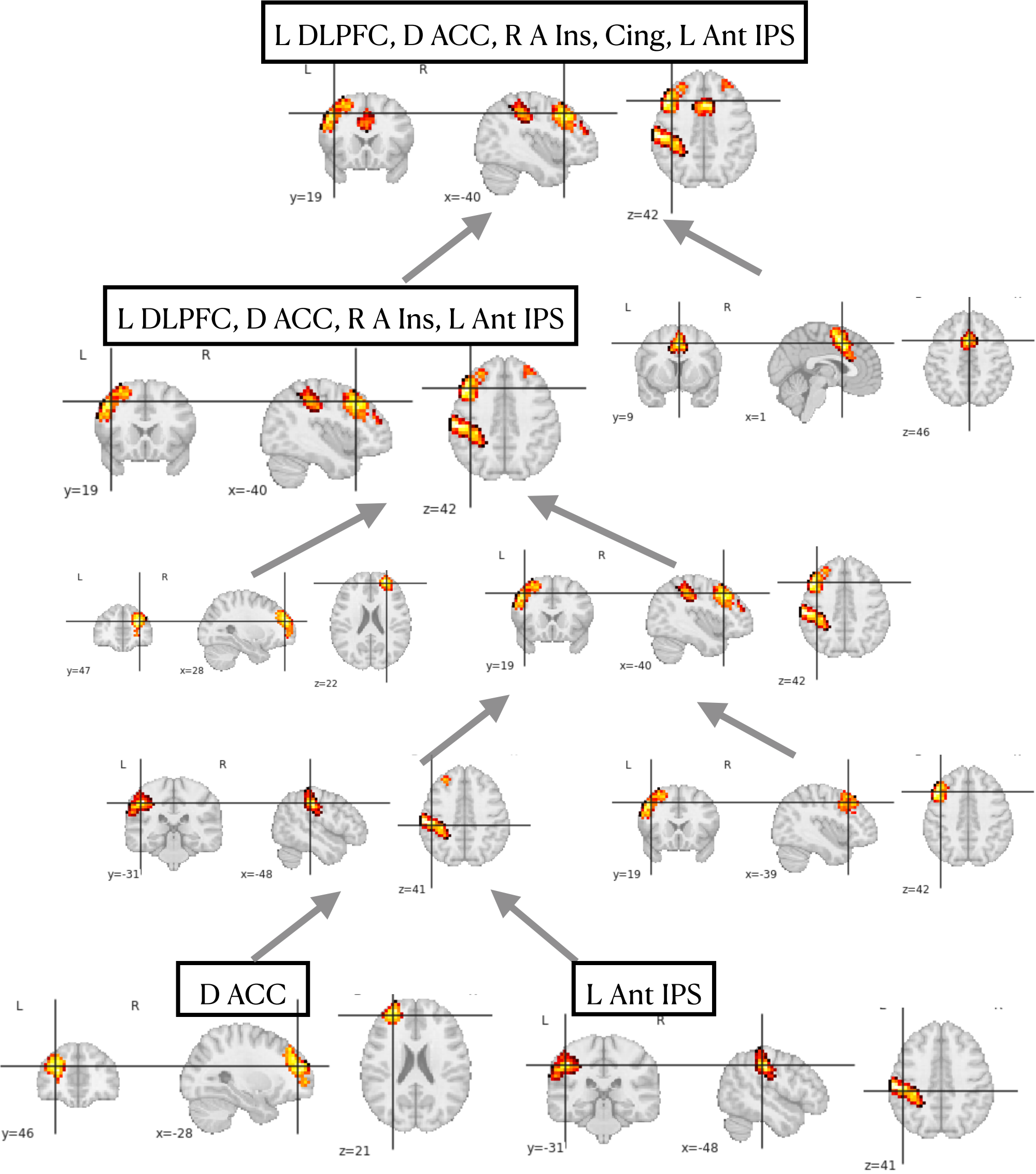


Learning Hierarchies of Brain Activation from Resting-state fMRI data

Discovering patterns of functional activity
HCM's Chunks can be Matched with Stimulus Onsets



Learning Hierarchical Activation Patterns





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Summary: Gestalt principles of grouping and theories of chunk can be understood as a rational way of learning representations from sequences with an inherent hierarchical structure

Paper in collaboration with Noémi Éltető , Ishita Dasgupta, and supervised by Eric Schulz

Link: <https://openreview.net/forum?id=LceHl9wKmoQ>

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