Information-Theoretic Redundancy Reveals the Dynamic Construction of Behaviorally-Relevant Representations in the Ventral Stream

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Presentation Abstract Summary In visual categorization tasks, an observer's behavior depends both on task and on information encoded from their visual field. Where, when and how does the brain's dynamic encoding of visual information interact with task demands to become a representation of task-relevant information? Eight observers categorized the emotional expressions of faces sampled with Bubbles while we recorded MEG responses. Using mutual information, we measured the dynamic coding of stimulus features in each observer. To relate feature coding in the brain to emotion categorization, we introduce information theoretic redundancy, quantifying the 3-way interaction between stimulus feature, MEG signal, and behavioral response. It represents how much of the trial-by-trial stimulus variation commonly affects both the MEG signal and the observer's response. In all observers, redundancy indicates the subset of visual features important for the task; it increases in early visual cortex from the onset of visual coding, suggesting task demands inform the uptake of task-relevant features early on; it concentrates in a specific region within the right fusiform gyrus and peaks later in time (i.e. 180-250 ms post stimulus) in most (6/8) observers. Our results reveal the right fusiform gyrus prunes visual information over time to forge a dynamic representation relevant for behavior.

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