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Perception of Mooney Faces: Extreme Generalization through Inverse Rendering?

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Abstract

Humans can successfully interpret images even when significant image transformations have distorted them. Such images aid in differentiating existing computational models for perception because models which predict similar results for typical stimuli may diverge when confronted with atypical stimuli. We propose an explanation of people's ability to perceive a specific class of degraded stimuli that require extreme generalization capabilities: Mooney, or two-tone images of faces. We provide a parametric and controllable method to generate Mooney faces and hypothesize that the human visual system generalizes under extreme cases because it reverses the naturalistic image generation process. We show that Mooney faces are approximated under extreme illumination conditions; a computer graphics perspective of the Mooney formation process suggests inverse graphics as a model for perceptual generalization. With a number of demonstrations, we argue that Mooney faces are important to understand the role of generative models and inverse graphics in human visual processing.