CS294-164 Report - Week 11

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1 Cone photoreceptor classification in the living human eye from photostimulation-induced phase dynamics

1.1 Main Idea

The paper studies the photostimulation-induced optical phase changes that occur in cone cells which carry substantial information about spectral type, enabling cones to be differentiated with unprecedented accuracy and efficiency. The authors conducted the following experiments: (1) photostimulation-induced optical phase changes occur in cone cells and carry substantial information about spectral type, enabling cones to be differentiated with unprecedented accuracy and efficiency (2) Phase Response of Cones Reveals Cone Spectral Type Cones were classified on the basis of their slow response, but we expect their fast response to also carry useful information, as it also covaries with stimulus energy and is initiated by photoactivation of photopigment. These responses straddle the phototransduction cascade; thus, their combined use should provide even more power for distinguishing cones. This study was also limited to the reflections of the cone OS.

1.2 New Ideas based on readings

Using this approach in Oz seems like the most obvious follow up work. Given that it is fast and works real time, it would be good to integrate this in Oz. Using the data collected by this approach, we could also train neural networks to classify/modify images/parts of images which that might affect people with a certain retinal disease.

2 Unsupervised Learning of Cone Spectral Classes from Natural Images

2.1 Main Idea

This paper studies the question: how is it possible to detect and exploit the presence of a novel sensory class? Here they setup an unsupervised learning algorithm, which when presented with a natural image detects the number of spectral cone classes in a retinal mosaic and learns the class of each cone using the intercone correlations obtained in response to natural image input.

2.2 New Ideas based on readings

Since having a rectilinear grid can introduce aliasing, it might make sense to experiment with other options. It might be interesting to explore the use of supervised techniques to make the algorithm work well with man-made data.