Abstract

Vision begins in the retina, which extracts salient feature of the environment and encodes them in the spike trains of retinal ganglion cells (RGCs), the output neurons of the eye. Each of the diverse RGC types encodes a unique set of visual features tailored to its function. Our proposal combines large-scale multi-electrode array recordings from the retinas of humans, mice, and fat-tailed dunnarts (a marsupial) with an innovative deep neural network analysis approach (i.e., the Retinal-Perceiver model) to address the following fundamental gaps in our understanding of retinal function: (1) We do not know how the retina processes naturalistic visual stimuli; (2) we have not identified the set of visual features encoded by the human retina; (3) we lack insight into how retinal function diverged across evolution; (4) we have not investigated the retinal basis for differences in visual perception and performance between the sexes.