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Carina Curto, Elizabeth Gross, Jack Jeffries, Katherine Morrison, Mohamed Omar, Zvi Rosen, Anne Shiu and Nora Youngs* (nyoungs@g.hmc.edu). *What makes a neural code convex?*

Neural codes allow the brain to represent, process, and store information about the world. Combinatorial codes, comprised of binary patterns of neural activity, encode information via the collective behavior of populations of neurons. A code is called convex if its codewords correspond to regions defined by an arrangement of convex open sets in Euclidean space. Convex codes have been observed experimentally in many brain areas, including sensory cortices and the hippocampus, where neurons exhibit convex receptive fields. What makes a neural code convex? That is, how can we tell from the intrinsic structure of a code if there exists a corresponding arrangement of convex open sets? Using tools from combinatorics and commutative algebra, we uncover a variety of signatures of convex and non-convex codes. In many cases, these features are sufficient to determine convexity, and reveal bounds on the minimal dimension of the underlying Euclidean space. (Received January 18, 2016)