

Canonical forms of neural ideals

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Abstract

A neural ideal captures the firing pattern of a set of neurons (called a neural code), turning problems in coding theory into algebraic questions. In Curto, Itskov, et al. 2013, the authors give an algorithm for computing the canonical form of a neural ideal, a unique set of pseudomonomial generators. In Gunturkun, Jeffries, and Sun 2020, the authors give a technique for polarizing neural ideals, to turn them into monomial ideals while retaining the structure of the canonical form. In joint work with Hugh Geller (Sewanee, The University of the South), we give a number of shortcuts for computing the canonical form of a polarized neural ideal and identify patterns in the generators of a neural ideal that determine whether it is in canonical form. In particular, we give a simple criterion for determining whether a neural ideal with 2 generators is in canonical form.

Keywords: neural ideal, neural code, canonical form, monomial ideal.