

# Covering Relations in Neural Codes

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## **Abstract**

How does my brain do this? This is a question that everyone must have asked themselves at least once in their lifetime. Brains are composed of billions of neurons and mysteriously they manage to use these neurons to encode the data of external stimuli from the real world via neuron firing events. This motivates researchers from different disciplines to collaborate in order to study how the brain functions. To mimic these neuron firing events, mathematicians introduced combinatorial neural codes. These are algebraic objects that keep track of the collections of neurons firing together. Using these neural codes to infer properties of a stimulus space is one of the tasks of neuroscience. For instance, does a combinatorial neural code have a convex realization? In 2020, Jeffs introduced morphisms of neural codes which preserve some combinatorial properties of corresponding stimuli in order to study the convexity of these codes. As an attempt to verify a conjecture about the convexity of codes, we have built a method together with Jeffs to enumerate the neural codes covering a given code via some morphisms. In this talk, we will give an overview of neural codes and describe this joint research.