



## Colloquium Series



### Ramsey property of simplicial complexes and the nerve of a cover

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**Abstract:** Given a topological space  $X$  and an open cover  $\mathcal{U}$  of  $X$ , the nerve of  $\mathcal{U}$  (or  $\mathcal{N}(\mathcal{U})$ ) is an abstract simplicial complex that “captures” the topological properties of  $X$ , under suitable conditions. We study Ramsey-theoretical properties of the nerve of a cover. Facts about these topological and combinatorial objects are used in neuroscience to infer, for instance, the topological properties of the environment through which an animal is moving. In this preliminary work, we use our Ramsey theorem for abstract simplicial complexes to translate the Ramsey phenomenon to the context of nerves  $\mathcal{N}(\mathcal{U})$  aiming to determine potential applications.

Ramsey theory can be understood as an evolving framework to study colorings (or partitions) of mathematical structures admitting interesting monochromatic substructures (that is, substructures contained in one single class of a partition, satisfying a desired property). Many phenomena arising in different contexts can be studied within this framework and that is why Ramsey theory has proved to be useful and very fruitful, with applications in several mathematical fields and other areas of science and technology.

**Keywords:** Neural code, Ramsey theory, Simplicial complex.

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