Topology and Basic Algebraic Topology

Winter Reading Project

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Topology arises in most of the field of mathematics quite naturally, and the study of topological spaces is a prime task in mathematics. Topology attempts to generalize geometry to apply it to a vast number of settings. This is going to a primary introduction to topology and we will also see what happens when we add more structure to the space such as topological groups. If time permits we will give a brief motivation for Algebraic Topology.

Brief plan for the reading project

§ We will start off with introduction to topological spaces, and discuss about bases, and continuous function and homeomorphisms on topological spaces.

§ We will also need some tools from group theory, and give a brief idea about matrix groups, which we will need later when we come to Topological groups.

§ Next task would be cover important topics such as connectedness, pathconnectedness and compactness.

§ We will discuss about ways to construct new topological spaces from existing spaces (quotient topology, connected sums, adjunction).

§ Finally we will discuss about topological groups, and see how the matrix groups are just geometric objects in disguise.

§ If time permits we will give a motivation for Algebraic Topology.

We will go over the following books

1. *Topology* by *Klaus Janich*.
2. *Introduction to Topological Manifolds* by *John Lee*.

   You may also use the book *Topology* by *James Munkres*.