

Geometry of classical matrix groups

To understand some geometrical property of a topological space, one tool is the fundamental group, which helps grasping the idea of “holes” in the space.

Some interesting spaces related to geometry are the spaces underlying the “classical” matrix groups: the general and special linear groups $GL(n, \mathbb{R})$, $GL(n, \mathbb{C})$, $SL(n, \mathbb{R})$, $SL(n, \mathbb{C})$, the orthogonal groups $O(p, q, \mathbb{R})$, $O(n, \mathbb{C})$ over the real or complex field.

In this project, we will study the particular properties of the fundamental group of a space which is underlying a group, and compute the fundamental groups of the examples given above, and if time allows, of the symplectic groups also. It will use some decomposition theorems for these groups, which interprets in a geometric context tools which have been seen in linear algebra.

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