

Project: Relative homology of the groups of non-singular matrices with binary coefficients

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Background: The groups $GL_n(\mathbb{F}_2)$ of non-singular matrices with binary coefficients form, with varying n , an important family of finite groups, and their homology is reasonably well understood in the limit $n \rightarrow \infty$. What is less clear is how this limit is attained. This information is encoded in the relative homology groups $H_j(GL_n(\mathbb{F}_2), GL_{n-1}(\mathbb{F}_2))$. It is known that these are zero for large values of n (compared with j), but the picture for small values of n is not clear. This necessitates computations in a range where these groups are non-zero.

Problem: How do the groups $H_j(GL_n(\mathbb{F}_2))$ approach their limit $H_j(GL_\infty(\mathbb{F}_2))$?

Specification: Calculate, for small values of j and n , as many of the relative homology groups $H_j(GL_n(\mathbb{F}_2), GL_{n-1}(\mathbb{F}_2))$ as time permits. Try to find a way to do this on a computer. Visualize the results in a table.

Prerequisites: Basic definitions of group theory and homological algebra. On these grounds, the homology of groups can be explained during the training, so that it is not required.

Training: Background from the homology of groups, and ways to calculate it on a computer, will be given during the supervision.

Time frame: The time frame for this project is around 75 working hours, not counting training.