

## **Calabi-Yau Manifolds, Discrete Symmetries and String Theory**

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Calabi-Yau manifolds play a central role in String theory, a formalism that attempts to describe natural phenomena at all length scales. One of the tests for a string-theoretic model is its ability to explain the origin of discrete symmetries confirmed in particle physics experiments. In the formalism of certain superstring theories, such symmetries must be found as isometries of the relevant Calabi-Yau manifold.

In this talk, I will describe a procedure to obtain symmetries of a class of smooth Calabi-Yau threefolds with non-trivial fundamental groups, as discrete subgroups of projective general linear groups. The procedure can be automatized by combining this classical group and representation theoretic approach with computer-aided Gröbner basis computation, to yield various finite symmetry groups that are of direct relevance in particle physics. I will also demonstrate that by specialising to certain sub-loci in the parameter space of such manifolds, one can find enhanced symmetries. To this effect I will demonstrate an example from an ongoing work, of a smooth Calabi-Yau manifold with the largest ever (to our knowledge) discrete symmetry group.

References: [arXiv:1709.01081](https://arxiv.org/abs/1709.01081) and [arXiv:1708.08943](https://arxiv.org/abs/1708.08943)