

MA4198 PROJECT PROPOSAL (PROJECT CUM SEMINAR GROUP)

SUPERVISOR'S INFO

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PROJECT ID: PS2410-10

TITLE

Combinatorics of Coxeter groups

BRIEF DESCRIPTION OF PROJECT

Coxeter groups are groups generated by reflections; for example, the symmetry group of each regular polyhedron is a finite Coxeter group. They are generalizations of symmetric groups and Dihedral groups. Coxeter groups find applications in many areas of mathematics such as Representation Theory and Number Theory, Quantum Groups in particular. This is a sister project of the project led by Prof. Huanchen Bao, *Towards the formalization of Coxeter combinatorics*.

This project aims to not just learn the fundamental properties of Coxeter groups, but also expose to some computer assisted proof for Mathematics. This project is suitable to the students who have passion on the abstract algebra and general interested in the current development of Mathematical Digitalization and AI for mathematics.

It is worth mention that there will be another parallel project on Formalization of Coxeter groups led by Prof. Huanchen Bao. In the sister project, Prof. Bao will emphasize on the proof assistant software, Lean 4 to formalize the math content. Lean 4 has attracted a lot attentions from the mathematical society in recent years; for example, Kevin Buzzard's Fermat Last Theorem formalization project.

EXPECTATION/S

This project involves many proofs on the fundamental properties of Coxeter groups. Moreover, there is a parallel project led by Prof. Huanchen Bao, working on the formalization of the relevant results of Coxeter groups. We expect that two groups can collaborate on this topic and combine the two projects to make a giant piece work on digitalizing the Coxeter groups.

PREREQUISITE/S (at level 3000 or below, with at most one course at level 3000)

MA 2202 Algebra I, MA 3201 Algebra II

READING REFERENCE/S

Abstract Algebra by David Dummit and Richard Foote
Combinatorics of Coxeter groups by Anders Bjorner and Francesco Brenti

