Summer Project

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1 Symbolic Polyhedron and Symbolic Powers of Monomial Ideals

Comparing the behaviour of symbolic and ordinary powers of a homogeneous ideal has become key to understanding many problems in commutative algebra and algebraic geometry. For the special class of monomial ideals, there is an interesting approach to study their symbolic and ordinary powers via the corresponding symbolic polyhedra and Newton polyhedra.

This approach turned out to be very efficient and many new understanding of symbolic powers have been recently discovered by knowledge of their convex geometric objects, for instance, results related to the containment problem, equality problem, degree bounding problem and many more.

On the other hand, this connection between algebraic objects and geometric objects also allows us to study symbolic powers algebraically and obtain new knowledge about their geometric counterparts. Another application is potentially new understanding on the area of linear integer programming.

2 Goals

One of my goals is to continue to investigate further the connection between symbolic powers of monomial ideals and their algebraic invariant with the corresponding symbolic polyhedra and their geometric invariant. Another goal is to study some problems involving symbolic powers and ordinary powers via their geometric objects, especially, the problem of equality between them and the problem of bounding the generators of symbolic Rees algebra.

3 Faculty Supervisor

Dr. Tai Ha