Combinatorial Koszul Homology: Computations and Applications
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ABSTRACT

With a particular focus on explicit computations and applications of the Koszul homology and Betti numbers of monomial ideals, the main goals of this thesis are the following: Analyze the Koszul homology of monomial ideals and apply it to describe the structure of monomial ideals. Describe algorithms to perform efficient computations of the homological invariants of monomial ideals. Apply the theory and computations on monomial ideals to problems inside and outside mathematics.

The thesis introduces as a main tool Mayer-Vietoris trees of monomial ideals.