

# Abstract

In this thesis, we explore the algebraic and combinatorial aspects of Neighborhood Simplicial Complex associated with a graphs. We compute the following invariants:  $f$ -vector,  $h$ -vector, Hilbert function and Hilbert Series of Neighborhood Simplicial Complex for graphs and their associated Stanley-Reisner rings. We also present some graph families for which the Stanley Reisner Ring associated to the Neighborhood Simplicial Complex is Cohen-Macaulay.