

# Betti numbers and flat dimensions of local cohomology modules

Alireza Vahidi

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*Abstract.* Assume that  $R$  is a commutative Noetherian ring with non-zero identity,  $\mathfrak{a}$  is an ideal of  $R$  and  $X$  is an  $R$ -module. In this paper, we first study the finiteness of Betti numbers of local cohomology modules  $H_{\mathfrak{a}}^i(X)$ . Then we give some inequalities between the Betti numbers of  $X$  and those of its local cohomology modules. Finally, we present many upper bounds for the flat dimension of  $X$  in terms of the flat dimensions of its local cohomology modules and an upper bound for the flat dimension of  $H_{\mathfrak{a}}^i(X)$  in terms of the flat dimensions of the modules  $H_{\mathfrak{a}}^j(X)$ ,  $j \neq i$ , and that of  $X$ .