Results on cohomology: vanishing, finiteness properties, and celebrated conjectures

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The goal of this talk is to discuss recent progress on cohomology theory. First, we present results concerning the impact of Ext vanishing on freeness of finitely generated modules over Noetherian local rings, and derive consequences in connection to celebrated problems in homological algebra such as the Auslander-Reiten, the Tachikawa, and the Huneke-Wiegand conjectures (joint work with R. Holanda). Finally, we discuss new facts on finiteness properties of local cohomology modules in regard to Hartshorne's problem on cofiniteness and Huneke's conjecture predicting the finiteness of the sets of associated primes of such modules (joint work with A. Dosea and R. Holanda).