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Homological Algebra Without Grading

Thursday, July 24, 2025 2:00 PM (30 minutes)

Complexes are a fundamental object in homological algebra, and as such, grading is deeply ingrained in the subject. But what happens if we remove the grading from a complex? This leads us to the notion of a differential module. In this talk, we will explore how the finiteness of the injective dimension of a finitely generated module over a local commutative noetherian ring can be detected using this ungraded framework. As an immediate application, we will see that this perspective also detects when such a ring is Cohen–Macaulay. This approach offers a new perspective on a classical question posed by H. Bass.

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