Brief Report
Volume 16:2, 2022

Journal of Generalized Lie Theory and Applications

ISSN: 1736-4337

Open Access

Homological Algebra: Overview

Rupali Saxena*

Department of Mathematics, Osmania University, Hyderabad, Telangana, India

Brief Report

Homological algebra is a branch of mathematics that studies homology in a broad algebraic setting. It is a relatively recent discipline, with origins in the work of Henri Poincaré and David Hilbert on combinatorial topology (a predecessor of algebraic topology) and abstract algebra (theory of modules and syzygies) around the turn of the nineteenth century. The emergence of homological algebra coincides with the growth of category theory. Homological algebra focuses on homological factors and the complicated algebraic structures that they entail. In mathematics, chain complexes are a popular and useful concept that may be examined using both homology and cohomology [1].

Homological algebra is a mathematical technique for extracting information from complexes and expressing it as homological invariants of rings, modules, topological spaces, and other 'physical' mathematical objects. Spectral sequences are an effective tool for this. Since its beginnings, homological algebra has played an important role in algebraic topology [2]. Its influence has benefitted commutative algebra, algebraic geometry, algebraic number theory, representation theory, mathematical physics, operator algebras, complex analysis, and partial differential equations theory. K-theory is an independent science that employs homological algebra approaches, similar to Alain Connes' noncommutative geometry. Cohomology theories have been constructed for topological spaces, sheaves, groups, rings, Lie algebras, and C*-algebras, to name a few [3,4].

Current algebraic geometry would be practically hard to comprehend without sheaf cohomology. The idea of exact sequence lies at the heart of homological algebra, and it may be used to do real-world calculations. The spectral sequence is the ultimate computational sledgehammer; it's needed to calculate the derived factors of a composition of two factors in the Cartan-Eilenberg and Tohoku procedures, for example. Spectral sequences are less crucial in the derived category approach, although they nevertheless play a role when concrete computations are necessary. There have been attempts at 'non-commutative' theories that expand first cohomology as torsors [5].

References

1. Grad, Harold. "On the kinetic theory of rarefied gases." *Commun Pure App Mathematics* 2 (1949): 331-407.
2. Grad, Harold. "Principle of the kinetic theory of gases." *Handuch der Physik* 12 (1958): 205-294.
3. Bobylev, Aleksandr Vasil'evich. "Fourier transform method in the theory of the Boltzmann equation for Maxwellian molecules." *In Soviet Physics Doklady* 20 (1976): 820-822.
4. Levermore, C. David. "Moment closure hierarchies for kinetic theories." *J Stat Phy* 83 (1996): 1021-1065.
5. Torrilhon, Manuel. "Modeling nonequilibrium gas flow based on moment equations." *Ann Rev Fluid Mech* 48 (2016): 429-458.

How to cite this article: Saxena, Rupali. "Homological Algebra: overview." J Generalized Lie Theory App 16 (2022): 321.

***Address for Correspondence:** Rupali Saxena, Department of Mathematics, Osmania University, Hyderabad, Telangana, India, e-mail: rupalisaxena@mathphy.us*

Received: 02 February 2022, Manuscript No. glta-22-56341; **Editor assigned:** 04 February 2022, PreQC No. P-56341; **Reviewed:** 17 February 2022, QC No. Q-56341; **Revised:** 22 February 2022, Manuscript No. R-56341; **Published:** 01 March 2022, DOI: 10.37421/1736-4337.2022.16.321