Free resolutions and their applications

Project Description: The study of infinite free resolutions is a major and important area in commutative algebra. Explicit calculations in this area are in general very difficult. There is still much demand for new insights and guiding conjectures. We use the concept of weak complete intersection ideals as a tool to obtain some explicit Poincare series of modules over a fiber product of commutative local rings.

In this project, we will focus on developing the general theory of weak complete intersections as well as its applications in the study of free resolutions. When I is a weak complete intersection ideal in a ring R, we will consider the more general case for a non-cyclic R-module, whose minimal free R-resolution has all differentials contained in the ideal I. We will study the growth pattern for its resolution as compared to the one for R/I. We will also study the rigidity problem for the Tor module involved. Finally, based on the more general theory, we will construct more examples of Golod rings and Golod homomorphisms. We will then use them to give explicit formulas for the Poincare series of modules over these fiber products and connected sums. This development will add more tools and applications in the study of infinite free resolutions.

Job Description: We are seeking a highly skilled and motivated research fellow specializing in commutative algebra and homological algebra contribute to our cutting-edge research initiatives. The ideal candidate will have at least basic knowledge of commutative algebra and homological algebra, and some research experiences in these fields and/or other fields in algebra. The ideal candidate should be willing to work with others and be able to think independently. The research fellow will play a key role in solving problems in rings and algebras. Collaborating closely with a team of researchers, you will actively contribute to the development and submission of research papers in decent reputable journals. Throughout the experience as a Focused Research Extended Experience (FREE) research fellow, you will be able to cultivate the relevant research and practical skills in a focused and extensive manner such that enhancing your chances for advancing graduate studies.

The term of employment spans two years, and the contract is structured for annual renewal.

Qualifications:
- Master's or bachelor's degree in mathematics. Background in commutative algebra and/or homological algebra.
- Experience with academic writing in pure mathematics and related research experiences.