模的自由分解及其应用

【项目描述】：模的无穷自由分解是交换代数研究的一个重要部分。在研究过程中进行同调代数的显式计算通常是困难的。对于无穷分解的研究需要新的想法并能够指引我们前进的猜想。以弱完全交理想为工具，可以得到一些关于模在一些交换局部环纤维积上的庞加莱级数的比较显式的表达。本项目计划深入发展关于弱完全交理想的一般理论和它在模的分解方面的研究。在已有的基础上，即当理想是环中的弱完全交，探讨更一般的模的最小自由分解问题和它们的增长模式。最后，给出庞加莱级数更为精确的刻画，为模的分解的研究提供更多的应用。

【职位概述】：我们正在寻求一位基础扎实、自我驱动，对基础数学理论和应用感兴趣，且愿意合作并具备独立研究思考能力的科研助理。理想的候选人至少应具有交换代数和同调代数方面的基础知识储备，并有过相关或其他代数领域方面的科研经历。候选人将在环与代数方面开展基础研究工作，通过与团队成员的密切合作，在国内外相关领域期刊上发表相关学术论文。通过聚焦性科研延展项目（FREE），候选人将有机会获取开展研究工作所需的专业技能和素养，从而增加申请博士或硕士研究生项目获批的可能性。

【职位要求】：
- 数学专业的硕士（或学士）及以上学历，具备交换代数和同调代数等相关背景。
- 基础数学方面的论文写作和相关科研经历。

有关此职位的问题，请联系杨铮博士，电子邮件：zhengyang2018@scu.edu.cn。

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.

This position commences in or after early 2024, with individuals anticipated to initiate their responsibilities no later than Spring 2024. 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.

For questions regarding this position, please contact Dr. Zheng Yang, at
zhengyang2018@scu.edu.cn.