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Research field: Algebraic Geometry

Keywords: Frobenius morphism, Cartier operator, Singularities, Vanishing theorems

Summary of current research:

I study algebraic varieties in positive characteristic from both local and global perspectives, using Frobenius morphisms and Cartier operators.

On the local side, I analyze properties of singularities via Cartier operators and aim to introduce new classes of singularities in positive characteristic that correspond to higher Du Bois and higher rational singularities in characteristic zero. I am also interested in the conditions under which relative vanishing theorems—such as Steenbrink-type vanishing—hold, as well as in their applications.

From a global perspective, my research focuses on various vanishing theorems in positive characteristic, including Akizuki–Nakano vanishing, Bogomolov–Sommese vanishing, and Bott vanishing. In particular, I am interested in applying these results to study the liftability of algebraic varieties in positive characteristic to characteristic zero.

Notice for the students:

In order to engage in cutting-edge research at the master's level, it is strongly recommended that students acquire a solid foundation in scheme theory before entering graduate school. Specifically, the material covered in Chapters 2 and 3 of R. Hartshorne "Algebraic Geometry" serves as a useful benchmark.

If time permits, it is also beneficial to explore more advanced topics such as the theory of algebraic surfaces (for example, L. Bădescu "Algebraic Surfaces") and the foundations of higher-dimensional algebraic geometry (such as R. Lazarsfeld "Positivity in Algebraic Geometry I,II"). That said, these topics can certainly be pursued after entering graduate school. Above all, a thorough understanding of the basics of scheme theory should be prioritized.

While mathematics is often perceived as a solitary endeavor, in practice, both learning and research are advanced through active communication with peers, members of research groups, researchers abroad, and advisors. We welcome individuals who are eager to grow together with those around them through the process of mathematical research.