THE TATE CONJECTURE OVER FINITE FIELDS FOR VARIETIES WITH $h^{20} = 1$

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Venue: Room 102, Shanghai Center for Mathematical Sciences

Abstract: The past decade has witnessed a great advancement on the Tate conjecture for varieties with Hodge number $h^{2,0} = 1$. Charles, Madapusi-Pera and Maulik completely settled the conjecture for K3 surfaces over finite fields, and Moonen proved the Mumford--Tate (and hence also Tate) conjecture for more or less arbitrary $h^{2,0} = 1$ varieties in characteristic 0.

In this talk, I will explain that the Tate conjecture is true for mod p reductions of complex projective $h^{2,0} = 1$ varieties when $p \gg 0$, under a mild assumption on moduli. By refining this general result, we prove that in characteristic $p \geq 5$ the BSD conjecture holds for a height 1 elliptic curve E over a function field of genus 1, as long as E is subject to the generic condition that all singular fibers in its minimal compactification are irreducible. We also prove the Tate conjecture over finite fields for a class of surfaces of general type and a class of Fano varieties. The overall philosophy is that the connection between the Tate conjecture over finite fields and the Lefschetz (1, 1)-theorem over C is very robust for $h^{2,0} = 1$ varieties, and works well beyond the hyperkahler world.

This is based on joint work with Paul Hamacher and Xiaolei Zhao.