MAXENCE MAYRAND, Université de Sherbrooke

The complex geometry of GKP codes

GKP codes, introduced by Gottesman, Kitaev and Preskill in 2001, encode finite-dimensional logical spaces into quantum harmonic oscillators, with code states given by joint eigenstates of commuting translations in phase space. I will explain how the theory of complex abelian varieties, which originated in the work of Abel, Jacobi and Riemann and has remained a very active area of research ever since, provides a rigorous mathematical framework for studying them. As a result, the tools and expertise developed for abelian varieties offer new ways of constructing and understanding GKP codes. In turn, natural questions about GKP codes, such as finding codes with many easily implementable logical gates or with optimal robustness to noise, become concrete problems on which mathematicians and physicists can work together. This talk is based on joint work with Baptiste Royer, arXiv:2605.28784.