

Elliptic curves and chip-firing games on graphs

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Abstract: In this talk, I will discuss chip-firing games on graphs, and the related critical groups which have arisen independently in various areas of mathematics. These areas include mathematical physics, arithmetic geometry, and combinatorics. Such critical groups lead to various analogies between objects arising in number theory and algebraic geometry, and those arising in combinatorics and tropical geometry.

The main object of study in this talk will be elliptic curves over finite fields and their associated structure as groups. For a family of graphs obtained by deforming the sequence of wheel graphs, the cardinalities of the critical groups satisfy a nice reciprocal relationship with the orders of elliptic curves as we consider field extensions. I will finish by discussing other surprising ways that these group structures are analogous.