Geometry of the moduli of higher spin curves

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Abstract

I will describe some aspects of the geometry of the moduli of generalized spin curves (r-spin curves) for $r \geq 2$. Smooth r-spin curves, are pairs (X, L) with X a smooth curve and L a line bundle whose rth tensor power is isomorphic to the canonical bundle of X. These are a natural generalization of 2-spin curves (algebraic curves with a theta-characteristic), and arise, among other places, in the theory of two-dimensional quantum gravity coupled to matter. A remarkable conjecture of E. Witten suggests that these moduli spaces should have some Gromov-Witten-like invariants which correspond to solutions of the Gelfand-Dikii hierarchy of differential equations.

In this talk I will treat the geometry of both the moduli of smooth spin curves and its compactification—the moduli of stable spin curves. In particular, I will describe the irreducibility and the Picard group of these spaces. Although there are many similarities to the moduli of curves, some striking differences are also apparent; for example, unlike the Picard group of the moduli space of curves, the Picard group of the (uncompactified) moduli space of r-spin curves has non-zero torsion whenever 2 or 3 divides r.