MODULI SPACE OF SEMI-STABLE SHEAVES WITH FIXED DETERMINANT OVER SINGULAR VARIETIES

Let $X$ be a projective variety (possibly singular) over an algebraically closed field of any characteristic. We introduce the notion of alternating determinant of a coherent sheaf on $X$, which is semi-stable and if $X$ is regular, coincides with the dual of the determinant. Using this we construct a moduli space of semi-stable sheaves with fixed (alternating) determinant over $X$, which arises as a fiber to some determinant morphism. This moduli space is projective if $X$ is normal.

We also construct a relative moduli space of semi-stable sheaves with fixed alternating determinant and prove that it has good specialization properties. As an application, for $X$ an irreducible nodal curve, we show that the moduli space is non-singular, projective and rationally chain connected, if the fixed alternating determinant is invertible.