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4. Algebraic Geometry

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Moduli spaces of torsion-free sheaves on nodal curves

We study moduli spaces $U_Y(n,d)$ (resp. $U_Y(n,L)$) of semistable torsion-free sheaves of rank n, degree d (resp. with a "fixed determinant L") on a reduced connected nodal curve Y. Explicit descriptions of $U_Y(2,L)$ are obtained in case Y is hyperelliptic. The relation between representations of $\pi_1(Y)$ in $GL(n,\mathbf{C})$ and vector bundles on Y is studied. Examples of stable bundles which do not come from representations and whose tensor products etc. are not semistable are constructed. Normalisations of $U_Y(n,d), U_Y(n,L)$ are obtained using parabolic bundles. It is shown that if Y is irreducible and $U'_Y(n,L)$ (resp. $U'^s_Y(n,L)$) denote the subsets corresponding to vector bundles (resp. stable vector bundles) then Pic $U'_Y(n,L) \approx \mathbf{Z}/(m)$, Pic $U'^s_Y(n,L) \approx \mathbf{Z}$ for almost all n,d . Results are extended to principal G bundles on Y.

References. Bhosle Usha N. : Representations of the fundamental group and vector bundles. Math. Ann. 302,601–608 (1995). Vector bundles on curves with many components. To appear in Proc. London Math. Soc.