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New Hermitian and Non-Hermitian Toda field theories and Calogero models from infinite symmetries

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Many integrable theories can be formulated universally in terms of Lie algebraic root systems. Examples are conformal field theories that can be expressed in terms of the simple roots of finite Lie algebras, massive field theories that can be written in terms of simple roots of the affine Kac-Moody algebras and Calogero (Moser-Sutherland) models that require the entire root system of the finite Lie algebras in their formulation. Here we discuss extensions to similar systems based on hyperbolic and Lorentzian Kac-Moody algebras. We discuss various properties of these models, including their integrability and invariance with regard to infinite Weyl groups of affine, hyperbolic and Lorentzian type. Some of these model are Hermitian whereas others are Non-Hermitian.

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