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Lie Algebras of Hamiltonian Vector Fields and Symplectic Manifolds

We construct a local characteristic map to a symplectic manifold M via certain cohomology groups of Hamiltonian vector fields. For each $p \in M$, the Leibniz cohomology of the Hamiltonian vector fields on $\mathbb{R}^{2n}$ maps to the Leibniz cohomology of all Hamiltonian vector fields on M. For a particular extension $\mathfrak{g}_n$ of the symplectic Lie algebra, the Leibniz cohomology of $\mathfrak{g}_n$ is shown to be an exterior algebra on the canonical symplectic two-form. The Leibniz cohomology of this extension is then a direct summand of the Leibniz cohomology of all Hamiltonian vector fields on $\mathbb{R}^{2n}$.

Keywords: Leibniz homology, symplectic manifolds, symplectic invariants.

MSC: 17B56, 53D05, 17A32