

Proposed Project Work

Recently, in joint work by Damianou and Fernandes, a connection between integrable hierarchies and the so-called modular class of a Poisson manifold was established.

We recall that the modular class is a Poisson cohomology class, which is the obstruction to the existence of a measure invariant under all hamiltonian flows. This notion extends to any Lie algebroid, and there is a relative modular class associated with a morphism of Lie algebroids. As was shown first by Magri and Kosmann-Schwarzbach, Poisson-Nijenhuis manifolds give the appropriate setting to study integrable hierarchies. The work of Damianou and Fernandes shows that to any non-degenerate Poisson-Nijenhuis manifold one can associate a canonical integrable hierarchy, which is intimately connected with the relative modular class of the Poisson-Nijenhuis tensor.

In this visit we have extended these works leading to the discovery of further connections between modular classes and integrable hierarchies. We have also removed the non-degeneracy assumption that was assumed there. We have started to look at the the modular class for infinite dimensional Hamiltonian systems, which poses some non-trivial chalengins, and we started to look at the relationship to algebraic integrability and to separability. I expect that Marco Pedroni (Milano) and Pol Vanhaecke (Poitiers) will visit my institution (IST-Lisbon) to proceed with this work.