Contact Geometry and Contact Hamiltonian Systems

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December 15, 2023, 11:00 a.m.
Torre Archimede, Room 2BC30

Abstract

The purpose of this seminar is to introduce the main objects in contact geometry and contact Hamiltonian systems and the way they are related. In particular we will pay most of the attention to all the "contact form-dependent" objects and we will show some important characterizations which will help us to understand their geometric structure.

The beginning of the seminar will be dedicated to the condition of maximal non integrability of the contact structure, which is the central property that a contact distribution has to respect.

After some basic examples of contact manifolds, $\mathbb{R}^{2n+1}$ and $\mathbb{R} \times T^*M$, we will move to existence and uniqueness of the Reeb vector field to present the idea behind the Contact Darboux theorem's proof.

Finally, we introduce contact Hamiltonian systems and give their local form using Darboux coordinates. We will then comment on the use of contact Hamiltonian systems to model dissipative phenomena.

Bibliography

1. John M.Lee, *Introduction to Smooth Manifolds*, Second Edition, Springer, 2012.
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3. M.de Leon and M.L.Valcazar, *Contact Hamiltonian systems*, Journal of Mathematical Physics 60, 2019.
4. A.Bravetti, *Contact Hamiltonian Dynamics: The Concept and Its Use*, Entropy 19, 2017.