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Titolo progetto 'Nonlinear Wave Equations in Not Euclidean Settings' (NWEinNES)
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Abstract progetto:

The aim of this project is to study the Cauchy problems associated with nonlinear evolution equations (e.g. wave equation, heat equation, damped wave equation) by considering the spatial variable in a space other than the Euclidean space with the flat metric, namely:

- a) in the Heisenberg group (more generally, in a Carnot group);
- b) in the periodic case (more generally, in a compact Lie group);
- c) in the semi-periodic case;
- d) in \mathbb{R}^N equipped with a metric different from the flat one.

We are interested in investigating, under which assumptions on the nonlinear terms and on the Cauchy data, local in time solutions to these PDEs may be globally prolonged or blow up in finite time. In the latter case, it is interesting to determine asymptotically the lifespan of a solution (maximal existence time) in terms of the size of the data. A special emphasis will be put on nonnegative power type nonlinearities and the pursuit of critical exponents: by critical exponent, here we mean a threshold value for the power of the nonlinear term which separates the values that guarantee the global existence of small data solutions from those that provide the blow-up in finite time under suitable sign assumptions for the data.

The challenging part of this project consists of the development of functional-analytic tools that allow us to investigate the existence of suitably defined solutions (local or global in time) by providing a strategy for the handling of nonlinear terms. From the blow-up side, the main task required to derive sharp results is the analysis of suitable solutions to the adjoint equation of the linearized model.