

Acronimo: nessuno

Titolo del progetto: Interactions between Geometric Structures and Function Theories

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Ruolo Uniba: Research Unit

Responsabile scientifico: Amedeo Altavilla

Referente amministrativo: Claudia Sicolo

Dipartimento: Dipartimento di Matematica

Finalità:

The aim of this project is to create new connections and to strengthen the existing ones in two transversal but complementary senses:

- among related areas of mathematics, ranging from Geometry to Topology and Analysis, but also to Symbolic Computation;
- encouraging a transmission of knowledge between different generations of mathematicians.

Our project will promote the transfer of skills, techniques and methodologies and will foster the collaboration among the members, with the goal of obtaining significant contributions in the expertise areas of the various members, with an important fallout on the related scientific community.

The core expertise areas of the project members can be divided into two main themes:

#### A) GEOMETRIC STRUCTURES ON MANIFOLDS

The study of manifolds endowed with structure; this includes symplectic/almost Kähler manifolds, (almost) contact (metric) structures, geometric structures inspired by Riemannian holonomy ( $G_2$ ,  $SU(4)$ ,  $Sp(2)$ ,  $Spin(7)$ ), special metrics on complex manifolds, special curvature conditions on (pseudo-)Riemannian manifolds, twistor techniques in differential geometry, and holomorphic foliations;

#### B) FUNCTION THEORIES

The theory of complex and hypercomplex analytic functions of one and several variables, with a special attention for their zero sets, their (quasi-)conformal properties, their function spaces, their relation with complex and hypercomplex functions, and with quaternionic manifolds.

We point out that these are not just separate items, as we shall show in the detailed presentation of the main research areas of this project.

#### Abstract:

The aim of this research project is to explore the interactions between the geometry of manifolds and the structure of function spaces using a blend of techniques. We will focus on geometric structures and the theory of complex and hypercomplex functions. These are very lively and rich research areas in the Italian and international mathematical community. We aim at bringing together researchers at various stages of their careers to provide a fruitful environment enabling discussion and transmission of knowledge and techniques.

#### Risultati attesi:

Almost contact metric manifolds, their special metrics and the Blair conjecture will be treated at BA; international collaborators for this project are A. Andrada (Córdoba) and V. Martín-Molina (Sevilla).

3- $(\alpha, \delta)$ -Sasaki manifolds will be studied at BA, with help from international collaborators: I. Agricola (Marburg) and L. Stecker (Hamburg).

The study of complex symplectic structures and Spin(7) structures will be undertaken at CO, based on existing international collaborations with M. Freibert (Kiel), A. Latorre (Madrid), L. Martín-Merchán (UNITO), and V. Muñoz (Málaga).

Einstein solvmanifolds and nilpotent Lie groups will be studied at MI and CO; the existing results of the MI group are already part of an international collaboration with V. del Barco (Campinas)

The theory of algebraic twistor spaces will be studied at BA, AN and MI; it is already object of an international collaboration with S. Salamon (King's College), E. Ballico (UNITN), M.C. Brambilla (UNIVPM).

Configurations of flags will be studied at BA and AN with the contribution of an international collaboration with E. Falbel and A. Guilloux (Sorbonne Université).

Holomorphic foliations and characteristic classes are object of study of members of BA with the help of the following international collaborations: M. Jardim (Uni. Campinas), C. Araujo (IMPA), T.Suwa (Hokkaido University)

The study of transcendental hypercomplex functions will be developed at BA, MI and AN in collaboration also with G. Gentili (UNIFI) and J. Prezelj (University of Primorska).

The study of function spaces will be carried out by researchers at AN and BA with collaborations with N. Arcozzi (UNIBO), A. Monguzzi (UNIBG), D. Seco (U. Carlos III de Madrid)

Fueter type theorems will be studied at BA and AN, with collaborations with H. De Bie (UGhent) and S. Biagi (POLIMI).

Several hypercomplex variables and quaternionic manifolds will be the object of study of all units with several external collaborations among which we mention A. Gori (UNIMI) and J. Prezelj.

The Levi core of CR manifolds will be study at MI with the collaboration of G.M. Dall'Ara (INdAM, SNS)

Partenariato: nessuno

Evidenze pubbliche:

<https://reclutamento.ict.uniba.it/assegni-di-ricerca/concorsi/2023-pr-01.100>

<https://reclutamento.ict.uniba.it/assegni-di-ricerca/concorsi/2024-pr-01.118>

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Contributo MUR: 64.243 €

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