



Dipartimento
Meccanica
Matematica
Management

MUR
Dipartimento
di Eccellenza
2018-2022
2023-2027

Research project

Nome and Surname: Erasmo Caponio, Pietro d'Avenia, Alessio Pomponio

Title: Variational Methods and Nonlinear Analysis

Description: Our research group at Politecnico di Bari combines complementary expertise in variational methods, geometric analysis, and nonlinear PDEs, to address fundamental mathematical challenges with far-reaching applications.

We investigate the existence, multiplicity, and qualitative properties of solutions to nonlinear differential equations.

Our work spans from abstract functional analysis to concrete applications in physics and engineering.

Research interests include, but are not limited to:

Nonlinear elliptic equations – developing mathematical tools with applications to nonlinear Schrödinger or Klein Gordon equations, optical theory, quantum mechanics.

Fractional and nonlocal differential equations - modelling complex phenomena with different types of interactions.

Geometric PDEs and mathematical physics - including junction conditions in general relativity, modified gravity, and electromagnetic theories, mean curvature problems.

Critical point theory and minimax methods - advancing fundamental techniques for finding solutions to nonlinear problems as critical points of suitable functionals.

Qualitative analysis of solutions - understanding properties like symmetry, stability, concentration phenomena, blow-up behaviour, regularity, decay.

Candidates should provide detailed CV

Contacts

Erasmo Caponio: erasmo.caponio@poliba.it

Pietro d'Avenia: pietro.davenia@poliba.it

Alessio Pomponio: alessio.pomponio@poliba.it