# MoSSGIn - Moduli Spaces of Sheaves: Geometry and Invariants

In modern algebraic geometry, a key approach to studying algebraic varieties — and more broadly, orbifolds (quotients of varieties by finite groups) — is through their categories of sheaves. Sheaves are algebraic objects that encode crucial information about varieties and orbifolds, including their geometric subvarieties and solutions to equations defined on them. Packaging sheaves into moduli spaces allows a systematic way to study the structure and properties of the underlying orbifolds. This proposal focuses on moduli spaces of sheaves on three-dimensional complex orbifolds, which are of particular significance in theoretical physics, notably for capturing instanton dynamics in Calabi-Yau compactifications in type II string theory. Our main objective is to study the local geometry of these moduli spaces under pair-stability conditions and explicitly compute the associated Pandharipande-Thomas (PT) invariants, which are crucial for both enumerative geometry and string theory. The research is structured into three scientific work packages (WP): WP1 will introduce and study poset Quot schemes—a generalization of classical Quot schemes—which parametrize flags of quotient sheaves, nested according to finite posets. This tool will provide the foundation for further computations. WP2 will focuse on moduli spaces of stable pairs over local stacky curves, which are defined by rank 2 vector bundles over smooth projective curves with marked points and prescribed ramification indices. We will develop new methods to reduce the complexity of PT invariants computation to performing intersection theory on poset Quot schemes, making the problem more tractable and leading to explicit closed formulas for these invariants. WP3 will aim to prove the Gromov-Witten/PT correspondence for local stacky curves, a conjecture that has driven much of the research in enumerative geometry over the past two decades. Proving this correspondence would represent a major breakthrough in the field.

**UNIPD Supervisor:** Paolo Rossi
**MSCA Fellow:** Sergej Monavari
**Department:** Mathematics "Tullio Levi-Civita"
**Coordinator:** Università degli Studi di Padova (Italy)
**Total EU Contribution:** Euro 193.643,28
**Call ID:** HORIZON-MSCA-2024-PF-01
**Project Duration in months:** 24
**Find out more:** https://cordis.europa.eu/projects/en