Publicacions més rellevants de la línia de recerca:

Espais de moduli de fibrats vectorials i esquemes de Hilbert

Referència: Kleppe, J. and Miró-Roig, R.M. *Dimension of families of determinantal schemes*, *Trans. A.M.S.*, **357** (2005), 2871–2907.

Abstract:A scheme $X \subset \mathbb{P}^{n+c}$ of codimension c is called *standard determinantal* if its homogeneous saturated ideal can be generated by the maximal minors of a homogeneous $t \times (t+c-1)$ matrix and X is said to be *good determinantal* if it is standard determinantal and a generic complete intersection. Given integers $a_0, a_1, ..., a_{t+c-2}$ and $b_1, ..., b_t$ we denote by $W(\underline{b}; \underline{a}) \subset \mathrm{Hilb}^p(\mathbb{P}^{n+c})$ (resp. $W_s(\underline{b}; \underline{a})$) the locus of good (resp. standard) determinantal schemes $X \subset \mathbb{P}^{n+c}$ of codimension c defined by the maximal minors of a $t \times (t+c-1)$ matrix $(f_{ij})^{i=1,...,t}_{j=0,...,t+c-2}$ where $f_{ij} \in k[x_0, x_1, ..., x_{n+c}]$ is a homogeneous polynomial of degree $a_j - b_i$.

In this paper we address the following three fundamental problems : To determine (1) the dimension of $W(\underline{b}; \underline{a})$ (resp. $W_s(\underline{b}; \underline{a})$) in terms of a_j and b_i, (2) whether the closure of $W(\underline{b}; \underline{a})$ is an irreducible component of $\mathrm{Hilb}^p(\mathbb{P}^{n+c})$, and (3) when $\mathrm{Hilb}^p(\mathbb{P}^{n+c})$ is generically smooth along $W(\underline{b}; \underline{a})$. Concerning question (1) we give an upper bound for the dimension of $W(\underline{b}; \underline{a})$ (resp. $W_s(\underline{b}; \underline{a})$) which works for all integers $a_0, a_1, ..., a_{t+c-2}$ and $b_1, ..., b_t$, and we conjecture that this bound is sharp. The conjecture is proved for $2 \leq c \leq 5$, and for $c \geq 6$ under some restriction on $a_0, a_1, ..., a_{t+c-2}$ and $b_1, ..., b_t$. For questions (2) and (3) we have an affirmative answer for $2 \leq c \leq 4$ and $n \geq 2$, and for $c \geq 5$ under certain numerical assumptions.

Referència: Costa, L. and Miró-Roig R.M. A counterexample to Douglas-Reinbacher-Yau's conjecture. *Journal of Geometry and Physics*, **57** (2007), 2229–2233.

Abstract: In "Branes, Bundles and Attractors: Bogomolov and Beyond", by Douglas, Reinbacher and Yau, the authors state the following conjecture: Consider a simply connected surface X with ample or trivial canonical line bundle. Then, the Chern classes of any stable vector bundle with rank $r \geq 2$ satisfy $2rc_2 - (r-1)c_1^2 - \frac{r^2}{12}c_2(X) \geq 0$. The goal of this short note is to provide two sources of counterexamples to this strong version of Bogomolov inequality.

Referència: Miró-Roig, R.M. and Soares, H. Cohomological characterization of Steiner bundles.

Forum Math., **21** (2009), 871–891.

Abstract: A vector bundle E on a smooth irreducible algebraic variety X is called a Steiner bundle of type (F_0, F_1) if it is defined by an exact sequence of the form

$$0 \to F_0^s \xrightarrow{\varphi} F_1^t, \to E \to 0,$$

where $s, t \geq 1$ and (F_0, F_1) is a strongly exceptional pair of vector bundles on X such that $F_0^\vee \otimes F_1$ is generated by global sections.

Let X be a smooth irreducible projective variety of dimension n with an n-block collection $\mathcal{B} = (\mathcal{E}_0, \mathcal{E}_1, \dots, \mathcal{E}_n)$, $\mathcal{E}_i = (E_1^i, \dots, E_{\alpha_i}^i)$, of locally free sheaves on X which generate $D^b(\mathcal{O}_X-mod)$. We give a cohomological characterisation of Steiner bundles of type $(E_{i_0}^a, E_{j_0}^b)$ on X, where $0 \leq a < b \leq n$ and $1 \leq i_0 \leq \alpha_a$, $1 \leq j_0 \leq \alpha_b$.