TENSOR DAYS

1. Iman Bahmani Jafarloo, Special apolar subset: the case of star configurations

We consider a generic degree d form F in $n+1$ variables. In particular, we investigate the existence of star configurations apolar to F, that is the existence of apolar sets of points obtained by the n-wise intersection of r general hyperplanes of $\mathbb{P}^n$: We present a complete answer for all values of (d, r, n) except for $(d, d+1, 2)$ when we present an algorithmic approach.

2. Claudia De Lazzari, Dimension of Tensor Network Varieties

A Tensor Network variety is an algebraic variety of tensors associated to a graph and two sets of positive integer weights. In quantum many-body physics Tensor Network varieties are used as a variational ansatz class to describe strongly correlated quantum systems whose entanglement structure is encoded by the underlying graph. I will present an upper bound on the dimension of the Tensor Network variety. I will discuss a refined upper bound for the case of Matrix Product States and highlight some examples where the bound is not sharp. This is based on a joint work with Alessandra Bernardi and Fulvio Gesmundo.

3. Francesco Galuppi, Defectivity of Segre-Veronese varieties

Secant defectivity of projective varieties is classically approached via dimensions of linear systems with multiple base points in general position. The latter can be studied via degenerations. We exploit a technique that allows some of the base points to collapse together. We deduce a general result which we apply to prove a conjecture by Abo and Brambilla: for $c \geq 3$ and $d \geq 3$, the Segre-Veronese embedding of $\mathbb{P}^m \times \mathbb{P}^n$ in bidegree (c, d) is non-defective.

4. Maciej Gałązka, On the rank of monomials on $\mathbb{P}^1 \times \mathbb{P}^1$.

Let $F = x^k y^l u^m v^n$, where $k \geq l$, $m \geq n$ be a bigraded monomial on $\mathbb{P}^1 \times \mathbb{P}^1$. I will present upper and lower bounds on the bihomogeneous rank of F.

Date: October 13, 2021.

5. Joachim Jelisiejew, Minimal border rank tensors, smoothability and ω

In the talk I will recall the old and new connections between smoothability and minimal border rank tensors and explain how these results suggest that the current bound on the matrix multiplication exponent ω is suboptimal, but also what are the main obstacles to lower it. The talk is mostly expository but relies to a joint work with Mateusz Michałek and also with Arpan Pal and JM Landsberg.

6. Tomasz Mańdziuk, Limits of saturated ideals of points

The notion of the border rank with respect to an embedded smooth projective toric variety is related to the distinguished irreducible component of a certain multigraded Hilbert scheme. In the talk I present some conditions for a point to lie in that component.

7. Filip Rupniewski, Rank additivity property for 2×2 matrix multiplication tensors

We address the problem of the additivity of the tensor rank. That is, for two independent tensors we study if the rank of their direct sum is equal to the sum of their individual ranks. A positive answer to this problem was previously known as Strassen's conjecture until counterexamples were proposed by Shitov. The latter are not very explicit, and they are only known to exist asymptotically for very large tensor spaces.

I will give a few conditions for the additivity of three-way tensors. As a consequence we will obtain that there is no faster way to multiply two pairs of 2×2 matrices. The optimal one is to multiply the first pair and then the second one, independently.

8. Pierpaola Santarsiero, Identifiability of rank-3 tensors

Rank-2 and rank-3 tensors are almost identifiable with only few exceptions. In this talk we classify them all.

9. Reynaldo Staffolani, Schur apolarity

Inspired by the classic apolarity theory of symmetric tensor, we develop an apolarity theory for any $SL(n)$-rational homogeneous variety. This is related to the tensor decomposition of specific structured tensors whose tensors of structured rank 1 are parametrized by points of Flag varieties. Eventually we will see some algorithms discriminating tensors of small rank.