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PhD at the University of Genova (Italy) in April 2011. Advisor: Aldo Conca

Postdoc at the University of Genova up to January 2013

Postdoctoral Fellowship at MSRI for the Fall semester 2012

1. Lyubeznik's conjecture on cohomological dimensions

I am going to speak of it at the Postdoc seminar at MSRI on Oct 12 or Oct 19

2. Relations among minors

Collaborators: Winfried Bruns and Aldo Conca. Winfried is going to speak of it at the Commutative Algebra Colloquium of Nov 7, at MSRI

3. Stanley's conjecture on matroid h-vectors

Collaborators: Alexandru Constantinescu and Thomas Kahle. Thomas or I will probably speak of it during the workshop "Combinatorial Commutative Algebra and Applications", at MSRI from Dec 3 to Dec 7. A related problem will be also discussed by Alex during the RTG workshop at UC Berkeley, from Sep 26 to Sep 29

1. Let Y be a subvariety of an algebraic variety X. How many equations do define $Y \subset X$? How can we bound such a number from below? So far the known methods are essentially cohomological. Precisely they arose by a study of the vanishing of the sheaf cohomology of the complement $X \setminus Y$. The two most successful considered topologies have been (up to now) the Zariski one and the étale one. The conjecture of Lyubeznik essentially says that the étale cohomology gives better bounds.

2. Take a $(m \times n)$-matrix of indeterminates over some field ($m \leq n$). Which algebraic relations do occur between its t-minors, for some fixed $t \leq m$? If $t = m$ the only minimal relations are the Plucker's ones, but as soon as $t < m$ cubic minimal relations appear for "shape reasons". We described all such relations in a representation theoretic fashion, and we conjecture that there are no more minimal ones.

3. If you consider the independent sets of a matroid as faces, you get a simplicial complex. So you can take the associated face ring (that is the polynomial ring mod out by the ideal generated by the circuits of the matroid), and wonder about its algebraic properties. In particular we can consider its h-vector. Stanley conjectured that it is actually a pure O-sequence.