ODTU-Bilkent Algebraic Geometry

“Counting 2-planes in cubic 4-folds in P^5”

By

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Abstract: (work in progress joint with I. Itenberg and J.Ch. Ottem)
We use the global Torelli theorem for cubic 4-folds (C. Voisin) to establish the upper bound of 405 2-planes in a smooth cubic 4-fold. The only champion is the Fermat cubic. We show also that the next two values taken by the number of 2-planes are 357 (the champion for the number of *real* 2-planes) and 351, each realized by a single cubic. To establish the bound(s), we embed the appropriately modified lattice of algebraic cycles to a Niemeier lattice and estimate the number of square 4 vectors in the image. The existence is established my means of the surjectivity of the period map. According to Schütt and Hulek, the second best cubic with 357 planes can be realized as a hyperplane section of the Fermat cubic in P^6.
If time permits, I will also explain that essentially the same arithmetical reduction answers another geometric question, viz. the maximal number of conics in a sextic surface in P^4. (It would be nice to find a geometric relation between the two.) The two best numbers of conics are 285 (a single surface) and 261 (three Galois conjugate surfaces; one of them maximizes the number of real conics in a real sextic surface).

Date: 9 October 2020, Friday
Time: 15:40 +
Place: Zoom

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