Hacettepe University
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GENERAL SEMINAR

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15:00

Zoom Link
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Error correction from toric varieties: toric codes and their locality

All the signals sent through noisy communication channels (telephone, radio waves, Internet optical fibre...) are likely to be degraded during the transmission. To make sure that the messages sent are correctly received, we use a tool that is omnipresent in today's telecommunications, which is at the frontier between mathematics and computer science: error-correcting codes. In this talk, we will focus on linear error-correcting codes. Mathematically speaking, these are just vector spaces over a finite field. Their structure ensures that, even if errors occur during transmission, the receiver of the message can detect and even correct them.

In this talk, we will interest in toric codes, which are a family of linear error-correcting codes that comes from algebraic geometry and combinatorics. They consist of vector spaces spanned by the evaluation of some monomials at the elements of a finite field. When evaluating univariate polynomials of bounded degree, we get the well-known Reed-Solomon codes, which have optimal correction capability and efficient decoding algorithms. By allowing multivariate polynomials, efficiency parameters may deteriorate, and the decoding is much less obvious. However, for a given base field, we get longer codes and, above all, we gain locality, i.e. the possibility to correct a symbol by accessing a few other symbols of a codeword. After giving a short presentation about linear error-correcting codes and introducing toric codes, we will present how toric codes are