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Program

Tutorial

Lattices have been an indispensable tool in information theory since Shannon's landmark 1949 paper on the capacity of the AWGN channel. Lattices are mathematical objects; regular arrangements of points in space. In the last twenty-five years, lattices have moved from being a useful theoretical auxiliary to a central building block in high-gain and capacity-achieving codes and optimal quantisers in a wide range of scenarios. This tutorial will teach foundational concepts in lattice theory. Theoretical ideas will be illustrated with applications in signal processing and communications.

Theory: lattices and the geometry of numbers, packings and coverings, root lattices, their duals and other important lattices.

Algorithms: lattice reduction, Euclidean algorithms, sphere decoding.

Applications: channel codes, quantisers, frequency estimation, blind detection, timing recovery.

(This tutorial is based on a course that was taught at the Institute of Telecommunications in the Vienna University of Technology over their Summer Semester, 2012, while the presenter was on sabbatical there.)

Plenary 1

Poster 1

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Poster 2

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Thuy Tran (University of South Australia, Australia); William G Cowley (University of South Australia, Australia); André Pollok (University of South Australia, Australia)
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Poster 3

Statistically Robust Cognitive Radio Beamforming
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