Speaker

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School

Random walks: applications and interactions

Location and date

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Title

Brick wall excursions

Abstract

Let us consider an m-steps random walk in $\mathbb{R}^d$ that starts at the origin and consists of m independent steps of length 1, where the direction of each step is chosen uniformly at random. Take the distance to the origin (after m such steps) and compute a sequence of its even moments. As was shown in 2015 by Borwein, Straub, and Vignat, in dimensions $d = 2$ and $d = 4$ this sequence is an integer. While for $d = 2$, there was an interpretation in terms of words, for $d = 4$ no combinatorial interpretation was known.

The aim of this talk is to provide such an interpretation, both for $d = 2$ and $d = 4$, in terms of n-step lattice paths in dimension $(m-1)$. Our key tool is a bijection between Dyck paths with a prescribed number of peaks and words of a certain type. In addition, this bijection allows us to derive closed formulas for the number of lattice paths provided with certain statistics.

This talk is based on the ongoing work with Sergey Kirgizov and Michael Wallner.