# Geometry and Analysis Parallel Session: Abstracts

# IMU Annual Meeting, 2022

**Gautam Aishwarya: Diversity and dimension of probability measures in metric spaces**

In this talk, we will discuss a one-parameter family of metric-sensitive notions of entropy for probability measures on a metric space. Originally introduced by Leinster and Cobbold in the context of quantification of biodiversity, they generalise Renyi entropies and sometimes enable a smoother passage from information theory to geometry. Foundational results, including those regarding notions of dimension and maximum entropy arising from these entropic measures, will be presented. If time permits, we will also see an application of these tools to discrete geometry.

**Ohad Feldheim: A phase transition in zero count probability for Stationary Gaussian Processes**

Let $f(t)$ be a centered real stationary Gaussian processes (SGP). Denote by $N(T)/T$ the average number of zeroes of such a process in $[0,T]$. The expectation of this random variable, $\mu := E(N(1))$ is a well-studied quantity computable by the celebrated Kac-Rice formula. Here we study the probability of a significant deviation of this random variable, namely the events $E_\eta^+ = \{N(T) \geq \eta T\}$ (overcrowding of zeroes) and $E_\eta^- = \{N(T) \leq \eta T\}$ (undercrowding of zeros). We show that this behavior depends on the spectrum of the process: if the process is compactly supported then we can recover a critical $\eta_0$, such that $P(E_\eta^+) \geq \exp(-C_\eta T)$ for all $\eta < \eta_0$ and $P(E_\eta^+) \leq \exp(-C_\eta T^2)$ for all $\eta > \eta_0$. A similar behavior with respect to undercrowding is demonstrated by processes with a spectral gap.

Joint work with Naomi Feldheim & Lakshmi Priya.

**Boaz Slomka: Isobarycentric inequalities**

Consider the following problem: Given a finite Borel measure on $\mathbb{R}^n$, which sets have maximal measure among all subsets with prescribed barycenter? We shall describe the solution to this problem under mild assumptions on the measure. As an application, we partially answer a question of Henk and Pollehn, which is equivalent to a special case of the Log-Minkowski inequality.

Joint work with Shoni Gilboa and Pazit Haim-Kislev

**Gershon Wolansly: From optimal transport to optimal networks**

The theory of optimal transport was born towards the end of the 18th century, its founding father being Gaspard Monge. In the 40's of last century L. Kantorovich introduced a relaxation of the monge problem to linear programming. Today Optimal transport is a very active field. It has connections with PDEs, kinetic theory, fluid dynamics, geometric inequalities, probability and many other mathematical fields as well as in computer science and economics. On the other hand, optimal network's theory was born in the 60's of last century by Gilbert as a generalization of the Steiner minimal tree problem. In contrast to optimal transport it is inherently non-convex of high complexity. In this talk I'll review some limit theorems of optimal transport and demonstrate its connection with the Gilbert's problem.