Barcelona Analysis Seminar **2022–2023**

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Online streaming (Google Meet). Click here to join.

Energy Optimization for m-particle Interactions on the Sphere

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A great deal of study has been devoted to energies involving two-particle interactions, of the form

$$E_K(\{z_1, ..., z_N\}) = \sum_{i \neq j} K(z_i, z_j) \quad \text{or} \quad I_K(\mu) = \int \int K(x, y) d\mu(x) d\mu(y).$$

Such systems have applications in discrete geometry, signal processing, and modeling various natural phenomena (e.g., electrostatic or gravitational energy), among other uses. Energies involving many-particle interactions (i.e. with kernels of $m > 2$ inputs) are far less understood, though such kernels have appeared recently to improve upon previous results in discrete geometry (such as bounds for optimal codes and kissing numbers) which made use of two-particle interactions. In this talk, we will discuss recent work in developing general theory for energy optimization on the sphere for multivariate potentials, some connections and applications, and a variety of open problems. In particular, we will discuss geometric kernels, such powers of the volume of a simplex generated by k points (a multivariate generalization of Riesz kernels). The work in this talk covers work done in collaboration with Dmitriy Bilyk, Damir Ferizovic, Alexey Glazyrin, Josiah Park, and Oleksandr Vlasiuk.