Euclidean Random Assignment Problems, old and new

Friday, 26 November 2021 14:30 (45 minutes)

An Euclidean Random Assignment Problem (ERAP in short) is as follows:

- there are two *n*-sets $\mathcal{B} = (B_i)_{i=1}^n$ (blue points) and $\mathcal{R} = (R_i)_{I=1}^n$ (red points) of i.i.d. random variables valued on a metric space (Ω, D) according to a prob. measure ν (disorder);
- for a permutation (or assignment) $\pi : \mathcal{B} \to \mathcal{R}$, there is an energy $\mathcal{H}(\pi) = \sum_{i=1}^{n} D(b_i, r_{\pi(i)})^p$, where $p \in \mathbb{R}$;

what can one say about the random variable $H_{\text{opt}} = \min_{\pi} \mathcal{H}(\pi)$, depending on the choice of (Ω, D) , on the disorder ν , and p?

ERAPs were pioneered in statistical physics by Mézard and Parisi in the '80s as toy models for finite-dimensional spin glasses; and any ERAP is Monge-Kantorovich optimal transport problem for the empirical measures of blue and red points, in which $W_p^p(\rho_B, \rho_R) = \frac{1}{n}H_{opt}$, where W_p is p-Wasserstein distance.

Despite these connections, ERAPs have been exceedingly difficult to understand, and surprisingly few results have been proven to date.

In this talk I will review some selected ideas and results on ERAPs focusing on low dimensions of the underlying space Ω . If time allows, I will discuss current work in progress and touch upon a few research perspectives.

Presenter: Prof. D'ACHILLE, Matteo (Université Paris-Est Créteil)

Session Classification: main contributions