INTERNSHIP & PhD PROPOSAL

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CROWDS AS ACTIVE MATTER

Mesmerizing impressions of virtually all patterns observed in bird flocks, fish schools, insect swarms, and even human crowds are effectively rendered in silico by simple algorithms. Going beyond visual impressions and predicting the collective dynamics of groups of living creatures in response to physical, social, or biological imperatives, however, remains a formidable challenge.

Combining experiments on massive crowds composed of thousands of marathon runners, and active-matter theory, we established that polarised crowds can be effectively describe as active fluids [1]. The collective motion of runner crowds can be quantitatively understood from the same conservation laws and symmetry considerations used to describe the flow of coffee in a cup, or wine in a glass.

We will perform a novel series of experiments on ultra dense crowds, Fig. 1, and will attempt to describe them as active solids. To do so, we will characterize the large-scales deformations of extreme crowds using quantitative image analysis, and analyse their spontaneous fluctuations using concepts and tools from active-matter physics.



Fig. 1. Foule dense rassemblée pour l'ouverture d'une feria espagnole. Images N. Bain et D. Bartolo, 2019.

[1] Nicolas Bain and Denis Bartolo, Science (2019) [PDF]