

Emergence of collective oscillations in massive crowds

Denis Bartolo

Building upon a combination of quantitative observations and theoretical insights, I will illustrate and elucidate the emergence of collective oscillations within densely packed pedestrian crowds.

Our understanding of massive crowds has long been limited by the lack of quantitative measurements. I will demonstrate that the San Fermin Festival in the city of Pamplona, Spain, provides an opportunity to circumvent this limitation. For decades, every year, at the same day and exact hour, thousands of individuals gather in the same square to await the festival's opening within a secure environment, where crowd density can, nevertheless, exceed five people per square meter.

Our data reveal that beyond a critical density, crowds of pedestrians waiting for the festival's opening undergo a dynamic transition from a quiescent to a dynamic state, in which the entire crowd oscillates with a period of approximately fifteen seconds. This emergent dynamics echoes the correlated motion of groups of hundreds of individuals along chiral trajectories. I will then explain how our observations constrain the description of dense crowds as active matter and show that dense crowds are odd frictional solids.