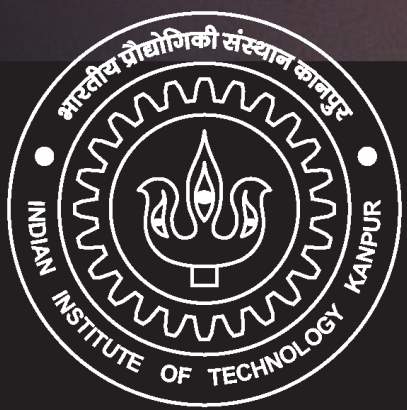
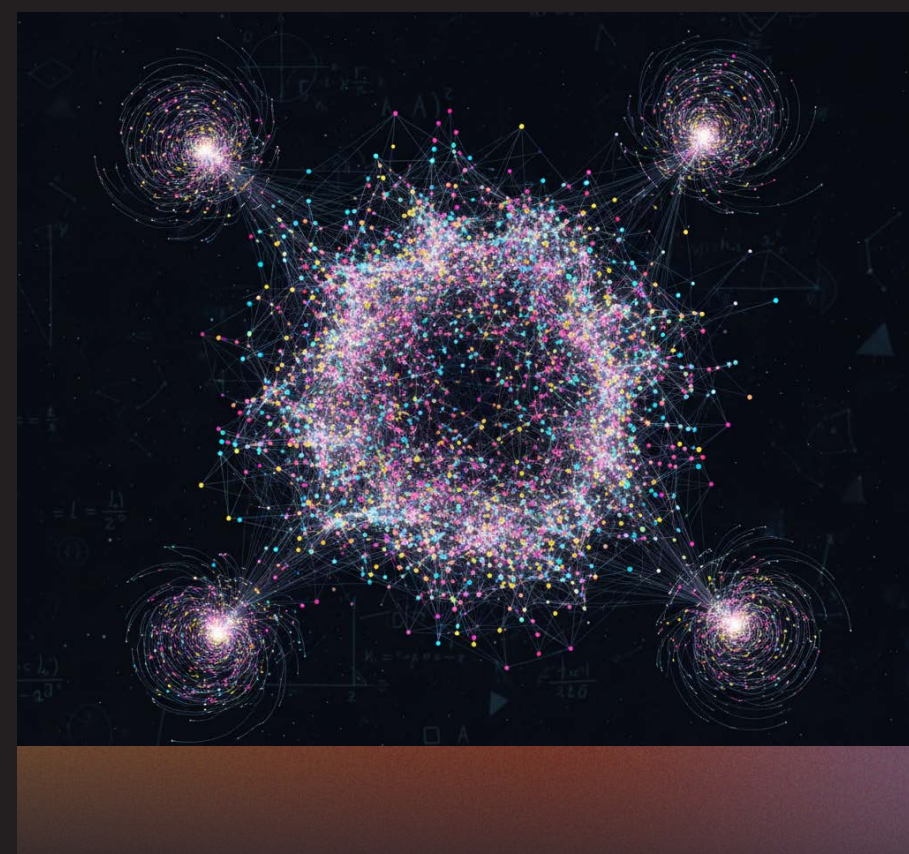
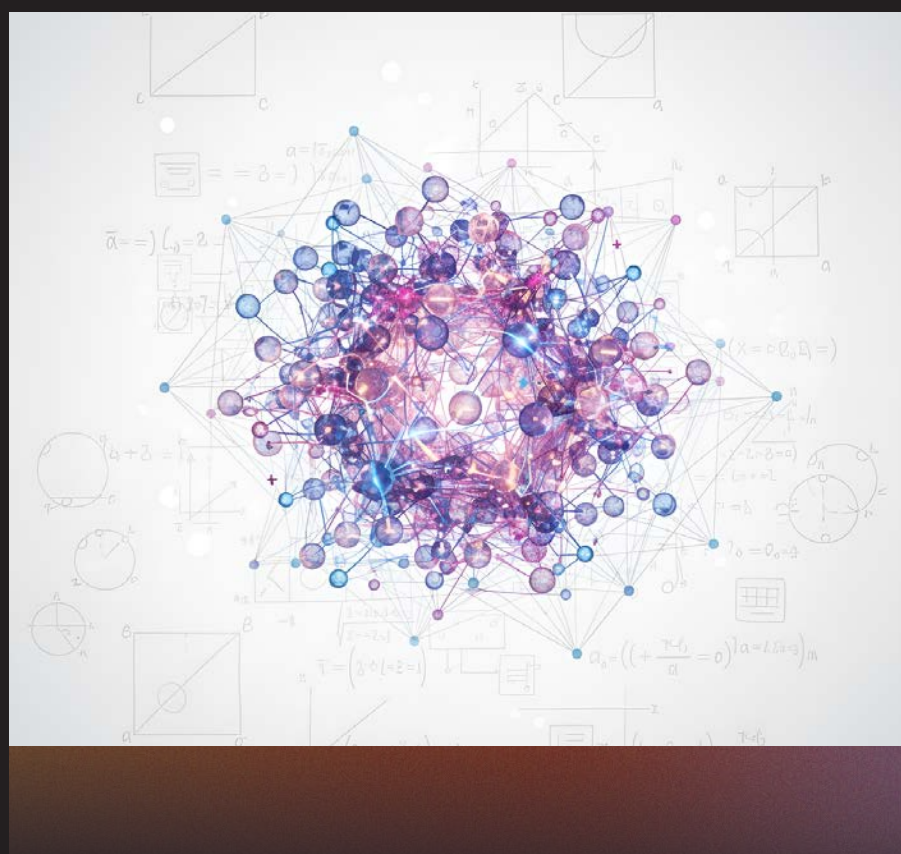
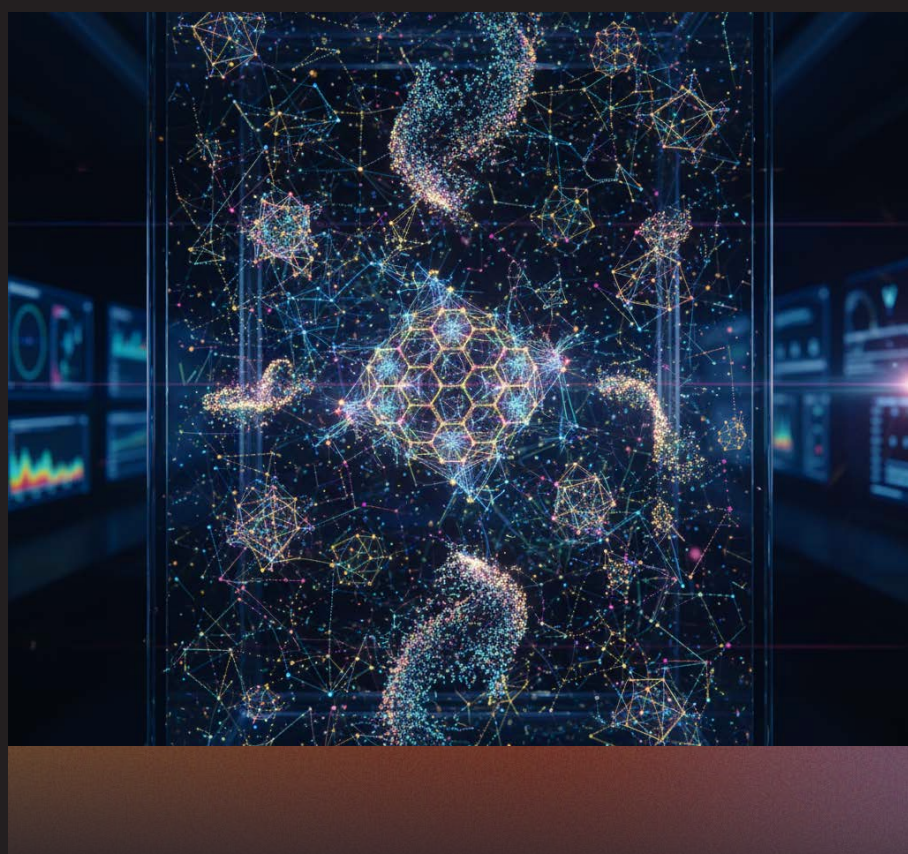




DEPARTMENT OF PHYSICS INDIAN INSTITUTE OF TECHNOLOGY KANPUR

DISTINGUISHED PHYSICS COLLOQUIUM SELF-ORGANIZATION IN A PERSISTENT ACTIVE LIQUID



ABSTRACT

We have used Langevin dynamics simulations to study the effects of activity in a two-dimensional athermal glass-forming system of Lennard-Jones particles. We consider the limit of infinite persistence time in which the self-propulsion forces on the particles have the same magnitude but different directions that do not change with time. This system exhibits a liquid state for large values of the self-propulsion force and a force-balanced jammed state if the self-propulsion force is smaller than a threshold value. The liquid state is found to exhibit long-range correlations. A length scale extracted from spatial correlations of the velocity field increases with system size as a power law with exponent close to one. Spatial correlations of the self-propulsion forces also exhibit a similar length scale, indicating that the particles self-organize to form a steady state in which particles with similar directions of self-propulsion forces come close to one another and move together. This state is “critical” in the sense that it exhibits a correlation length that diverges in the limit of infinite system size. The velocity pattern in the steady state exhibit an intriguing asymmetry. The development of correlations in time, starting from an initial state with random velocities and forces, is analogous to that in domain growth and coarsening in spin systems after a quench from the disordered to the ordered state. However, quantitative features of this process appear to be different from those in domain growth in spin systems with the same symmetry.

SPEAKER



PROF. CHANDAN DASGUPTA
IISC AND ICTS, BANGALORE

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