Tata Institute of Fundamental Research
Survey No. 36/P, Gopanpally Village, Serilingampally, Ranga Reddy Dist., Hyderabad – 500 046

Seminar

Information Processing Distributed Cellular Systems

Madan Rao

NCBS, Bangalore

Recent advances in molecular and cell biology are exhorting us to seek a new language to describe biological reality. One such task is to address how physical and chemical processes in cells are translated into information (Paul Nurse, 20020) and to adequately describe the complex flows of information in living systems. To this end, I will discuss our attempts at building a conceptual framework for the processing of noisy molecular information in cells and tissues treated as Distributed Computing Systems. I will illustrate this with two examples, both dealing with strategies of optimal local control to achieve global tasks. First, I will talk about information decoding in tissues, and what are the optimal cellular strategies that ensure accurate inference of spatial position of cells during Morphogenesis. Second, I will discuss information encoding in cells in the context of synthesis of a complex molecular (Glycan) code, and address what are the optimal cellular strategies and operational logic that ensure this. We will see that this has major implications for the non-equilibrium self-assembly of Golgi compartments in cells. I will end with a discussion of the geometry of these high dimensional inference landscapes with implications for dimensional reduction, redundancy and robustness in generic biological networks.

Thursday, Jul 18th 2024

16:00 Hrs (Tea / Coffee 15:45 Hrs)

Seminar Hall, TIFR-H