# ME Seminar

## Observing and inferring the characteristics of a collective

**Dr. Danny Raj M, INSPIRE Faculty, Dept. of Chemical Engg., IISc**

### ABSTRACT

Many experimental studies in the field of complex systems and complex flows involve the use of computer vision to investigate the underlying dynamics of the agents. Examples include the study of the motion of an intruder and the grains in granular flows, hydrodynamics of droplet interaction in microchannels, dynamics of traffic flows, etc. This raises a fundamental question of whether the 'true' properties of individuals can be inferred from the measurements made while they are part of a group. Take for example, large crowds in pilgrimage centres like in Tirupati or Mecca. With limited information of the dynamic position and velocity of individuals, can one quickly spot those who are unable to keep up with the crowd and prevent a stampede? In dense crowds, individuals are generally forced in the direction of their neighbours, even when they are unwilling or unable to move in that direction. I look at a simple idealisation of this problem—oppositely moving discs—and study how the collective state of the whole can affect an observer's ability to infer the underlying behaviour of agents.

### ABOUT THE SPEAKER

After completing my bachelors (B.Tech) in Chemical engineering from AC Technology, Anna University, Chennai (2007-2011), I went to IIT Madras where I acquired a dual degree MS and PhD from the department of Chemical engineering (2011-2017). After my PhD, I stayed there for a year as a postdoc, working on industry-collaborative projects (with GE) and developed hybrid process models for Chemical processes in a metal-processing industry. I am currently (April 2018 - present) hosted in the department of chemical engineering as an INSPIRE faculty. I work in the area of complex systems engineering where I study systems (collective) that are made up of many interacting entities or what I call 'agents'. Examples range from an ensemble of droplets in a micro-channel to a school of fish; and pedestrian movement to the spread of an epidemic.

**December 18, 2020, 4:00 pm, Microsoft Teams**