AI-based system to avoid stampede

Prelims: *Current events of National and International Importance | Technology*

Why in News?

Ahmedabad police to use AI-based system during Rath Yatra to avoid stampede.

- It is still in the development stage, and has yet to be named.
- It will ***calculate the density of people*** in a particular area of spanning certain square metres and determine, based on yet-to-be-decided parameters, if a stampede is imminent or not.
- Based on the results of this system, alerts will be sent out to officers to disperse crowds to avoid a stampede.
- The system will use ***thermal imaging and pixel-counting*** to count the occupied and unoccupied areas of a particular space.
- **Main functions - Real-time monitoring** - AI-powered CCTV cameras will continuously analyse video streams in real time.
- **Crowd density estimation -** Algorithms will calculate the number of people in a given area.
- **Thresholding -** Pre-defined threshold values for crowd density will be established. When the detected density crosses these thresholds, it will trigger an alert.
- **Anomaly detection –** It can identify unusual crowd behaviour, such as sudden surges in movement, unusual clustering patterns, fallen individuals, and aggressive movement.
- **Alerting authorities -** Upon detecting a potential stampede risk, the system sends immediate alerts to security personnel or control rooms via LCD displays, GSM messages or other communication channels.
- **Predictive analytics-** Advanced systems will use time-series prediction models to forecast crowd behavior and dynamics based on historical and real-time data, helping anticipate potential bottlenecks or overcrowding.
- **Reinforcement learning -** Algorithms can learn from past incidents to suggest optimal crowd flow routes and alternative evacuation paths during emergencies.
- **Challenges**
    - Limited accuracy
    - Computational complexity and cost
    - Data privacy and ethical concerns
    - Integration with existing infrastructure
    - Human intervention remains crucial
    - Defining thresholds

Reference

[The Indian Express | AI-based system to avoid stampede]