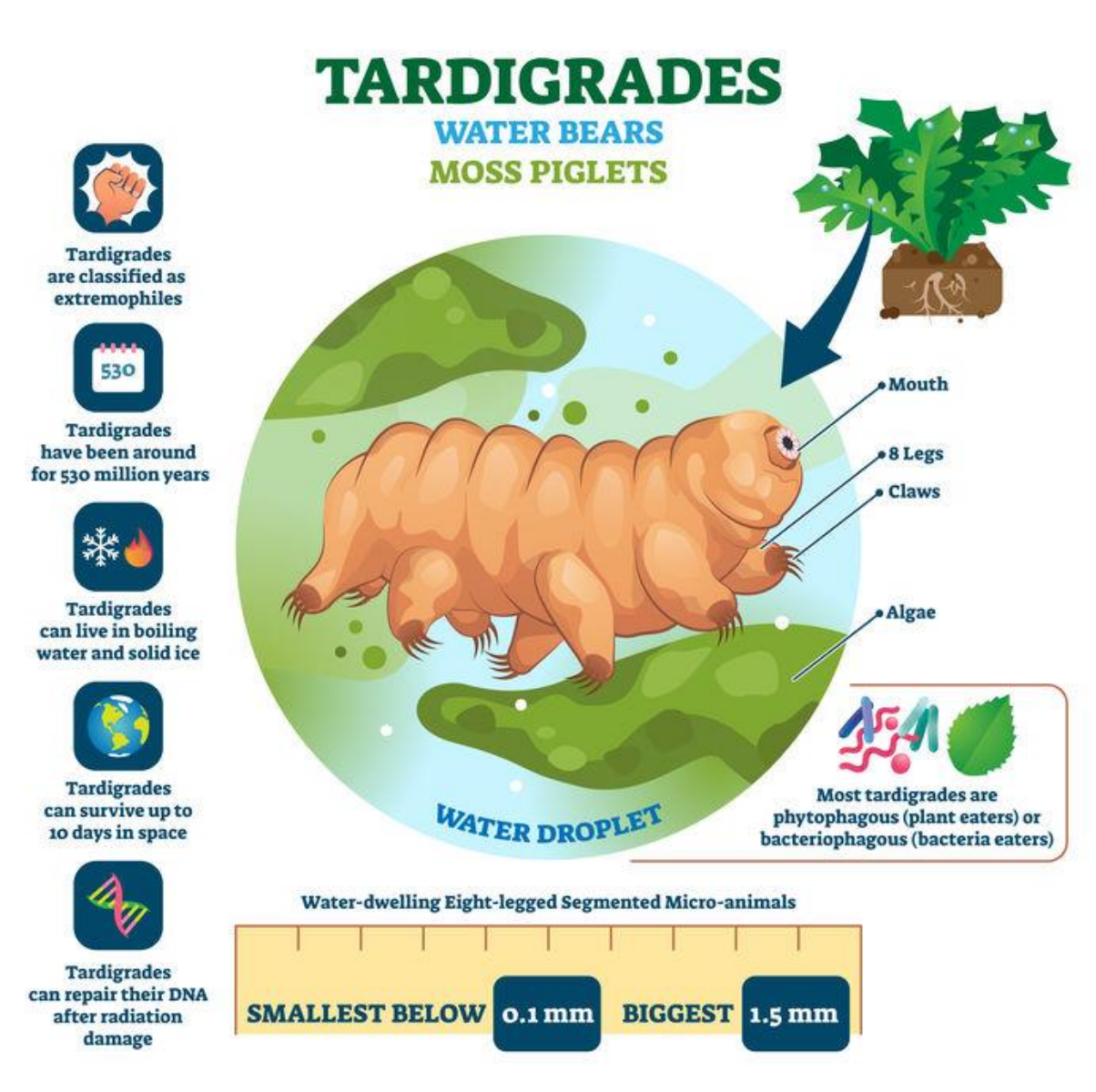
Daily News Juice — 12th June, 2025

1. Why Scientists Study Tardigrades in Space

Tardigrades in Space Missions

Indian astronaut Shubhanshu Shukla will study tardigrades aboard the International Space Station (ISS) during his two-week mission. The focus will be on how these tiny creatures revive, survive, and reproduce in space conditions.



What Are Tardigrades?

Tardigrades, also called water bears or moss piglets, are tiny aquatic animals about 0.5 mm long. They've existed for around 600 million years, surviving all major mass extinctions.

• They have four pairs of legs with claws and a specialized mouth to suck nutrients from plant cells and small organisms.

• Found in diverse habitats — from mountain tops to ocean floors — they mostly live in thin water films on mosses and lichens.

Why Are Tardigrades Studied?
Although discovered in 1773, tardigrades gained scientific interest recently due to their extraordinary survival abilities.

They can survive:
• Temperatures from -273°C to 150°C
• Space radiation and high pressure (up to 40,000 kPa)
• Decades of freezing

Their survival mechanisms could help in:
• Improving crop resilience
• Creating better sunscreens
• Preserving human tissues and organs

What Makes Tardigrades So Resilient?
Tardigrades survive harsh environments by entering a state called cryptobiosis, drastically slowing metabolism to less than 0.01% and reducing water content by over 95%.

In this state, called a tun, they become nearly indestructible. They also produce special CAHS proteins, which form a protective gel inside cells, shielding them from damage due to heat, radiation, and vacuum.

What is the Voyager Tardigrades Experiment?
This experiment will send tardigrades in their tun state to the ISS, then revive them to study the effects of microgravity and space radiation.

Goals:
• Identify genes that make tardigrades resilient
• Understand DNA repair in space
• Develop strategies to protect astronauts and biological materials during deep space missions

History of Tardigrades in Space
Tardigrades first went to space in 2007 aboard the European Space Agency's Foton-M3 mission.
• Around 3,000 were sent in tun state
• Many survived and even reproduced after exposure to open space
This made tardigrades the first animals to survive direct exposure to space.

Relevance: GS Prelims & Mains Paper III; Science & Technology
Source: Indian Express

2. Why Are There Protests in Los Angeles?

Introduction

Protests erupted in Los Angeles after federal agents conducted immigration raids targeting workplaces. The raids triggered anger and fear, especially in immigrant communities. Protesters clashed with law enforcement, prompting a heavy response from authorities.

Trump Sends National Guard to Los Angeles

President Donald Trump ordered 2,000 National Guard troops to Los Angeles, bypassing California Governor Gavin Newsom.

• This is a rare and dramatic move—the first time since 1965 that a U.S. president activated a state's National Guard without the governor's request.

• Trump called the protests a "form of rebellion", justifying federal military involvement.

California Leaders Oppose Federal Action

Governor Newsom and Los Angeles Mayor Karen Bass strongly opposed Trump's decision.

• Newsom called the move "inflammatory" and politically motivated.

• Bass warned it was a "dangerous escalation."

Both leaders demanded the National Guard be returned to state control.

How Did the Protests Start?

The protests began Friday, when federal agents in camouflage raided Los Angeles' garment district, targeting undocumented immigrants.

• The raids caused chaos—protesters chanted, threw eggs, and were met with pepper spray and rubber bullets.

• The unrest spread to nearby cities like Paramount, where clashes intensified.

How Have Protests Escalated?

• By Saturday, hundreds had been arrested, mostly in Paramount, a largely Latino area.

• On Sunday, troops arrived in downtown Los Angeles and faced off with protesters outside the Metropolitan Detention Center.
• Law enforcement used tear gas and crowd-control weapons to disperse demonstrators.

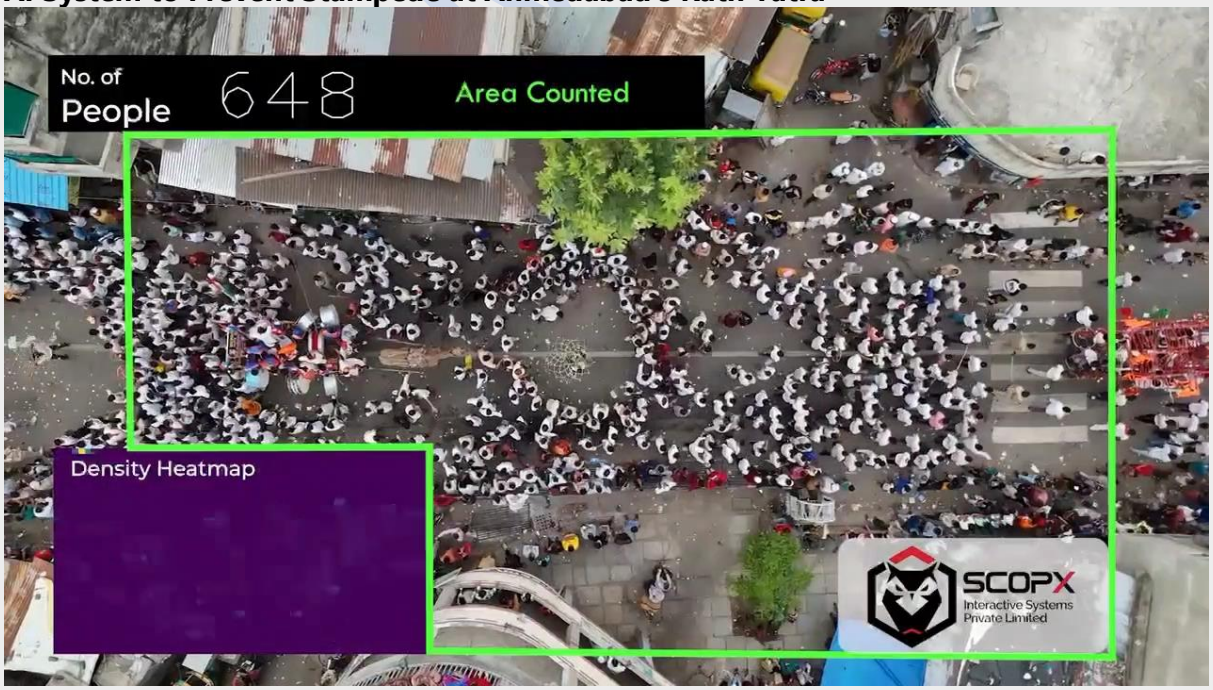
Who Controls the National Guard?
The National Guard can be deployed by either the state governor or the U.S. president:
• Normally, governors control the Guard for state emergencies like floods or fires.
• It's rare for a president to take control without a state's request.
• The last such case was in 1965, when President Lyndon B. Johnson acted during civil rights protests in Alabama.

What Are Officials Saying?
• Trump accused the protesters of being "insurrectionists" and hinted at using the Insurrection Act, which allows domestic military deployment.
• The White House said the National Guard was needed to stop "violent mobs."
• California officials rejected these claims, calling the protests mostly peaceful and saying local police had enough resources.
• Attorney General Rob Bonta and Governor Newsom both condemned the federal action as "unlawful".

Relevance: GS Prelims; Miscellaneous
Source: Indian Express

3. Ahmedabad police to use AI-based system during Rath Yatra to avoid stampede. How does it work?

AI System to Prevent Stampede at Ahmedabad's Rath Yatra



To manage large crowds during the upcoming Jagannath Rath Yatra on June 27, the Ahmedabad police will use an AI-powered anti-stampede system for the first time. Around 15 lakh devotees are expected to attend the event in the congested Old City area.

Why Is This Important Now?

This move comes after recent stampedes in:

• Bengaluru during IPL victory celebrations (11 deaths)

• Prayagraj during the Mahakumbh earlier this year

Authorities are being extra cautious to avoid similar tragedies.

Main functions and uses

1. Real-time monitoring: AI-powered CCTV cameras will continuously analyse video streams in real time.

2. Crowd density estimation: Algorithms will calculate the number of people in a given area. This can involve pixel-based analysis (converting images to black and white and counting "black pixels" representing people), and object detection, using machine learning models to identify and count individuals by detecting heads or torsos.

3. Thresholding: Pre-defined "threshold values" for crowd density will be established. When the detected density crosses these thresholds, it will trigger an alert.

4. Anomaly detection: Beyond just density, these algorithms can identify unusual crowd behaviour, such as sudden surges in movement, unusual clustering patterns, fallen individuals, and aggressive movement.

5. 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.

6. 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.

7. Reinforcement learning: Algorithms can learn from past incidents to suggest optimal crowd flow routes and alternative evacuation paths during emergencies.

Benefits

1. Proactive prevention: The primary benefit is the ability to detect and warn of potential stampedes before they occur, allowing authorities to take preventative measures.

2. Real-time insights: Provides immediate and accurate data on crowd density and movement, far surpassing manual observation.

3. Enhanced safety: Significantly improves safety in public spaces by reducing human error and enabling swift responses to risks.

4. Optimised resource allocation: Helps in better deployment of security personnel and resources to areas with high crowd density.

5. Improved efficiency: Automates a labor-intensive task, freeing up human operators for more complex decision-making.

6. Data for future planning: The collected data can be analyzed to improve crowd management strategies for future events.

Challenges

1. Limited accuracy: AI algorithms can face challenges with occlusion (people blocking each other), varying conditions (changes in lighting, weather, and camera angles), and bias in training data (leading to false positives).

2. Computational complexity and cost: Developing and deploying such systems can be expensive due to the need for high-resolution cameras, powerful processing units, and sophisticated algorithms.

3. Data privacy and ethical concerns: The extensive use of CCTV and AI raises concerns about individual privacy and potential misuse of data.

4. Integration with existing infrastructure: Integrating new AI-powered systems with older CCTV networks can be complex.

5. Human intervention remains crucial: While AI can alert, human responders are still essential for effective intervention and crowd dispersal. As seen during Maha Kumbh, even with AI alerts, a lack of ground personnel can limit effectiveness.

6. Defining thresholds: Determining appropriate crowd density thresholds for different environments and cultural contexts can be challenging.

Relevance: GS Prelims & Mains Paper III; Science & Technology
Source: Indian Express