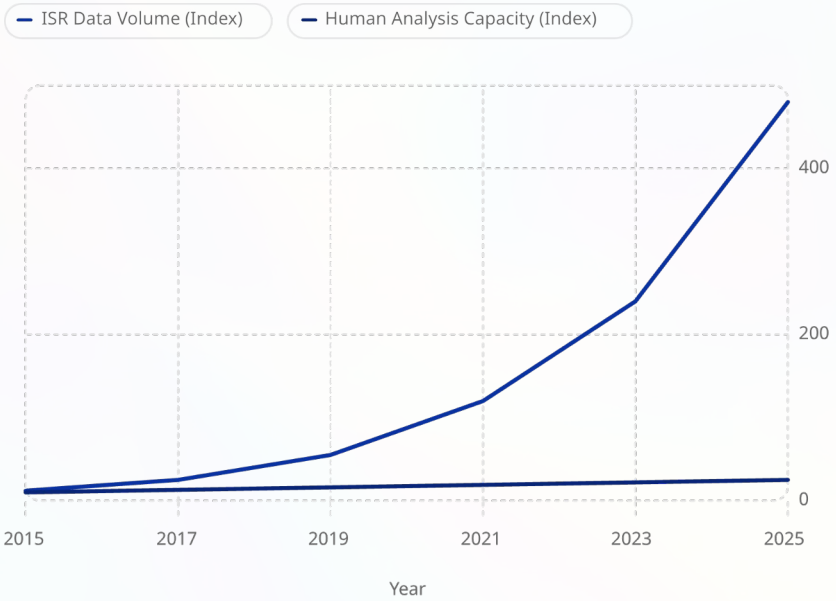
Geospatial AI as the Backbone of Network-Centric Warfare

Lt Col Vikas Agnihotri, VSM, PhD

Directorate General of Information Systems (DGIS), Indian Army

The Processing Gap: Data vs Decision Speed

Modern ISR systems generate data at a pace far exceeding human analytical capacity. The bottleneck is no longer collection — it is the time between data and decision.



The Divergence Is Accelerating

Human analytical capacity grows linearly. ISR data volume grows exponentially. Without AI-enabled processing, this gap widens irreversibly.

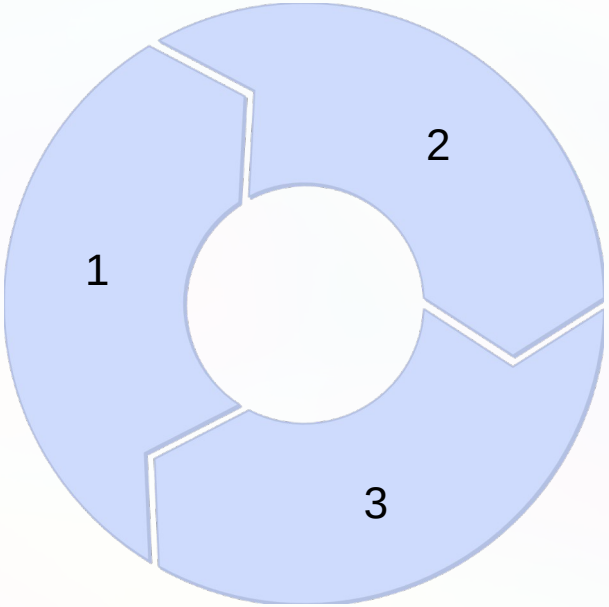
> "The bottleneck is no longer sensors. It is the time between data and decision."

- Modern operations generate unprecedented data volumes
- Human processing cannot scale at the same rate
- Decision superiority depends on processing speed
- Geospatial AI exists to close this gap

CORE AI CAPABILITIES

Object Detection & Classification

Vehicle detection, weapon system identification, infrastructure recognition, and personnel movement analysis.



Change Detection

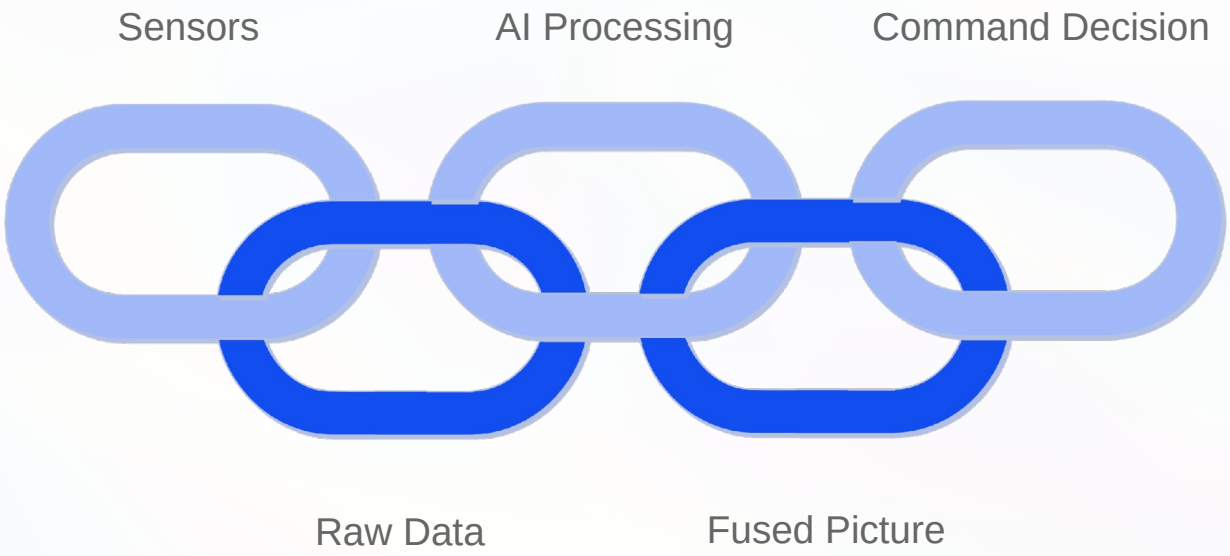
Terrain monitoring, infrastructure changes, force disposition shifts, and logistics activity tracking.

Intelligence Fusion

Integration of EO imagery, SAR, SIGINT, and multi-source intelligence into a unified operational picture.

From Sensor to Decision: Compressing the OODA Loop

AI-enabled geospatial analytics transforms raw sensor data into actionable intelligence at operational speed — compressing the OODA loop and accelerating decision-making.



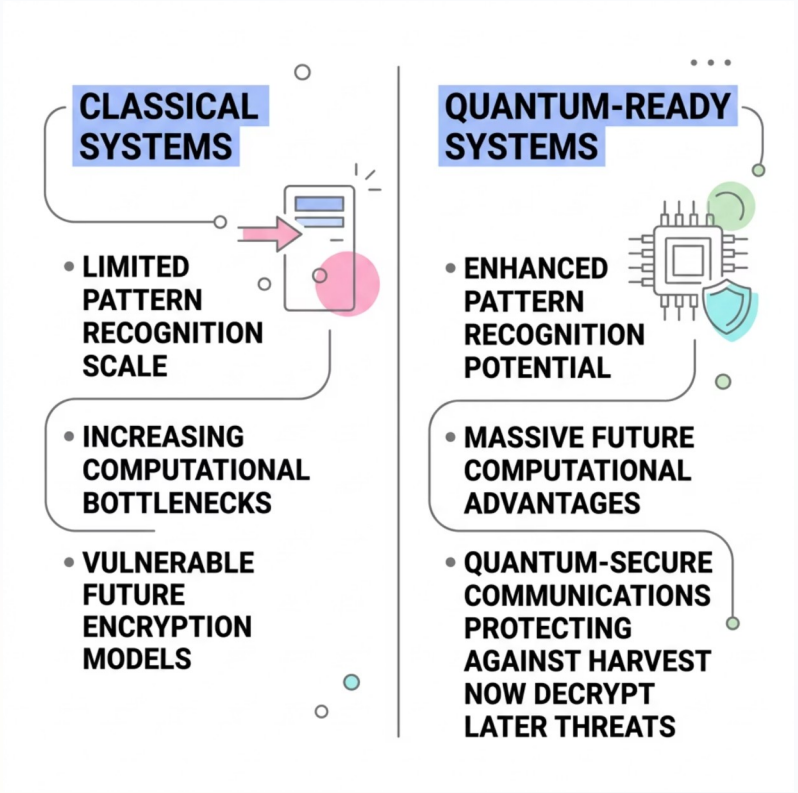
AI does not replace the commander — it provides better information, faster. The result is decision advantage at operational tempo.

Quantum-Ready Geospatial Infrastructure

Future quantum capabilities will fundamentally alter geospatial processing. Military organisations must build architectures today that can integrate quantum advances without complete redesign.

> "We are not waiting for quantum. We are building quantum-ready architectures today."

- **Pattern Recognition at Scale:** Quantum processing of large geospatial datasets at unprecedented speed
- **Quantum-Secure Communications:** Protection against "Harvest Now, Decrypt Later" threats



Trustworthy AI: The Difference Between Capability and Liability

Military AI must be explainable, resilient, and governed to be operationally useful.

Explainability

Transparent reasoning, confidence scoring, traceable evidence, human understanding

Resilience

Adversarial robustness, GPS spoofing resistance, jamming tolerance, graceful degradation

Ethical Governance

Human-in-the-loop authority, accountability mechanisms, bias mitigation, auditability

"An AI that fails or misleads when contested is more dangerous than no AI at all. Trust is not a feature you add at the end — it is the foundation you build on from the beginning."

The Geospatial AI Imperative: What India Must Do Now

India must move urgently to establish trusted geospatial AI as a strategic military capability.

1

Build Indigenous Geospatial AI Capability

Indian terrain, operational environments, threat models, and indigenous military AI ecosystem

2

Establish Joint Interoperability Standards

Common geospatial data standards, APIs, cross-service integration, joint command interoperability

3

Institutionalise Trustworthy AI Governance

Explainability requirements, resilience standards, ethical governance frameworks, doctrinal integration

> "The nation that masters trusted, real-time geospatial AI will define the terms of network-centric warfare in the Indo-Pacific."

Jai Hind