

AI transforming Defence & Security Operations

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Outline

1. Brief Introduction
2. Present Realities w.r.t AI
3. Glimpses in to the future...



Brief Introduction

NVM & Neuromorphic Hardware Research Group



Areas: Semiconductors for AI, Storage, Security, Computing, Intelligent Sensing etc.

Item	Count
Scientific Publications / IPR	100+
Products & Technologies	6+
Awards & Recognitions	20+
R&D Projects	10+
Citations	1800 +

Work Recognized by: IEEE, NASI, IEI, INAE, IASc, MIT, MRS, NSF

University Spin-off

Focus: Secure edge-AI solutions

CYRAN AI Solutions
An IIT Delhi Startup

CYRAN AI Solutions is a deep-tech startup recognized by the Department of Industrial Policy and Promotion (DIPP), Government of India under the flagship Startup India Program. At CYRAN, we build cutting-edge systems for **Artificial Intelligence (AI)** and **Cyber-Physical Security** applications. We are an IIT-Delhi-FITT incubated startup.

- Backed by strong R&D
- Secure-Edge Solutions
- Custom Solutions
- Made in India

Awards & Recognitions:

- National Startup Technology Award Winner 2021
- DRDO Dare to Dream Award 2021
- IDEX DISC Award 2021

Our Solutions and Sectors

- Edtech:** Buddhi AI DIY Kit (www.buddhikit.in)
- Security:** Biometrics, Face Recognition, Geospatial AI
- Smart Industry 4.0:** Workspace Management
- Electronics:** Electronics, IoT

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Brief Introduction



CYRAN® AI Toolset for GeoInt Capability

Proudly designed and Made in India

- End-to-end indigenized solution on AI for Geospatial Applications



**DST-TDB National
Technology Start up Award**



MoD-DIO IDEX Award



DRDO Dare to Dream Award

- Only indigenized solution to meet Geospatial AI requirements of Tri-services



ADB, IA



RM



COAS



IDS

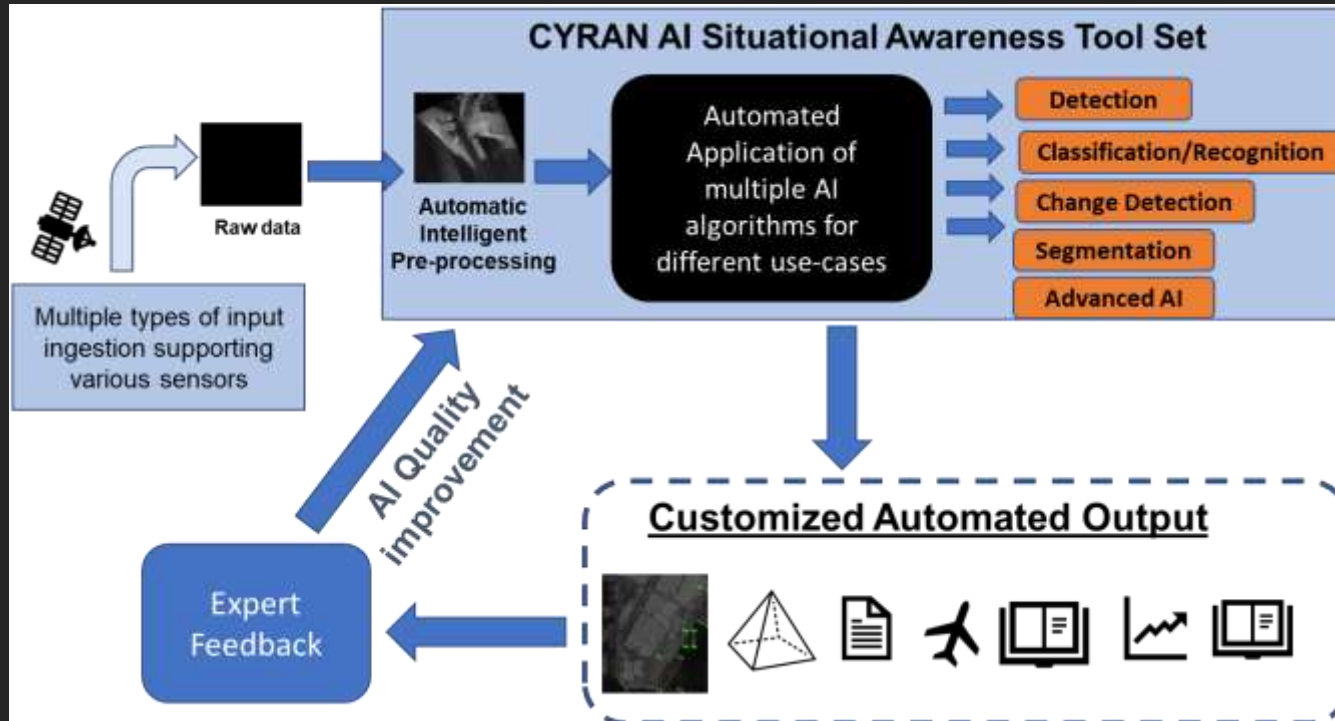




CYRAN® AI Toolset for Geoint Capability

Proudly designed and Made in India

- Solution made in close coordination with end-users



- Saves analysts from multiple pain-points
- Enables real-time insights that are impossible in pure manual process
- Secure & User adaptable

Present Realities w.r.t AI

Strategy → Geospatial + AI

If you are serious about AI...?

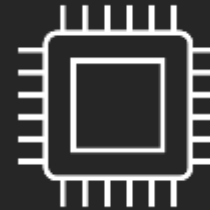
1. Data

Must avail every opportunity to digitize
CDO as important as CISO
Data in the right form is important



2. Hardware

Data is fuel...where are the engines and wheels?
Cloud has made us ignore computational hardware



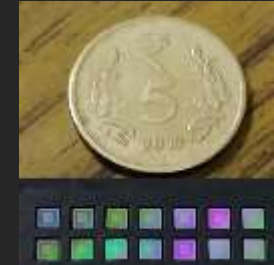
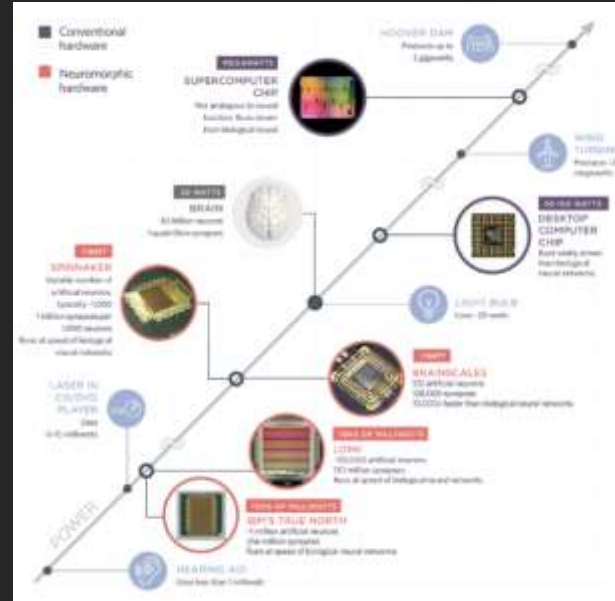
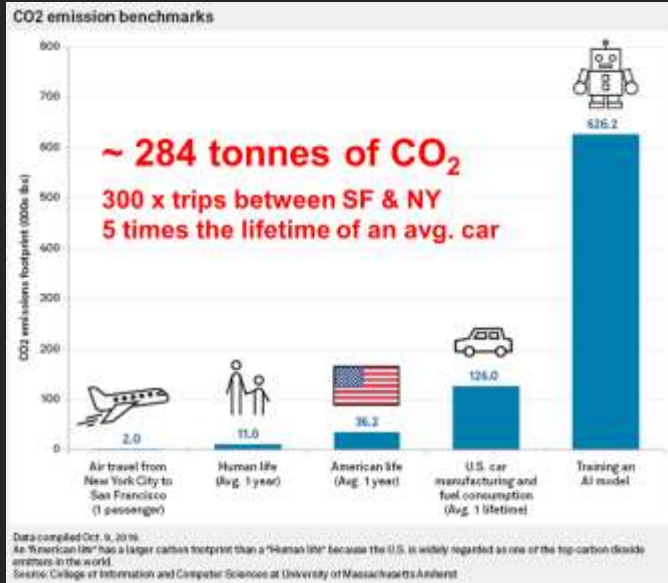
3. Algorithms

It's a flux – short self life – don't blindly chase metrics
Make your own standards – Field is naïve & evolving – Take risk
Versatility, on-field Adaptability, Scalability, Sustainability – matter in long-run



Glimpses in to the future...

1. Sustainable AI → Portable & more dynamic



1. Neuromorphic AI
2. Low-supervision AI

2. Intelligent Sensors & Storage → True-edge

1. On-sensor/In-sensor compute
2. In-memory compute
3. Intelligent payloads



Bio-inspired neuromorphic sensors



Thank you

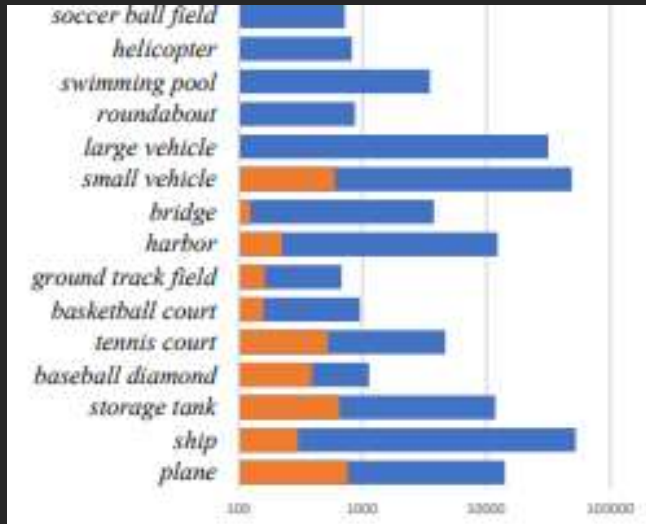
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How much data is sufficient?

655,451 object instances for
15 categories from 2,806
high-resolution images
of different locations



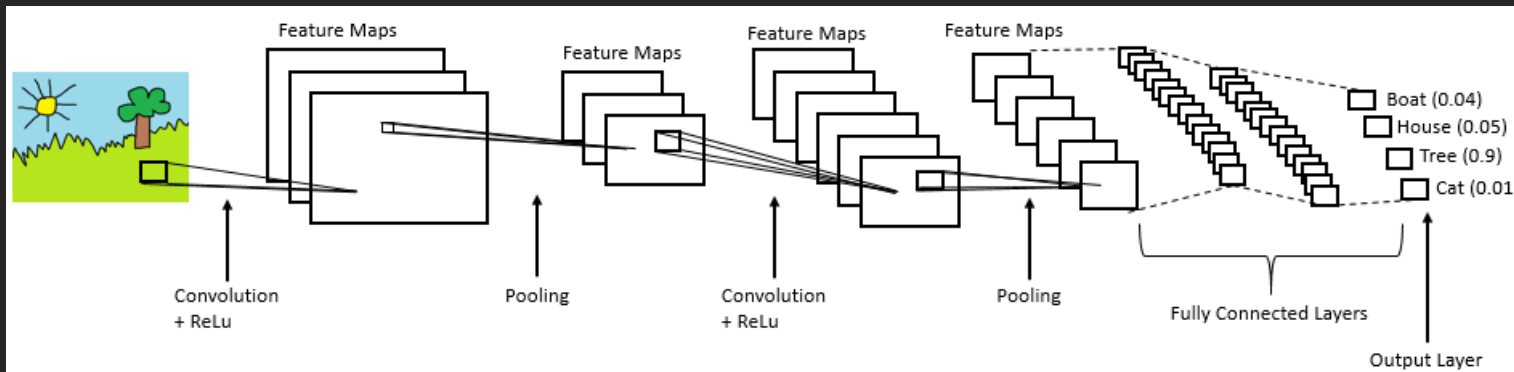
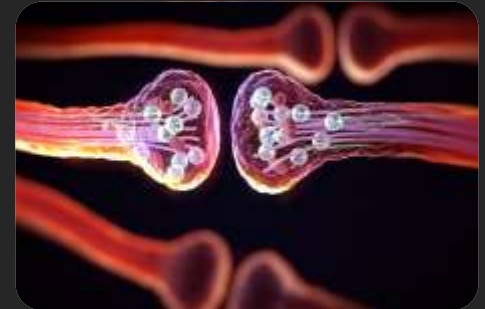
Rule of thumb: minimum few thousand human annotated unique instances

- Covering all geographies/topographies/variability

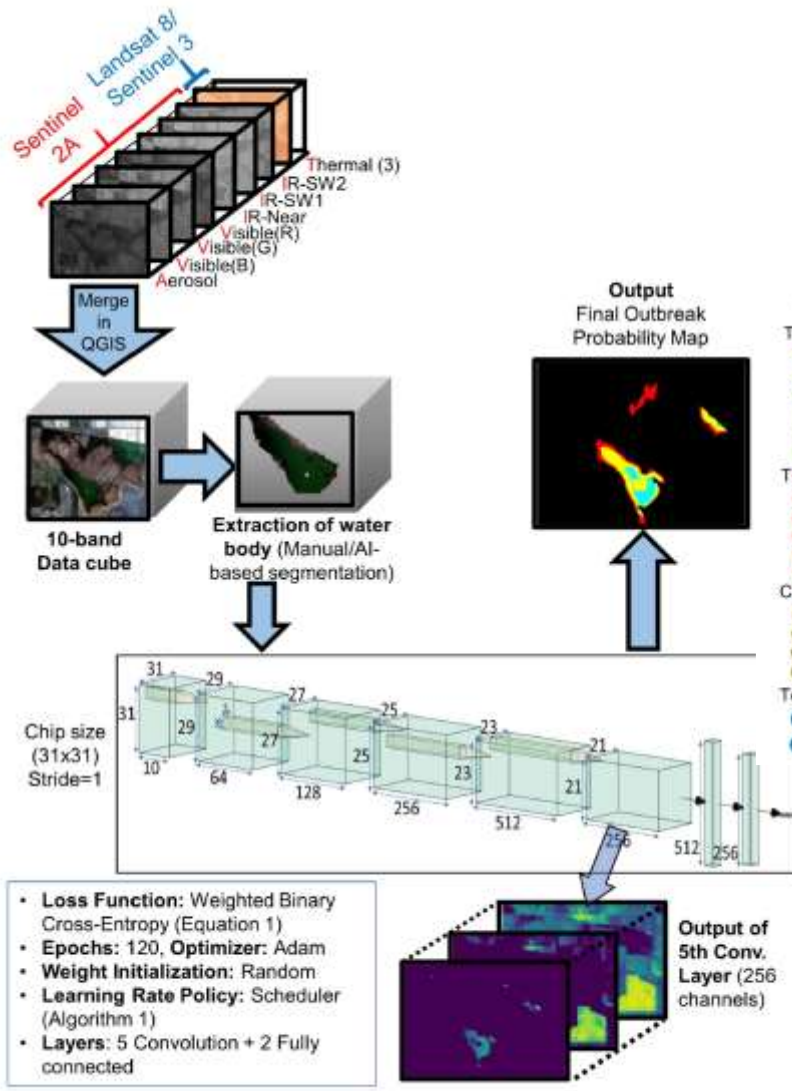


Example: Deep Learning Neural Networks

- Deep Neural Network > 100 layers
- Epochs so far: 220 K
- Weights : 65 million
- Model file Size: ~ 200 MB
- Avg. Accuracy (M4, M5): ~ 95 %
- Optimization problem with > 100 million parameters
- Maximum model training time: 40 hours non-stop with GPU



Multi-spectral Use Cases



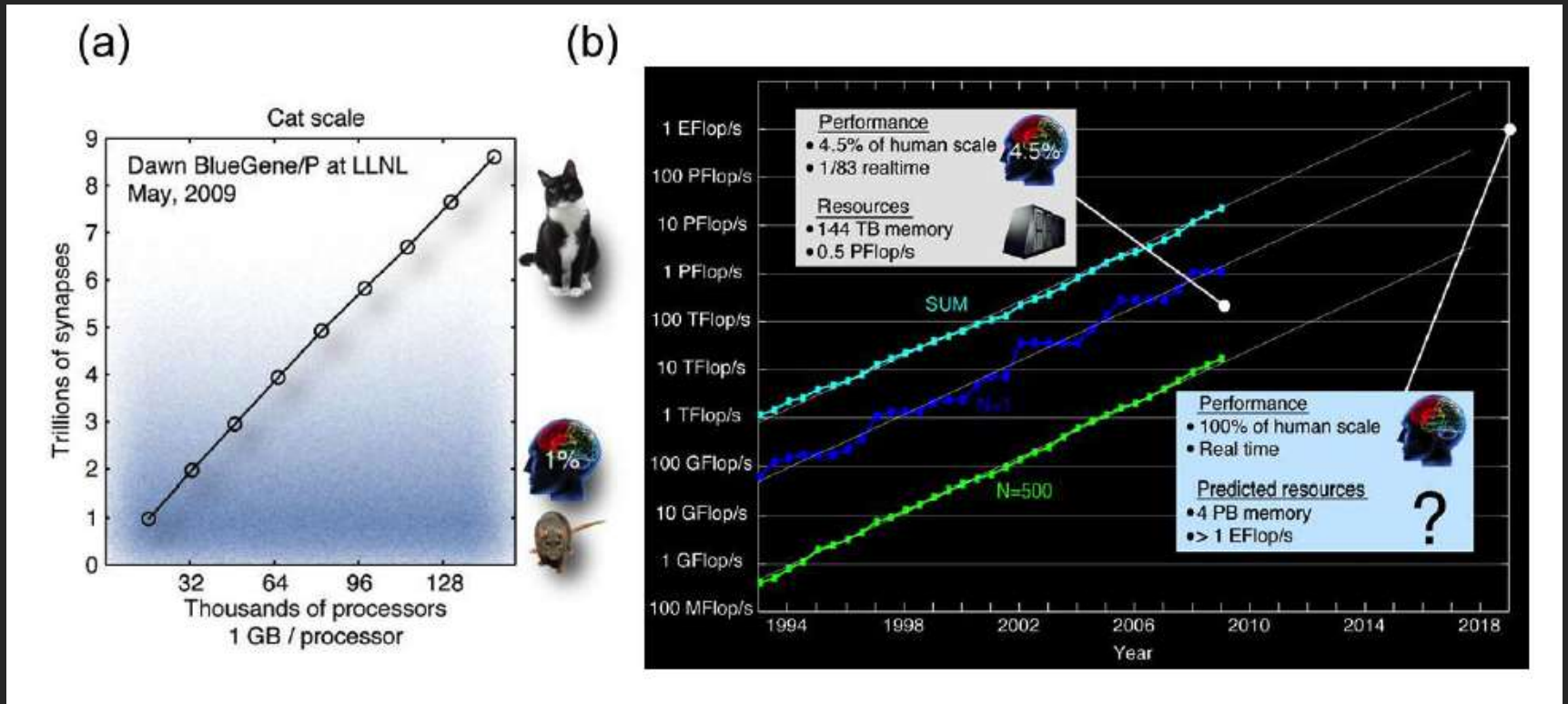
(c) Bird-Area Water-Bodies Dataset (BAWD) Geographical Spread

- Training Location (Positive)**
- 1 Kaitala
 - 2 Western Springs
 - 3 Kapiti Coast
 - 4 Lake Buloke
 - 5 Lake Pertobe
 - 6 Bromley Oxidation Ponds
- Training Location (Negative)**
- 1 Lake Balaton
 - 2 Lange Lacks
 - 3 Smith and Bybee
 - 4 San Carlos
 - 5 Lake Pakowki
- Complex Training Location**
- 1 Firth of Thames
 - 2 Sleeping Bear Dunes
 - 3 North Canterbury
 - 4 Radpole Lake
- Test Location**
- 1 Klamath National Wildlife Refuge
 - 2 Sambhar Lake



How much cooling does a cat brain need?

The cost of intelligence



Efficient Neuromorphic HW-SW Solutions

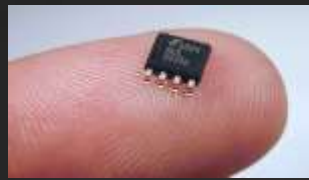
What we do



Low-Power



Ultra-fast



Low-footprint



Secure

The Arsenal



CPU



FPGA



GPU



ASIC

