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

Brief Introduction

iDEX Innovations for Defence Excellence
PM Awardee 2021

MAKE IN INDIA

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

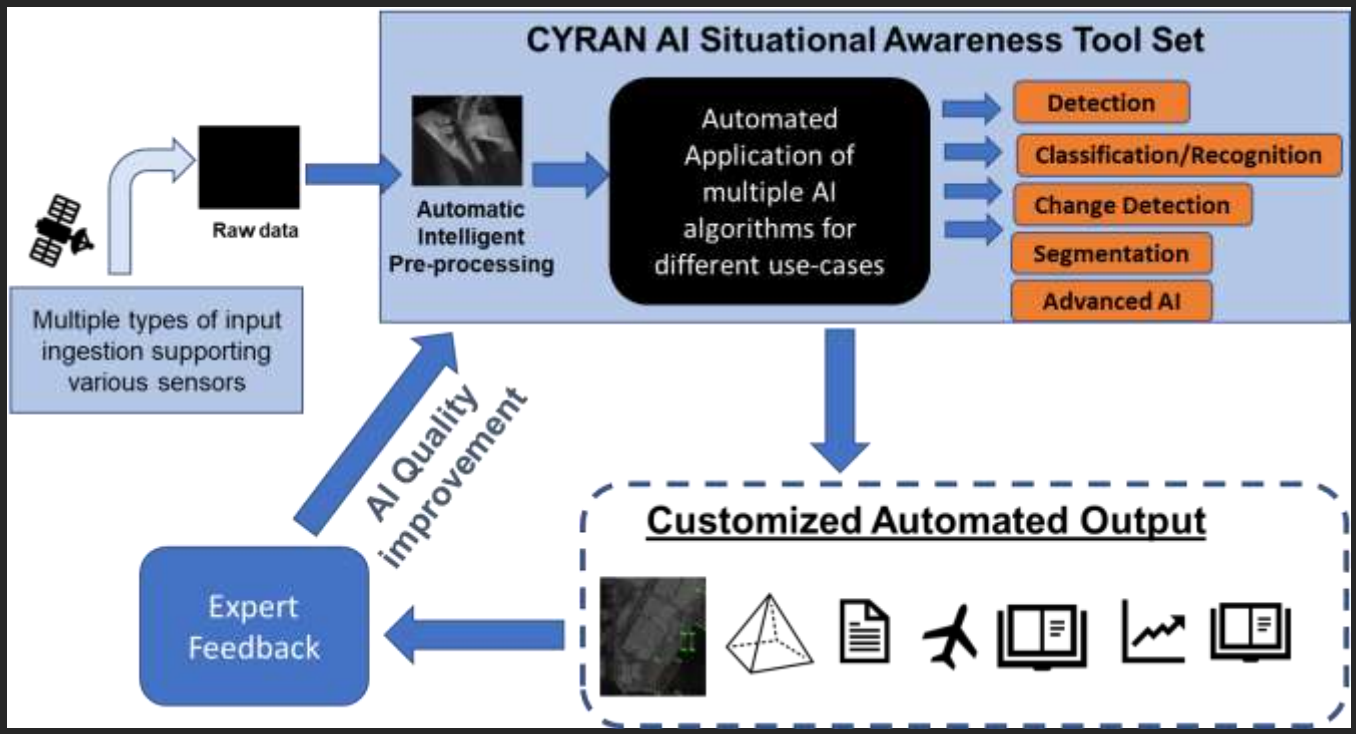
IDS

Brief Introduction

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

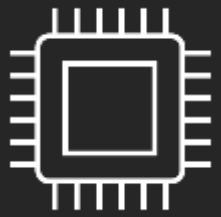
If you are serious about AI…?

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

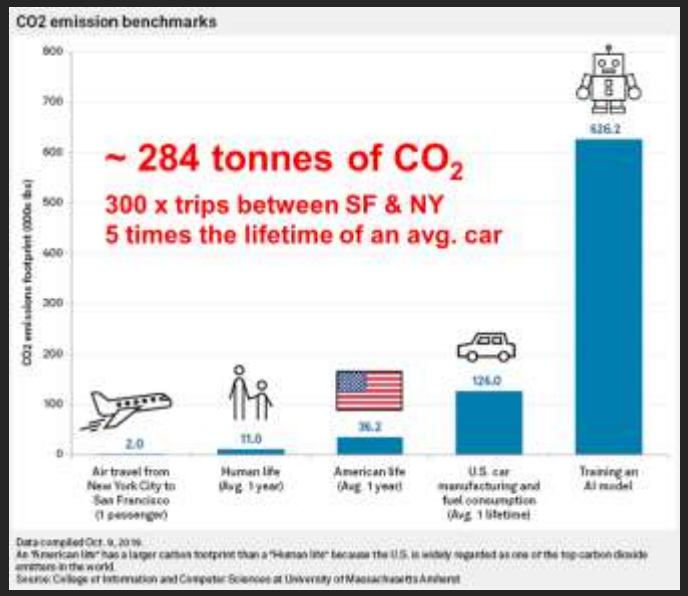


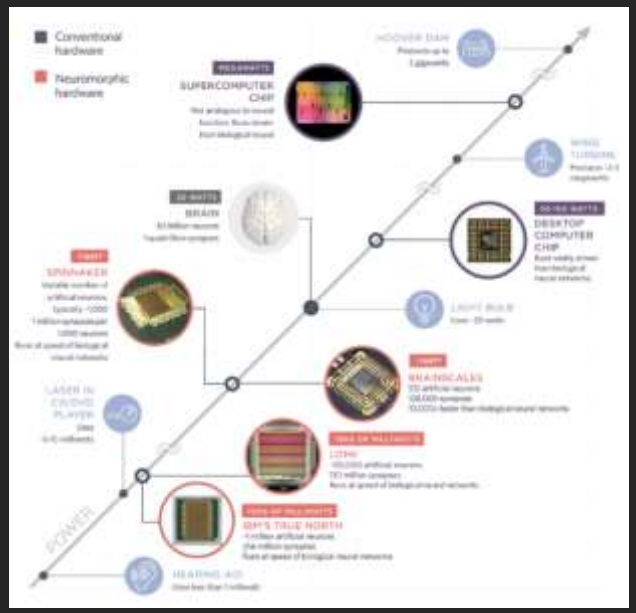
3. Algorithms

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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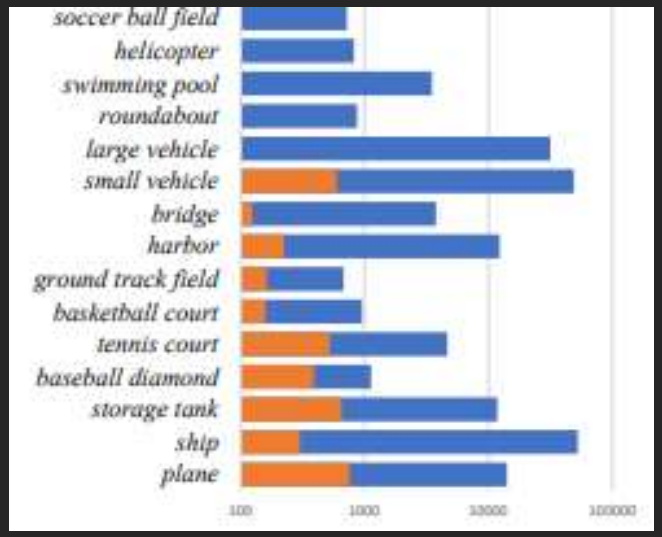
How much data is sufficient?

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

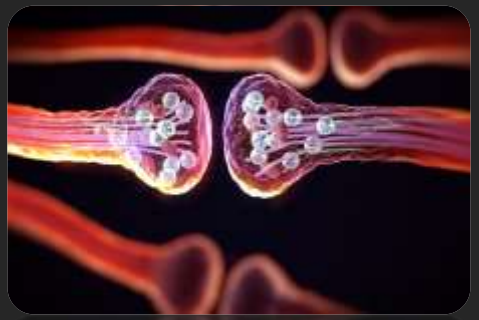


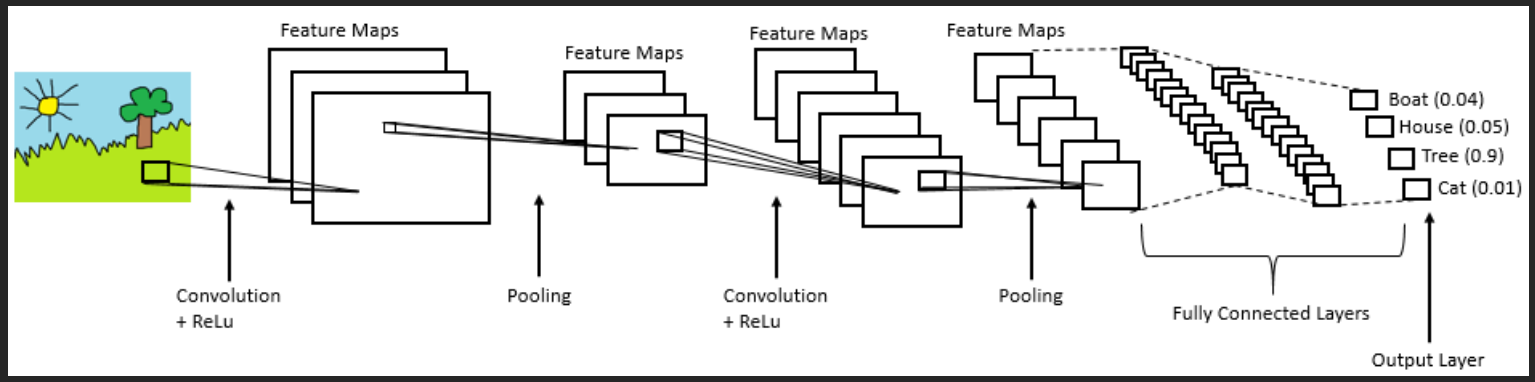
Rule of thumb: minimum few thousand human annotated unique instances

- Covering all geographies/topographies/variability

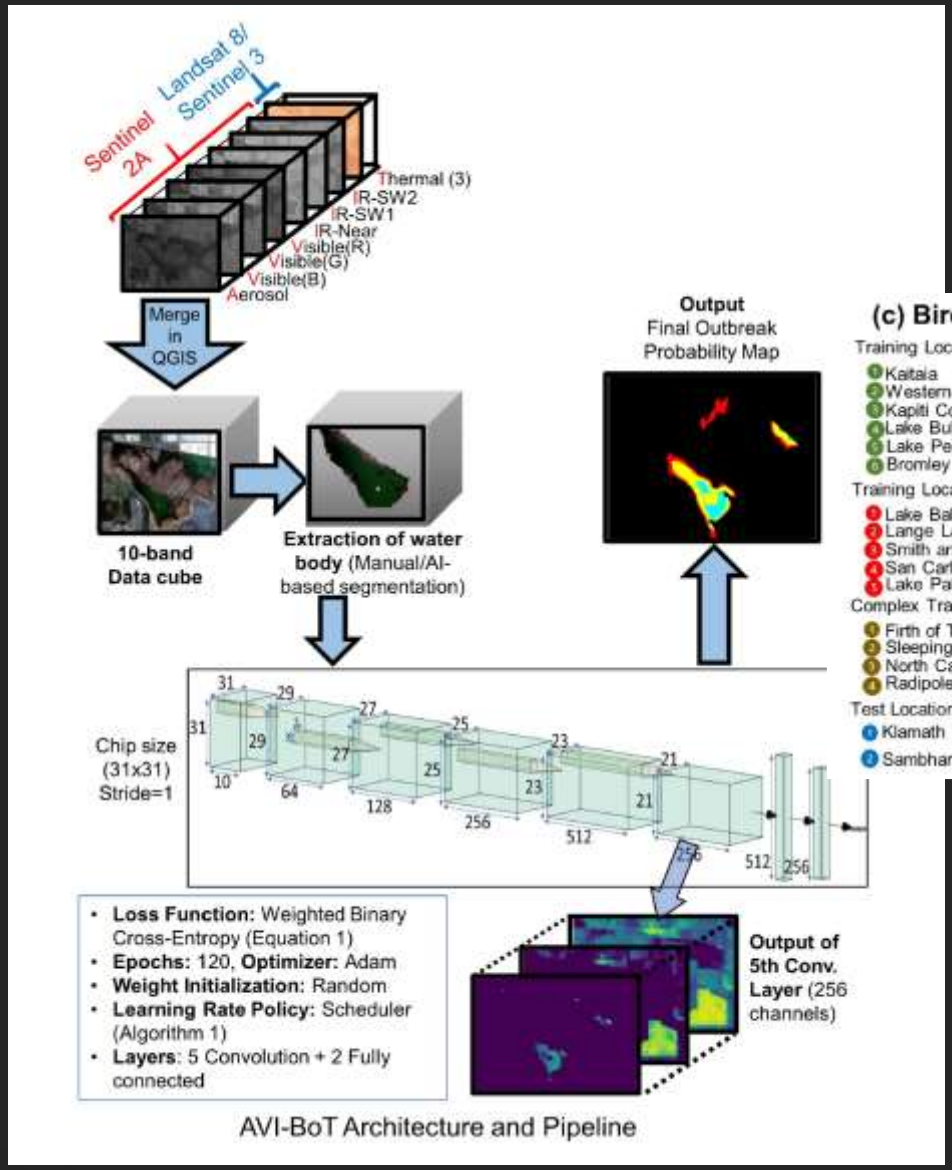
Example: Deep Learning Neural Networks

– 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

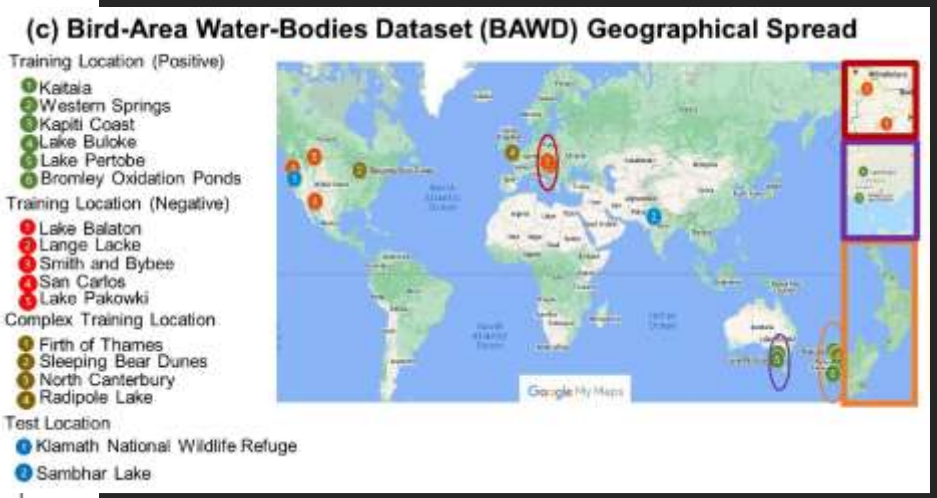




Multi-spectral Use Cases

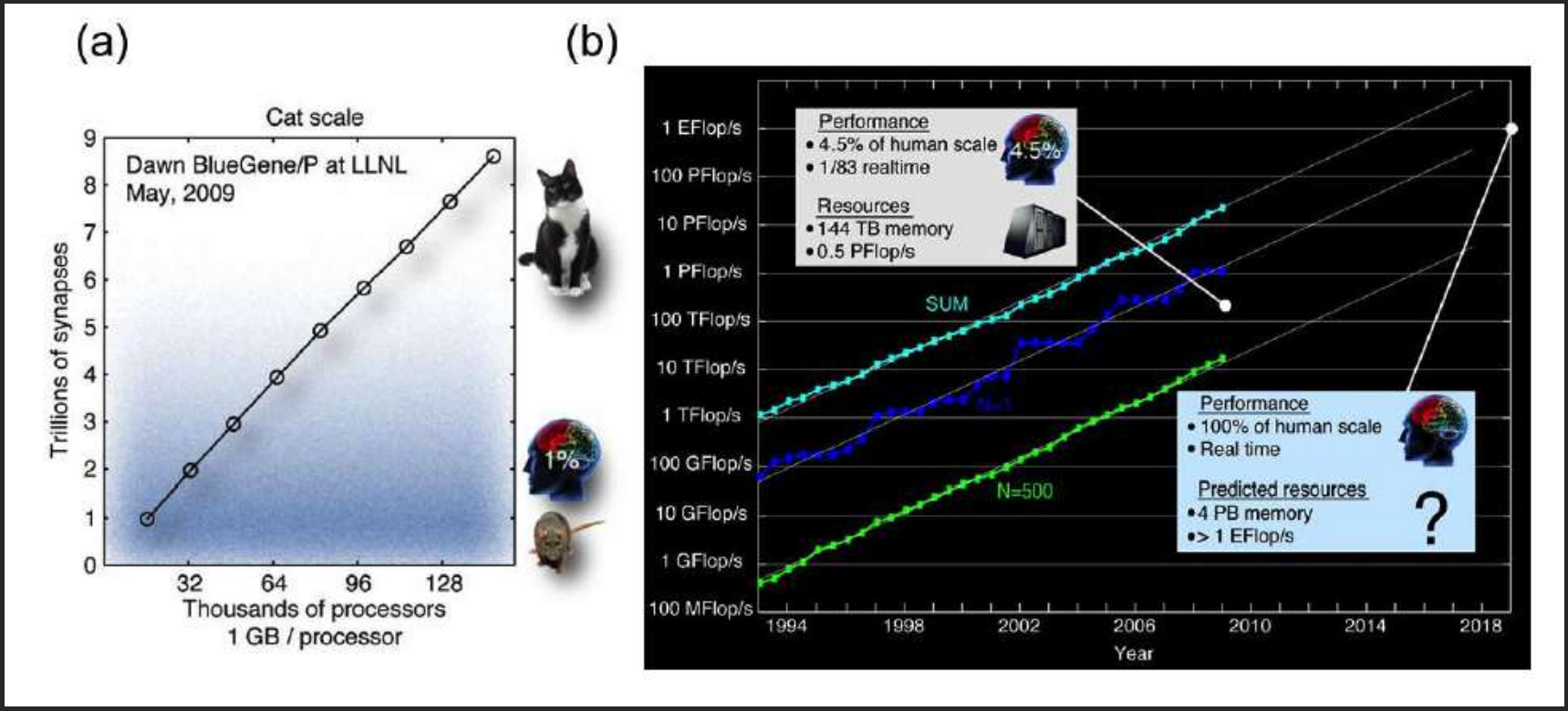


AVI-BoT Architecture and Pipeline



How much cooling does a cat brain need?

The cost of intelligence

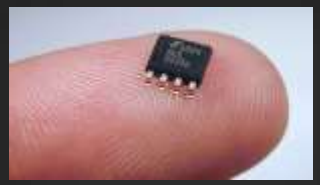


Efficient Neuromorphic HW-SW Solutions

What we do

Low-Power

Ultra-fast



Low-footprint

Secure

The Arsenal

CPU

FPGA

GPU

ASIC