EUROCONTROL

SUPPORTING EUROPEAN AVIATION

FLY AI FORUM

AI Trends

Romaric Redon, ANITI COO

29 April 2024

European Commission

EASA European Union Aviation Safety Agency

ASD AeroSpace and Defence Industries Association of Europe

CANSO

EUROPEAN DEFENCE AGENCY

EUROCAE

IATA

IFATCA

IFATSEA

ACI EUROPE AIRPORTS COUNCIL INTERNATIONAL

NATO OTAN

sesar JOINT UNDERTAKING

My AI Journey

1999 — AI Engineer (LISP)

2001 — AI Research Engineer

2009 — AI Research team Leader

2016 — AI Research Dep. Roadmap leader

2017 — DataLab Manager

2019 — AI Fast Track Lead

2023 — Director of operations

SYMBOLIC AI

MACHINE LEARNING

DEEP LEARNING

GEN AI

ANITI : Artificial and Natural Intelligence Toulouse Institute

Federation of all
AI Education, Research and Innovation activities
performed by AI Labs and Teams in Toulouse

Development of
PERFORMANT AND TRUSTWORTHY AI
for critical applications

- 120 Researchers
- 120 PhDs
- 50 seconded Engineers

TRUSTWORTHY AI		
FONDAMENTALS	ATTRIBUTES	INTEGRATION
• Machine learning architectures • Multi-modal Learning • Optimization for ML	• Robustness • Fairness • Frugality • Embeddability • Acceptability • Explainability	• Robotics • NLP • Planification • Anomaly détection • PINN's
Transport	**Industry 4.0**	**Environment**

1 coordinateur
Université de Toulouse

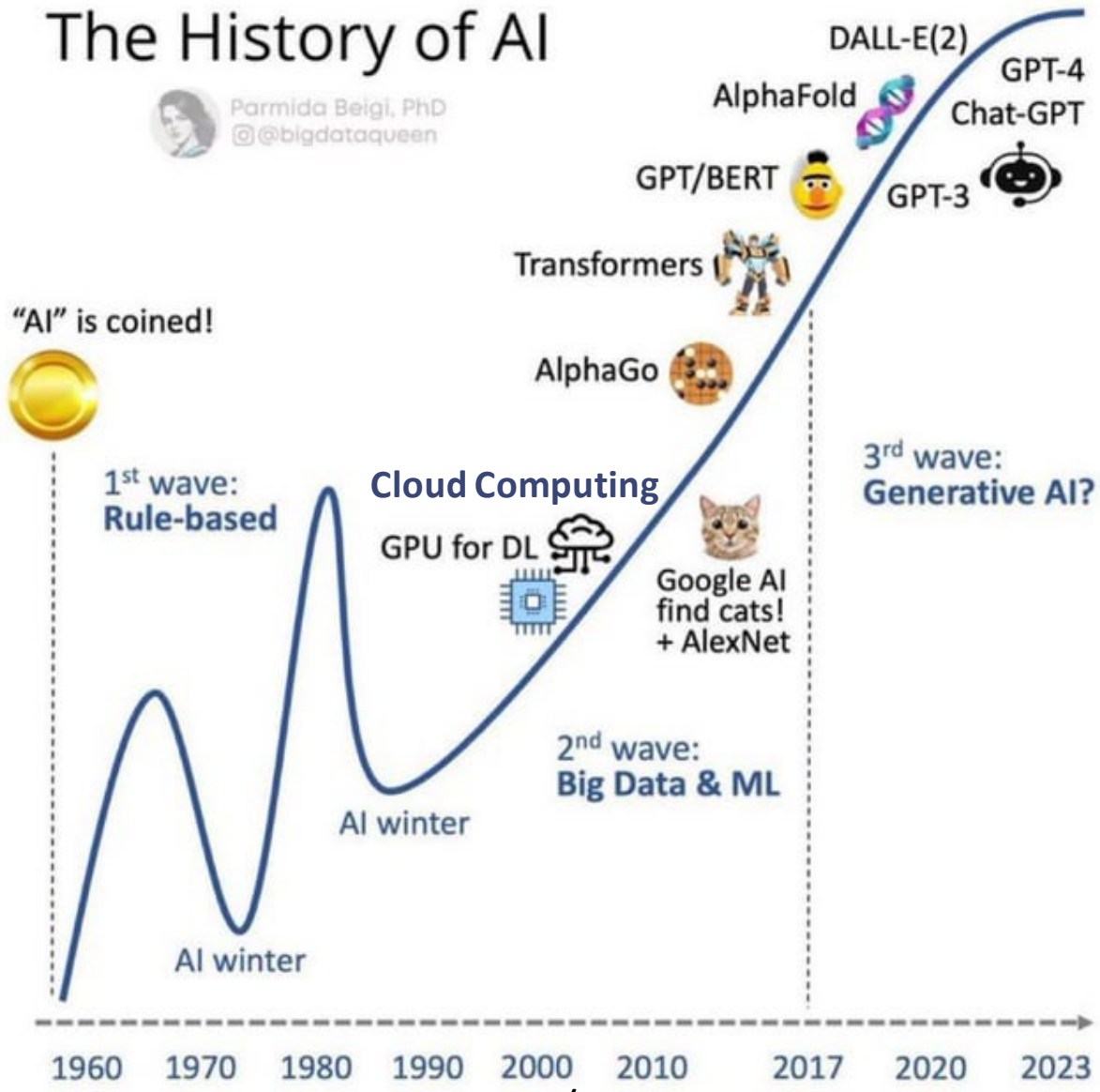
16 Laboratoires et institutions de recherche

7 Universités et écoles

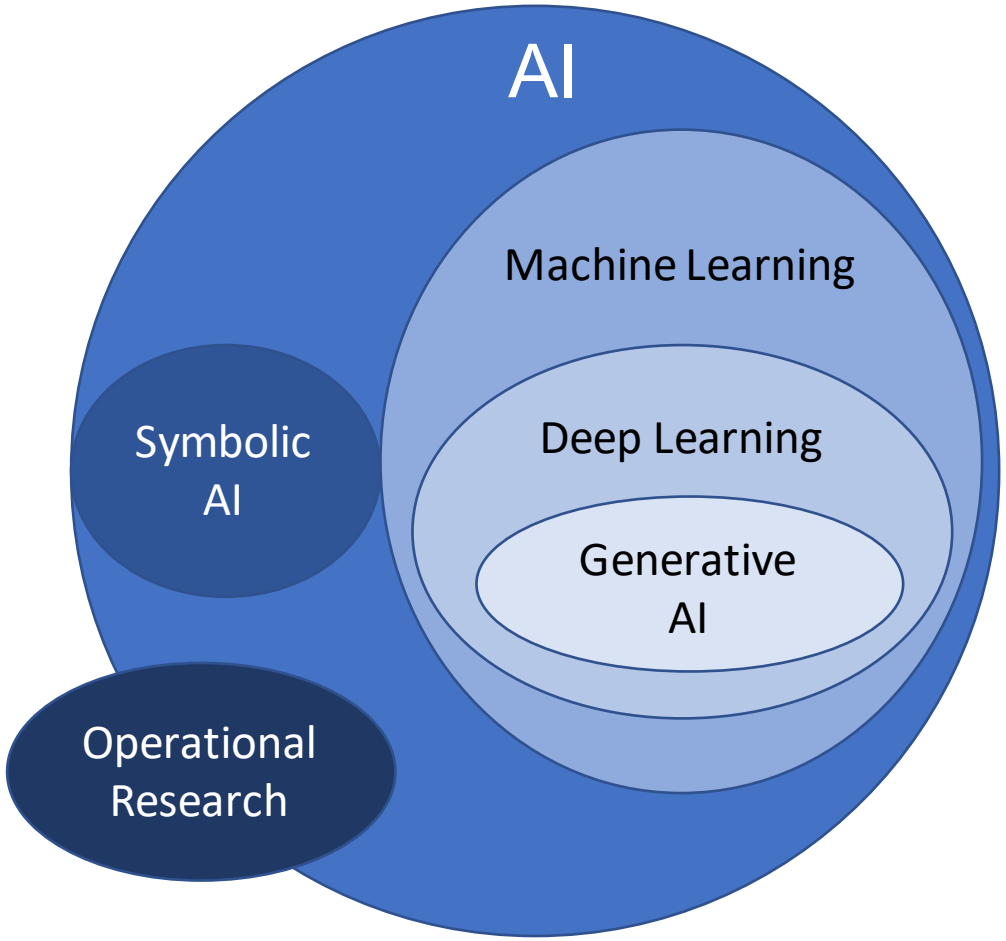
31 Entreprises et clusters

ANITI Chair AI4ATM and UTM Pr D. Delahaye 27 PhDs

The AI waves



Credit : https://www.linkedin.com/in/parmidab/



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AI for Aeronautics : composing with various types of AI

SYMBOLIC AI

TRADITIONAL ML/DL

GENERATIVE AI

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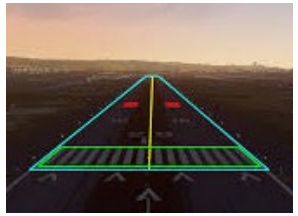
AI for Aeronautics

Perceive / Observe

Computer Vision

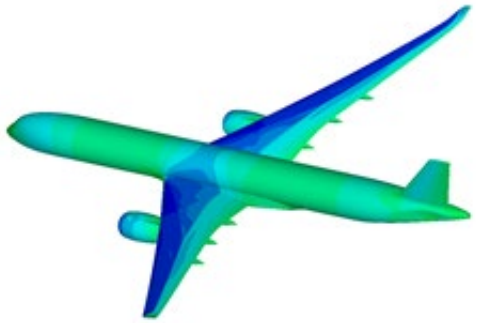


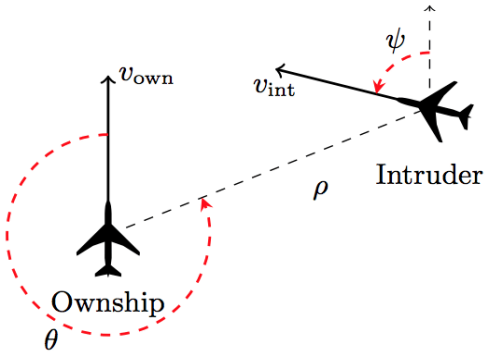
Pattern recognition and Times Series Analysis

Natural Language understanding and Processing

Predict / forecast / Orient

Hybrid Modelling





Generate

Computer Vision

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You
could you encode it please

ChatGPT
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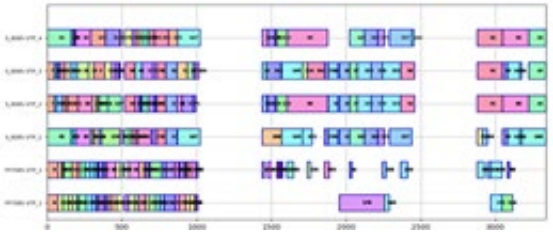
E) TEMPORARY FLIGHT RESTRICTIONS WITHIN 5NM RADIUS OF JFK UP TO 3000FT AGL DUE TO VIP MOVEMENT. NO ACFT MAY OPERATE WITHIN THIS AREA WITHOUT EXPLICIT PERMISSION FROM CONTROLLING AGENCY. UAV/DRONE OPS INCLUDED.
F) SFC G) 3000FT AGL
Contact JFK ATC (123) 456-7890 FOR PERMISSION.

Decide/Act

Decision making



AI for Smart and Sustainable Air Traffic Management and Air Mobility
AI4ATM

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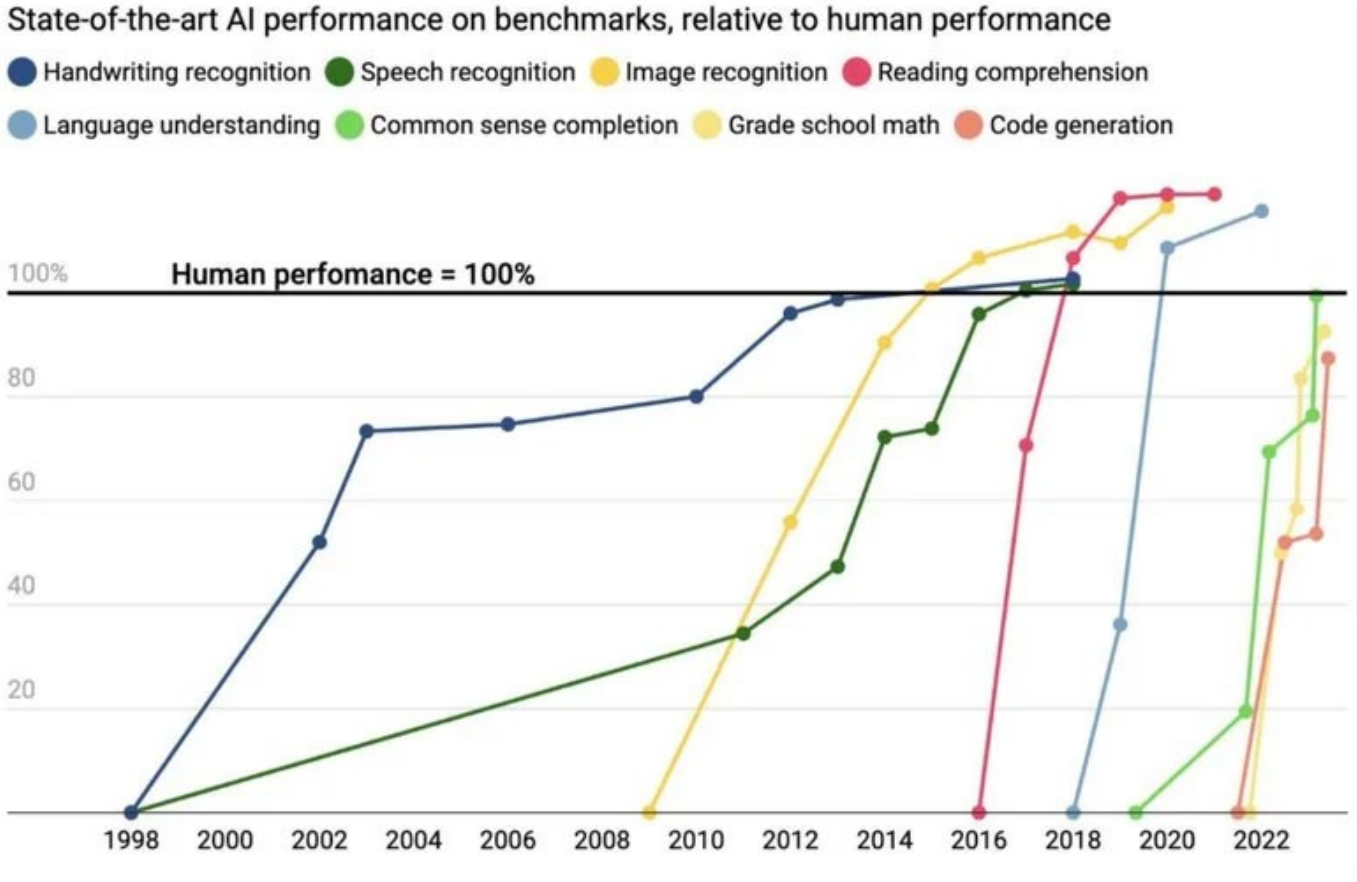
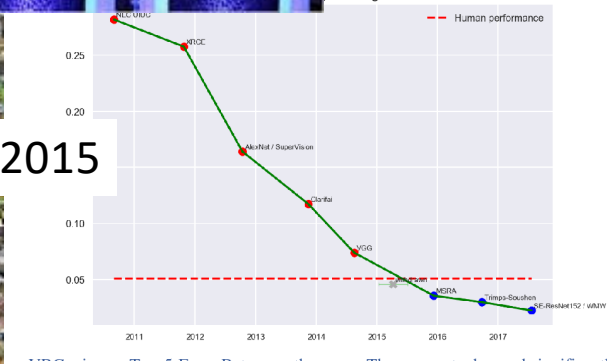
An impressive increase of performance



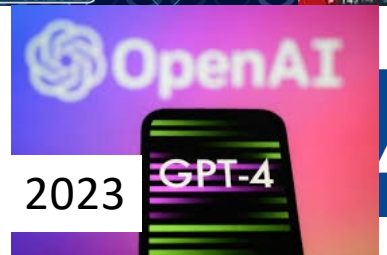
2011

2015



2017

2019



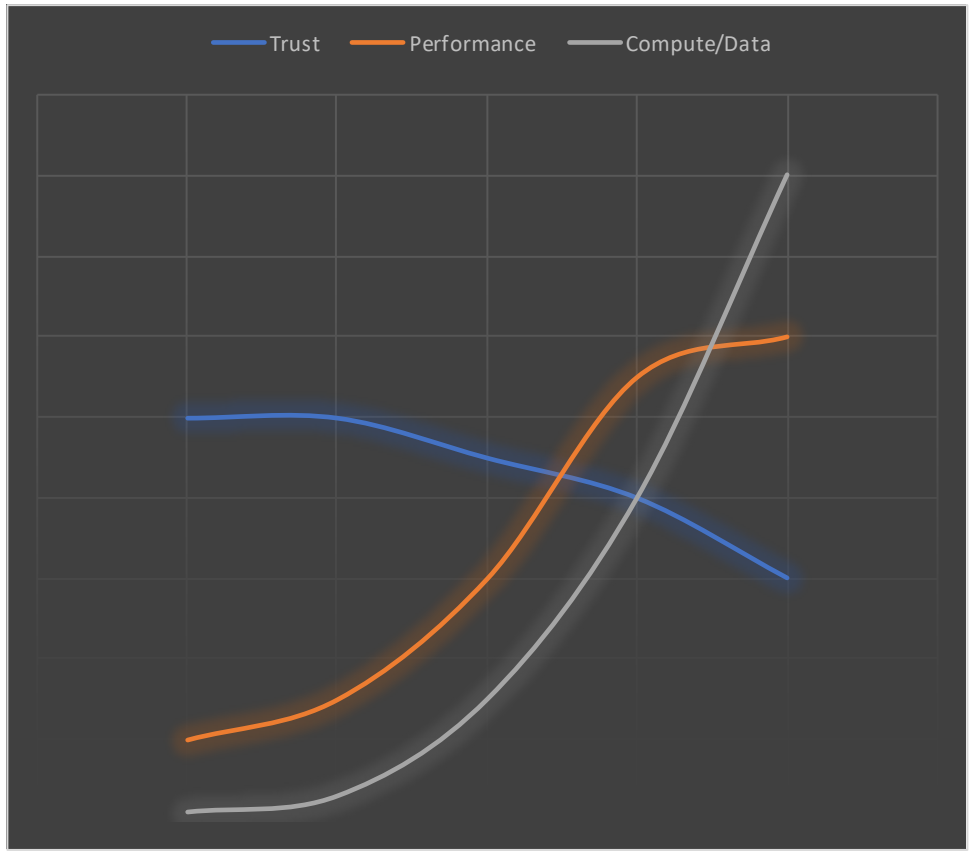
2023

AS AI MODELS HAVE GOTTEN PROGRESSIVELY LARGER THEY HAVE BEGUN TO SURPASS MAJOR HUMAN PERFORMANCE BENCHMARKS. SOURCES: © THE ECONOMIST NEWSPAPER LIMITED, LONDON, JUNE 11TH 2022. ALL RIGHTS RESERVED; SCIENCE.ORG/CONTENT/ARTICLE/COMPUTERS-ACE-IQ-TESTS-STILL-MAKE-DUMB-MISTAKES-CAN-DIFFERENT-TESTS-HELP

An impressive Increase of performance : but what about Trust and Compute/data requirements ?

FROM

Not so performant
Not a lot of data/compute
Very confident



TO

Very performant
Huge data/compute
Not so confident

Quantum computing

Increasing needs for TRUSTWORTHY AI and FRUGAL AI

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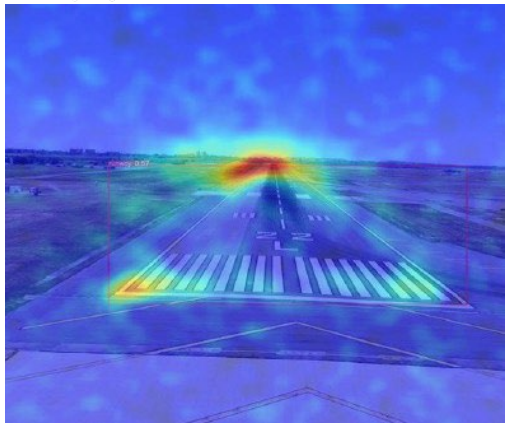
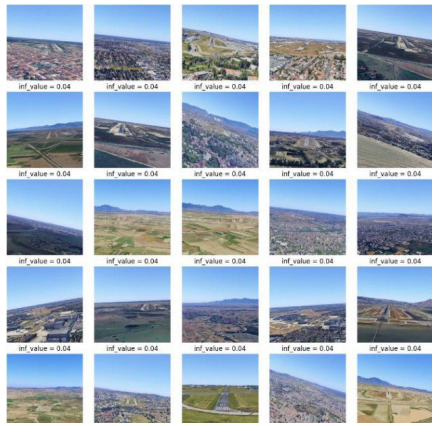
TRUSTWORTHY AI for critical embedded applications and critical processes

Explainability



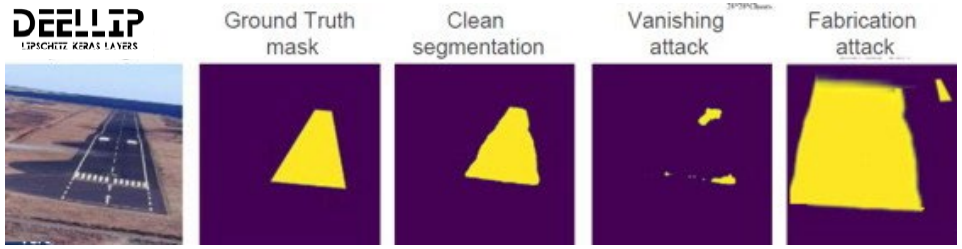
Biases understanding and correction



Uncertainty management

Monitoring out of distribution

Robustness against Adversarial attacks



NEW

RWY 16/34 CLSD
AVBL Twy

The Runway 16/34 is closed but available as taxiway

NEW

TRUSTWORTHY GEN AI

FRUGAL AI : something new is needed!

Sam Altman:

- Age of AI will require an ‘energy breakthrough

→ Investment in Nuclear Fusion

Yann Lecun

- Limitations of Deep Learning vs Human learning
- Importance of world models
- Imperative for energy-efficient AI systems

FRUGAL AI : Neuro Inspired more Frugal approaches : brain inspired cognitive architecture

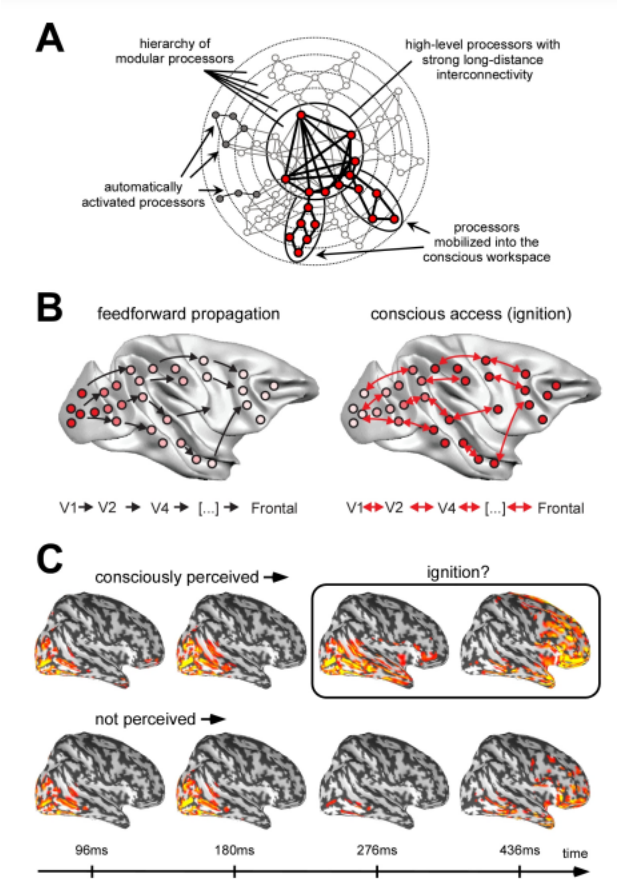
«In 4 years a child has seen 50 times more data than the biggest LLMs,[]
Text is simply too low bandwith and too scarce a modality to learn how the world works » Yann Lecun

Deep Learning and the Global Workspace Theory

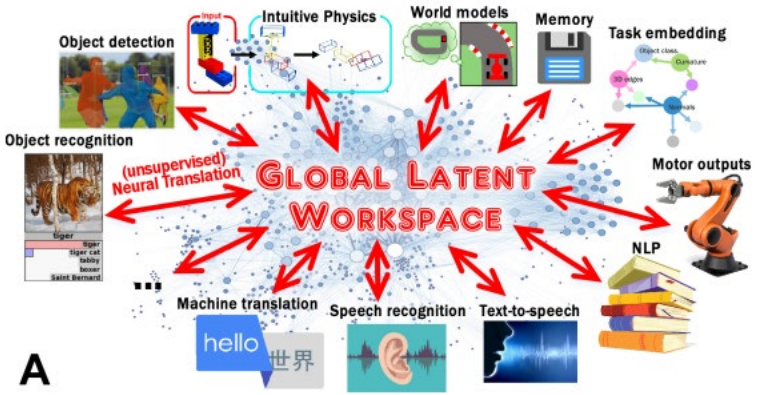
Rufin VanRullen[1, 2] and Ryota Kanai[3]

[1] *CerCo, CNRS UMR5549, Toulouse, France*
[2] *ANITI, Université de Toulouse, France*
[3] *Araya Inc, Tokyo. Japan*

unsupervised neural translation between multiple latent spaces (neural networks trained for distinct tasks, on distinct sensory inputs and/or modalities) to create a unique, amodal global latent workspace (GLW).



Global workspace in the brain



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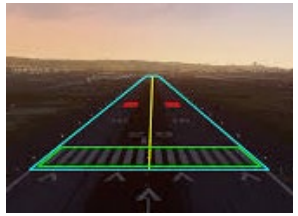

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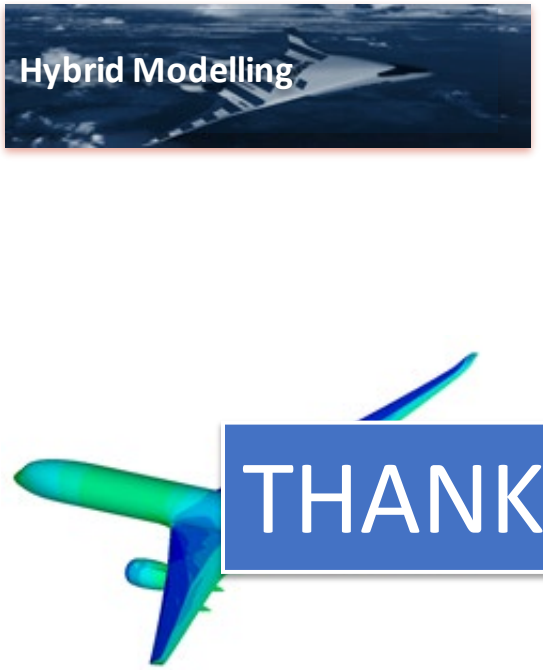

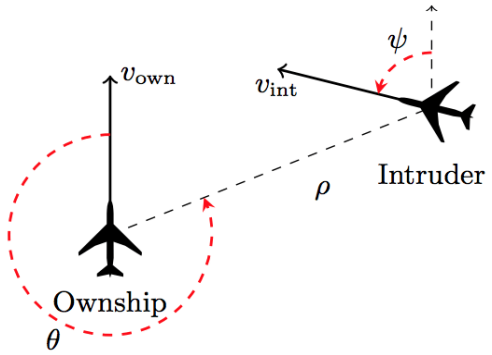

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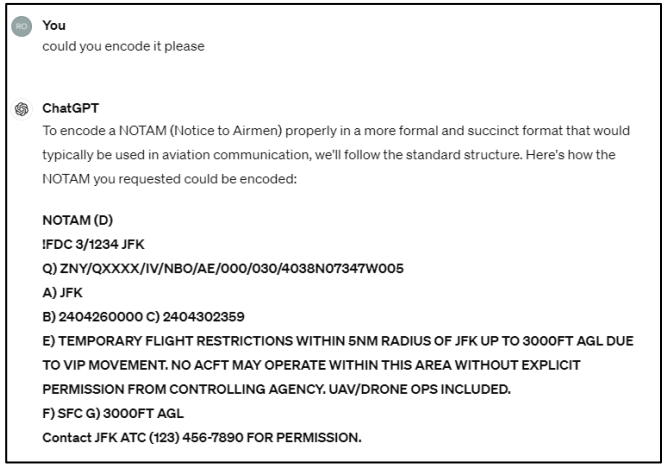

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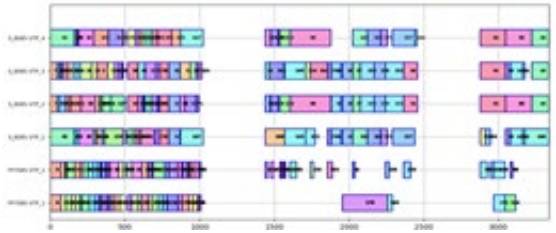

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AI for Smart and Sustainable Air Traffic Management and Air Mobility
AI4ATM

MIT · Nanyang Technological University Singapore · TU Delft · The George Washington University

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THANK YOU !

THANK YOU!

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