



ARTIFICIAL INTELLIGENCE MONTREAL & AEROSPACE

ELEMENT AI, THE BASICS AND WHAT IT ALL MEANS FOR THE AEROSPACE INDUSTRY

WHAT IS ELEMENT AI?



ELEMENT AI IS THE WORLD'S BIGGEST AND MOST INNOVATIVE AI APPLIED RESEARCH LAB.

Our team now includes a network of over 40 of the industry's most respected PHDs, software engineers and faculty professors.

We make it our mission to give organizations unprecedented access to cutting-edge research, expertise and the disruptive capabilities to deploy it within new commercial applications.

ELEMENT AI BRINGS **FULL-STACK CAPABILITIES** TO LARGE ORGANIZATIONS



THE TEAM



Gabriel Duford
VP Dev & Tech



Nicolas Chapados
Chief Science Officer



Yoshua Bengio
Co-founder/MILA



Jean-François Gagné
CEO



Anne Martel
VP Operations



Philippe Beaudoin
VP Research Group



Jean-Sébastien Cournoyer
Investment Community Advisor



OVER 40 EMPLOYEES
... AND COUNTING.



OVER 20 PHDs WITH COMBINED
H-INDEX OF 440+

THE FACULTY FELLOWS

15 AND COUNTING...



Aaron Courville
PhD



Christopher Pal
PhD



McGill



POLYTECHNIQUE
MONTRÉAL

LE GÉNIE
EN PREMIÈRE CLASSE



THE UNIVERSITY
OF BRITISH COLUMBIA



UNIVERSITY OF
TORONTO

HEC MONTRÉAL

THE DEEP LEARNING REVOLUTION

STARTED HERE, AT CIFAR



Yann Lecun
New York



Yoshua Bengio
Montreal



Geoffrey Hinton
Toronto

FUNDAMENTAL BREAKTHROUGHS

.....

2006

First successful recipe for training a deep supervised network.

2011 - 2012

First large scale development in industry.

2016 - 2016

Multiple significant advances in how we train models.



THE WORLD IS WATCHING

IN 2016, A DUTCH TV CREW SPENT 3 DAYS AT MILA TO CREATE A DEEP LEARNING DOCUMENTARY.

WHAT IS ARTIFICIAL INTELLIGENCE?



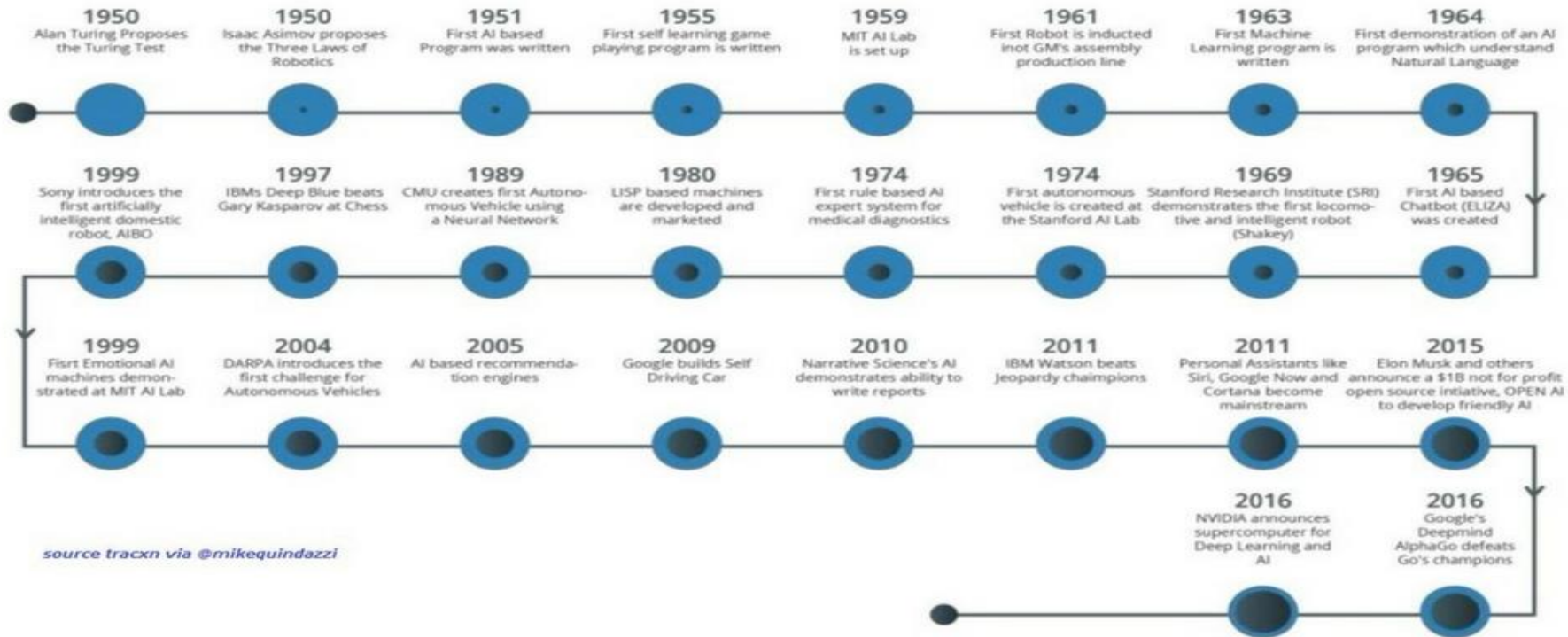
THE SCIENCE AND ENGINEERING
OF MAKING INTELLIGENT
MACHINES, ESPECIALLY
INTELLIGENT
COMPUTER PROGRAMS.

John McCarthy

Computer Scientist.

Coined the term Artificial Intelligence.

A BIT OF AI HISTORY...



source tracxn via @mikequindazzi

AI IS BOOMING.

BUT WHY NOW?

STORAGE

Our newfound ability to store massive amounts of data opens the door to tremendous advances in AI technology.

SPEED

Research and development is happening faster than ever.

DATA

Large sets of data are now openly available to train algorithms.

POWER

The recent surge in computing power means algorithms can grow, learn and improve at speeds never seen before.

A teal-colored background on the left side of the slide, featuring a complex, low-poly geometric pattern of interconnected triangles and polygons, creating a 3D effect with varying shades of blue and green.

AI SUB-FIELDS

- VISION
 - ROBOTICS
 - EXPERT SYSTEMS
 - PLANNING & OPERATIONS
- RESEARCH
- NATURAL LANGUAGE PROCESSING
 - MACHINE LEARNING

WHAT IS MACHINE LEARNING?



MACHINE LEARNING'S GOAL AND USAGE IS TO BUILD NEW AND/OR LEVERAGE EXISTING ALGORITHMS TO LEARN FROM DATA, IN ORDER TO BUILD GENERALIZABLE MODELS THAT GIVE ACCURATE PREDICTIONS, OR TO FIND PATTERNS, PARTICULARLY WITH NEW AND UNSEEN SIMILAR DATA.

Alex Castrounis
Founder.
InnoArchiTech

INDUSTRY IMPACT

Machine learning has great impact potential across industries and use case types

Impact potential
Low  High

Problem type	Automotive	Manufacturing	Consumer	Finance	Agriculture	Energy	Health care	Pharmaceuticals	Public/social	Media	Telecom	Transport and logistics
Real-time optimization	High	High	High	Low	High	High	Low	Low	High	High	High	Low
Strategic optimization	High	High	High	High	High	High	High	High	High	High	High	Low
Predictive analytics	Low	High	High	High	High	High	High	High	High	High	High	High
Predictive maintenance	High	High	High	High	High	Low	Low	Low	High	Low	High	Low
Radical personalization	High	Low	High	High	High	Low	High	Low	High	Low	High	High
Discover new trends/anomalies	High	High	Low	High	Low	Low	High	High	Low	High	High	Low
Forecasting	High	High	High	High	High	High	High	High	High	Low	High	High
Process unstructured data	High	High	High	Low	High	Low	High	Low	Low	High	Low	High

SOURCE: McKinsey Global Institute analysis

COMMON USES OF AI

ARTIFICIAL INTELLIGENCE ALLOWS FOR VASTLY SUPERIOR...

- AUTOMATION
- OPTIMIZATION
- PERSONALIZATION
- CLASSIFICATION
- PREDICTION
- DETECTION

A FEW EXAMPLES

Source: O'Reilly's *The Evolution of Analytics*

DRIVERLESS CARS

Automated emergency response systems can maneuver without driver input.

BANKING

New sources of Big Data help market new products, balance risk and detect fraud.

GOVERNMENT

Pattern recognition in images and videos enhances security and threat detection while transaction analysis can quickly spot health-care fraud.

MANUFACTURING

Pattern detection in sensor data or images can diagnose otherwise undetectable manufacturing defects.

RETAIL

Micro-segmentation and continuous real-time monitoring of consumer behaviour can lead to nearly instantaneous customized offers.

THE AI ICEBERG

ALPHAGO

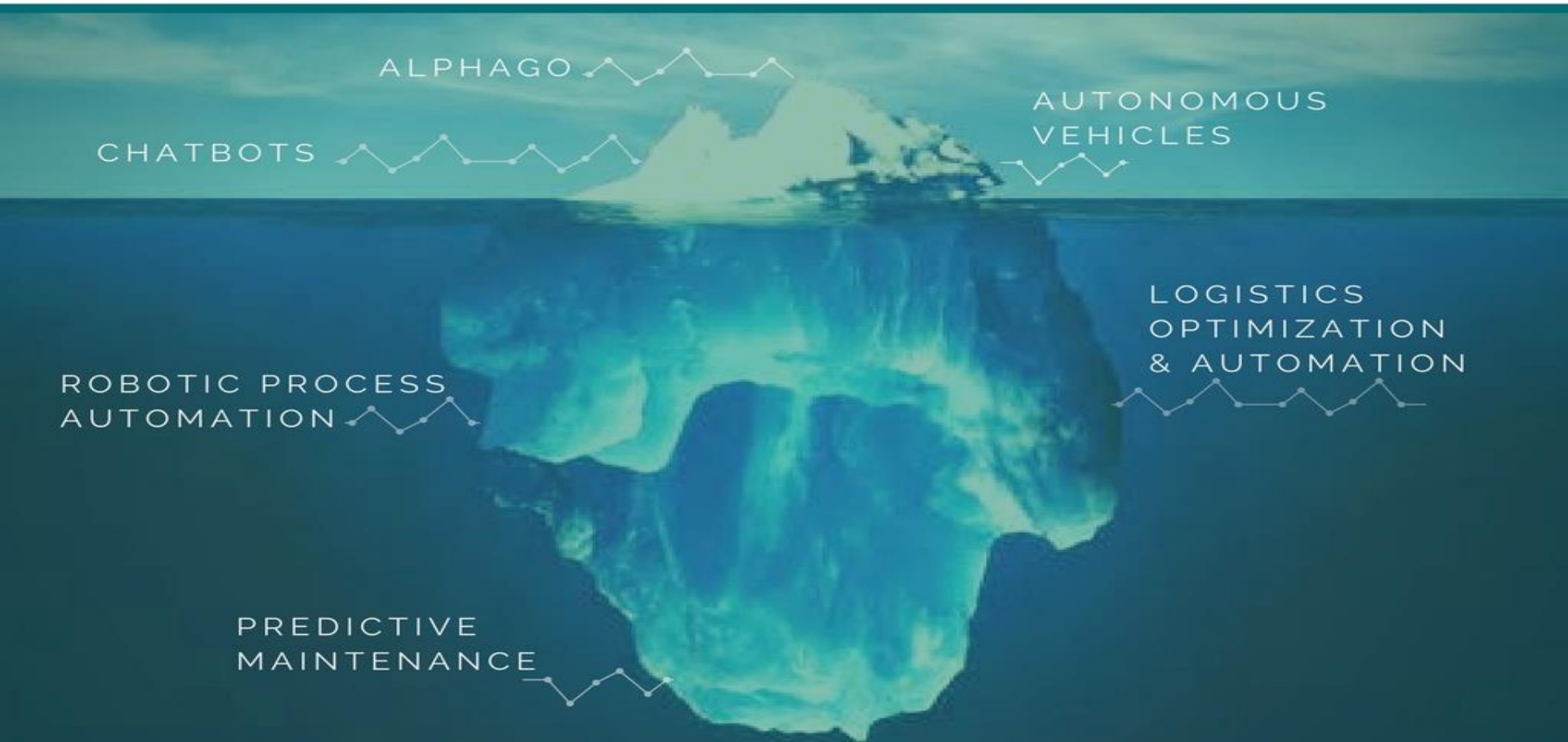
AUTONOMOUS
VEHICLES

CHATBOTS

ROBOTIC PROCESS
AUTOMATION

LOGISTICS
OPTIMIZATION
& AUTOMATION

PREDICTIVE
MAINTENANCE



HOW CAN AN AI PROJECT SUCCEED?

PRIORITY

Focus on using AI for big, fundamental problems or challenges as opposed to smaller, frivolous pet projects.

DATA

As data is at the very core of all AI, you'll need large quantities of clean, structured data for promising results and smaller error thresholds.

BUDGET

There are no two ways about it: artificial intelligence research, expertise and solution development requires funds.

BUY-IN

To succeed at an AI-First approach, you're going to need for your C-level execs to truly support and believe in the importance of adapting this new paradigm shift.



WHY CANADA?

AND MONTREAL.

- ACADEMIC RESEARCH STRUCTURES
- EXISTING TALENT POOL
- MATURE START-UP ECOSYSTEM
- FUNDING & INVESTMENTS
- INDUSTRY SUPPORT
- GOVERNMENT SUPPORT



MONTREAL LANDSCAPE

- Yoshua Bengio - UdeM Pioneer
- Impressive research ecosystem - MILA/IVADO
- Massive investments - Google/Microsoft

TIME FOR AN AI-FIRST STRATEGY



IN THIS NEW AI-FIRST WORLD, WE NEED TO DESIGN FOR
SYMBIOTIC AI-HUMAN EXPERIENCES.

A GOOD GUIDING PRINCIPLE IS TO DESIGN FOR THE PERSON
YOUR USER WANTS TO BE, WHILE BEING FLEXIBLE AND
HUMBLE.

Masha Krol

UX Designer. Element AI

INFO

STRATEGY = ←

MEASURING ROI

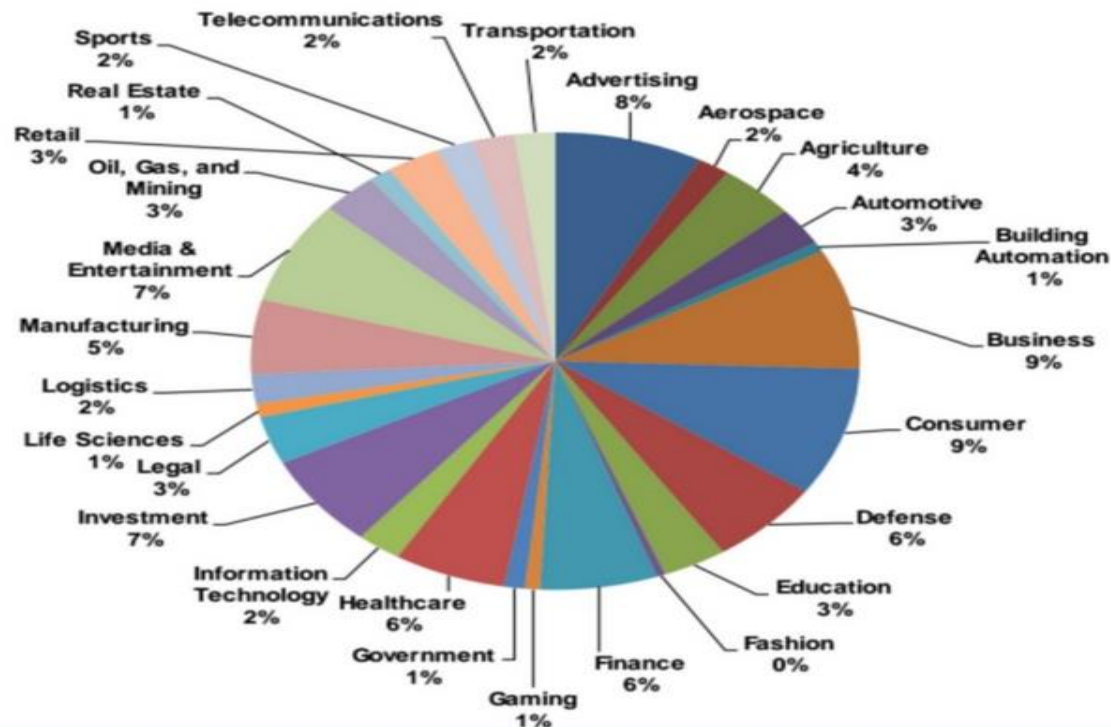
ON AN AI-FIRST PROJECT

- NEW REVENUES new products, expanded sales, customer retention etc.
- COST SAVINGS fraud reduction, optimized resource management etc
- BUSINESS CONTINUITY
- COMPETITIVE ADVANTAGE
- KNOWLEDGE TRANSFER
- OPTIMIZED COORDINATION & EFFICIENCY improved processes
- POSITIVE SOCIAL IMPACT

THE FUTURE

NO INDUSTRY LEFT UNCHANGED

Chart 2.5 Artificial Intelligence Revenue Share by Industry, World Markets: 2025





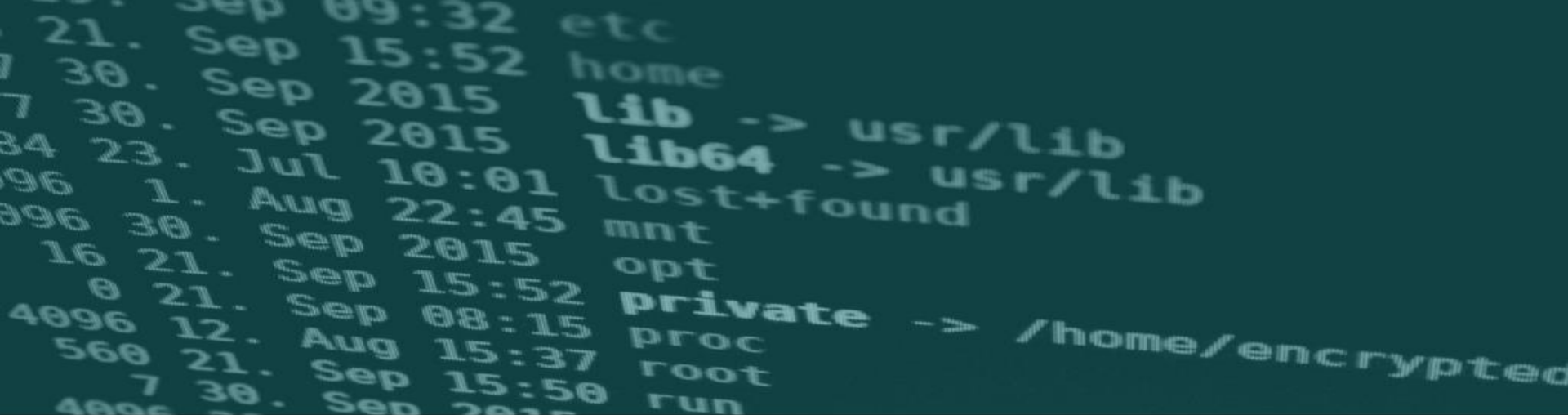
AEROSPACE INDUSTRY EXAMPLES

HOW AIRBUS IS LEVERAGING AI

By using neural networks for intelligent maintenance Airbus has...

Increased flight efficiency and optimized fuel consumption

Adjusted helicopter rotor blades faster and more accurately



DISCOVERING PATTERNS IN DATA

Discovering previously unknown root causes by establishing correlations that a human would never come up with.

IBM Watson determined the precise relationship between the temperature and early wear of brakes which allows Airbus to develop prognostics that help airlines avoid delays.

A350 XWB aircraft has some 50,000 sensors on board and collects 2.5 terabytes of data every day. If you let AI loose on this data, then problems and correlations can be recognized faster.

OTHER POTENTIAL APPLICATIONS

TRAFFIC CONTROL

AI can increase safety in our overcrowded airspaces by supporting air traffic controllers with imaging using optimization toolboxes to suggest efficient airport traffic scheduling

PERSONALIZATION

We've all sat beside someone interesting on a flight. What if who we sit beside to in a plane wasn't left up to chance? Airlines can seat people whose profiles are compatible next to one another.

VIRTUAL ASSISTANTS IN MANUFACTURING

After learning from blue collar workers on the shop floor, they could alter manufacturing and maintenance by providing assistance and even making recommendations.

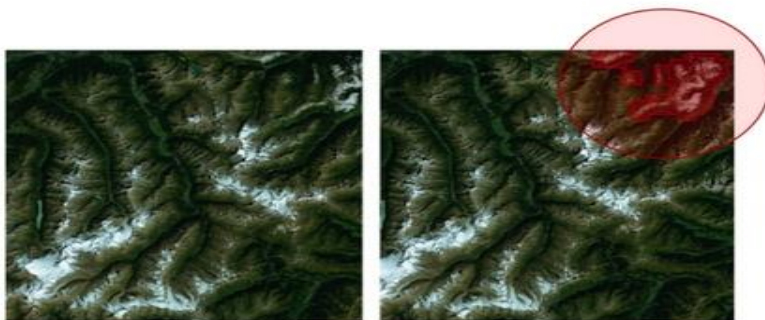
DATA-DRIVEN ADAPTIVE TRAINING

Gnōsys-equipped simulators become smart training devices capable of reducing training time and associated costs. Trainees gain confidence and expertise faster. <http://paladin-paradigm.com>

IMAGE RECOGNITION

'One Atlas' is the world's freshest satellite image library.

Before images from space end up in the database, clouds need to be identified and removed. This is difficult to determine, even for the human eye, whether a particular area on a satellite image is cloud or snow.



Using deep learning algorithms, otherwise unidentifiable clouds have been located in this satellite image .



THOR

THE VERY FIRST AI-PILOTED, 3D-PRINTED AIRCRAFT

AI technology could potentially be used in a passenger plane in instances when the pilots are unable to fly due to a fall in cabin pressure. **This is the moment when AI would calmly take over** making the most appropriate decision without panicking.

Autonomous takeoff, control, and GPS systems have existed in commercial aircrafts for multiple decades. New AI capabilities include robust visual recognition (object recognition, scene recognition) and big data-driven anomaly detection.

For example, to land a plane safely, AI must be able to correctly identify whether the terrain is suitable for landing or whether what is in front of it is actually a body of water using optical-recognition scanners and lasers



WHERE ARE WE HEADED?

AUTONOMOUS PLANES

We already have semi-self-driving airplanes. We call the devices autopilots, which have been in use for a long time. These will keep improving and gradually yield a higher degree of automation. It's very likely that we will see self-flying parcel delivery UAVs in the next ten years.

SELF-HEALING PLANES

Evidence-based predictions of what may not be working right tomorrow, to enable preventive inspection or replacement before a failure, and hence to lower costs of coping with real unscheduled failures and to increase safety.

DRIVERLESS FLYING TAXI SERVICE - Dubai

The drones, referred to as Autonomous Aerial Vehicles (AAV), are an easy-to-use innovation that can transport up to 100 kilograms -- enough for one person and a suitcase -- on a pre-programmed route through the city.



THANK YOU

QUESTIONS. COMMENTS. FEEDBACK.

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OMICHILD