ISO / IEC AI Workshop Series

Inaugural Workshop

Wael William Diab
ISO/IEC JTC 1/SC 42 Chair
ISO/IEC AI Workshop Chair

ISO JTC1 IEC
INFORMATION TECHNOLOGY STANDARDS

SC 42 – Artificial Intelligence

Welcome

Thank you for participating!

Participation Guidelines

Please use the Q&A function for questions

Please *do not use the chat function* for questions

This webinar is being recorded and will made available

Please keep your video off and audio muted unless speaking

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SC 42 – Artificial Intelligence

Acknowledgments

Program Committee

- Heather Benko
- Norbert Bensalem
- Andrew Dryden
- Peter Deussen
- Rohit Israni
- Mike Mullane
- Catherine Nelson
- Wael William Diab

ISO

- Elisabeth Gasiorowski
- Catherine Infante
- Vivienne Rojas

IEC

- Stephen Dutnall
- Gabriella Ehrlich
- Ian Gardner
- Giulia Pizzi
- Laura Rocha

Program

SESSION 1

(24th May 13:00 – 16:00 UTC)

- Opening Remarks
- AI Applications
- Novel AI Standardization

SESSION 2

(25th May 05:00 – 08:00 UTC)

- Opening Remarks
- Emerging AI Requirements
- Emerging AI Technology Trends

SESSION 3

(25th May 22:00 – 26th 01:00 UTC)

- AI Applications
- Novel AI Standardization
- Closing Remarks

Session 1

Program	Talk Title	Track Chairs	Aprox Start Time (UTC)
Kickoff			13:00
Wael William Diab			
Opening Remarks			13:05
Gilles Thonet			
Phil Wennblom			
AI Applications		Rohit Israni Catherine Nelson	13:15
Mike Glickman	Health informatics and AI, the road to Interoperability		
Neil Frost	AI potential Applications in Transport		
Christophe Preube	AI finds awareness in standardization work – the White paper of ISO/TMB SMCC		
Novel AI Standardization Approaches		Peter Deussen Norbert Bensalem	14:25
Kimberly Lucy	Creating Trust in AI Through Standards: A Management System Approach		
Wo Chang	Data Quality for Analytics and Machine Learning		
Tim McGarr / Florian Ostmann	AI Standards Hub (UK)		
Viveka Bonde	Novel Standerdization Approach to AI Ethics		

Session 2

Program	Talk Title	Track Chairs	Aprox Start Time (UTC)
Kickoff		N/A	5:00
Wael William Diab			
Opening Remarks		N/A	5:05
Silvio Dulinsky			
Emerging AI Requirements		Catherine Nelson and Peter Deussen	5:10
Elham Tabassi	NIST AI Risk Management Framework		
Mariagrazia Squicciarini	The UNESCO Recommendation on the Ethics of AI - Setting the standards for a better and more inclusive future		
Liz Coll	Can standards deliver consumer trust and confidence in AI		
Daniel Loevenich	Evaluation Standards for Conformity Assessment of Trustworthy Cloud-based AI Applications		
Emerging AI Technology Trends		Norbert Bensalem and Rohit Israni	6:30
Shubhashis Sengupta	Emerging AI Trends – as seen by an Industry Practitioner		
Tilak Kasturi	How specialized AI drives value for Automotive Service Organizations		
William Uppington	AI Quality: The Next Big Challenge in AI		
Babak Hodjat	From Data to Decisions, and Back		

Session 3

Program	Talk Title	Track Chairs	Aprox Start Time (UTC)
Kickoff			22:00
Wael William Diab			
AI Applications		Rohit Israni and Catherine Nelson	22:05
Charalambos Freed	Safety considerations in autonomous products		
Hajime Yamada	Development of SRD 63416 “Ethical Considerations of AI when Applied in the AAL Context”		
Kenzo Nonami	AI Powered UAV and Future Prospects		
Fumihiro Maruyama	Use cases and AI application guidelines in international standardization		
Novel AI Standardization Approaches		Norbert Bensalem and Peter Deussen	23:30
Jochen Friedrich	AI Standardisation supporting regulatory needs		
Linzhing Meng / Mike Thieme	Developing a TS on assessment of machine learning classification performance		
Yonosuke Harada	Introduction of Governance Implications of AI Systems		
Paul Cotton / Milan Patel / Wei Wei	The foundational standards for AI – ISO/IEC 22989 and ISO/IEC 23053		
Closing Remarks		Wael William Diab	0:55
Wael William Diab	Overview and introduction of SC 42		
Program Committee	Insights from the workshop		

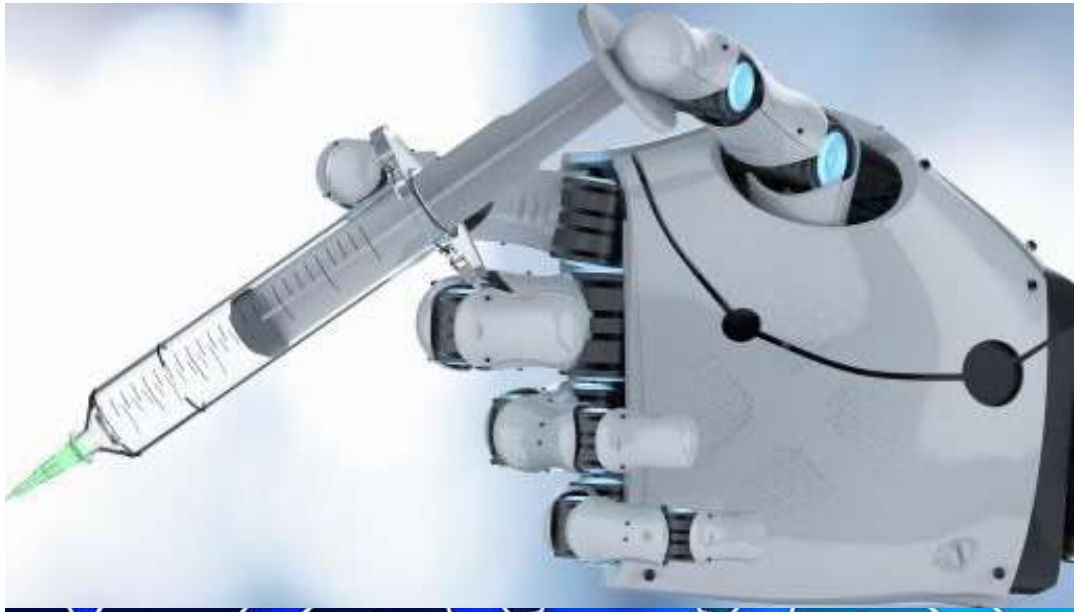
Thank you

Wael William Diab

wael.diab@gmail.com; Wael's LinkedIn

Workshop Website

ISO/IEC AI LinkedIn Page



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Safety considerations in autonomous products

Charalambos Freed

Vice President Nilfisk A/S

Member IEC ACOS TF
Collaborative Safety

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Introduction

From manual to autonomy

The evolution in technology and introduction of intelligent systems leads to new solutions which need a framing from safety perspective to create trustworthiness.

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Nilfisk – Charalambos Freed

- Vice President – Head of Standardization and Government Relations
- Chairman Technical Committee EUnited Cleaning
- Chairman Arbeitskreis Technik VDMA FV Reinigungssysteme
- IECEX Management Committee – Head of Greek Delegation
- Member WG Testing Bundesverband Deutsche Industrie
- IEC Member ACOS TF Collaborative Safety
- IEC Secretary SC 61J
- IEC Convenor TC 31 JMT62784
- IEC Secretary TC 61 WG44
- IEC Secretary TC 61 WG49
- IEC Convenor SC 61J MT 03
- IEC Convenor SC 59F WG 06
- Chairman CSA C234
- CLC Convenor TC 61 WG 6 + WG 10
- CLC Convenor TC 59 X WG 06-03+04
- CLC Convenor TC 31 WG 24
- Issue Manager EN 60335-2-67, -68, -69, -72, -79, EN 62784
- DKE Convenor AK 513.7.10
- IEC 1906 Award Winner

Environment / Circular Economy

Safety ⟷ Performance

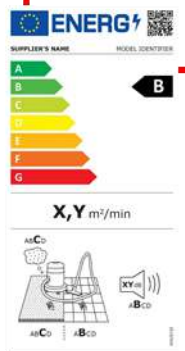
- Hazardous substances
- Waste
- […]

Partially

Ecodesign Directive

- Repair
- Recycle
- Refurbish
- Remanufacture
- Upgrade
- Add. Durability

[…]



Safety

Safety ⟷ Performance

Directives:

- Machinery
- Product Liability
- Explosive atmosphere
- Outdoor Noise

[…]

Digitization/Digitalization

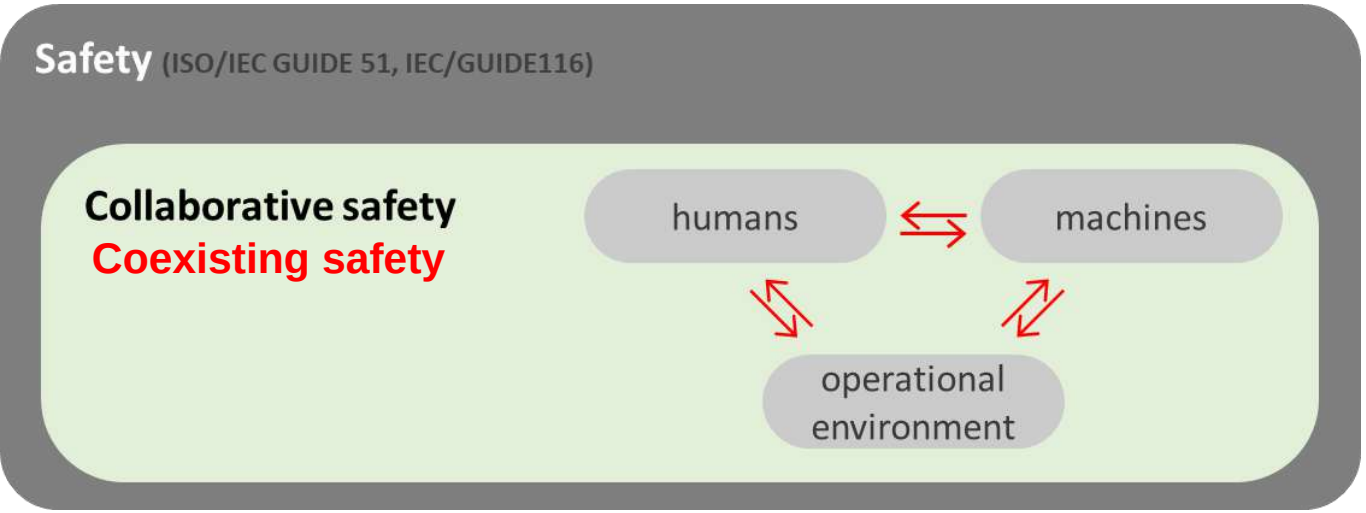
Safety ⟷ Performance

- Cybersecurity Act
- General Data Protection
- Artificial Intelligence
- IoT modules in machines
- […]

OT vs IT

- Machine Safety
- Cloud Data

New trends impacting safety



- Intelligent systems: primary drivers of digital transformation.
- Collaboration vs Coexistence: safety considerations
- Concerns: privacy, data integrity, safety, security, transparency and trustworthiness of new technologies.

Projects related to collaborative safety
ACOS 2nd survey among safety related TCs

- Interest
  - Coexistence first + collaborative safety in certain applications; assisted remote operation, automated decision making
- Challenges
  - Hazard-based design, self-detection of faults
  - New user/operator training information including public users
  - Maintenance; human factors
  - Risk management during use phase
  - Adaptation of functional safety technics
  - Identify applicable machine learning technics including statistics
  - Conformity assessment

ACOS task force
SMB decision 170/16

- Assess the evolution of technical development and standardization in this field
- Perform a gap analysis of any missing work
- Recommend to SMB future standardization work and roadmap
- Collaborate with ISO in this area

IEC SC 61J: commercial/industrial cleaning equipment

Standardization

Safety

Professional

EMC (RE-D) MD (ATEX, PE-D)

Industrial Commercial





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Transformation of machine: from manual to autonomous mode

manual

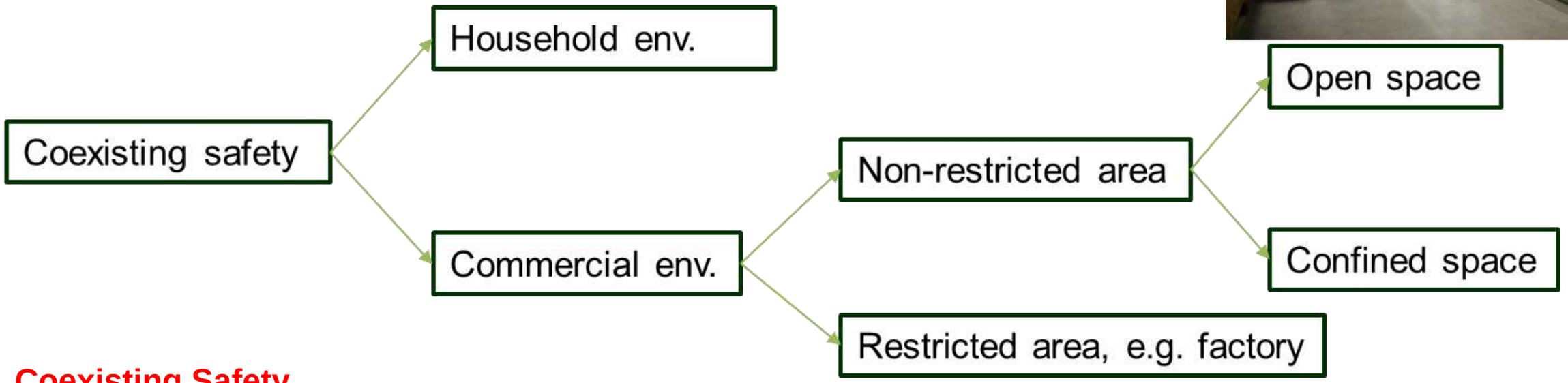
„magic addition“

autonomous

„Magic ingredients“

Parameter		
	Manual	Autonomous
Electrical and mechanical safety	Y	Y
EMC requirements	Y	Y
Attended machine	Y	**N**
Additional requirements as unattended machine on • motor, • plastics, • hardware, **software**, • environment.	-	Y
Obstacle and drop-off detection	-	Y

Environment: coexisting safety



Coexisting Safety

machine ensured safety, where humans share the same physical space with automatic / autonomous machines (robots, mobile robots), but generally act independently or with different tasks.

Collaborative Safety

machine ensured safety, when humans perform intended mutual actions together with automatic / autonomous machines (robots, mobile robot) to accomplish a common task

Environment: coexisting safety

- Commercial area: open space, dynamic environment, vulnerable people
- Person stands/lays/runs in front of machine.
- Person climbs onto the operator platform and/or pushes buttons.
- Person approaches from side.
- Machine heads towards drop-off.

IMPORTANT:
Intentional movements of persons towards the appliance in order to harm themselves, is **not covered.** The result would be a static appliance…

Route on getting the safety up and running

Liaison Officer IEC TC 61 → ISO TC 299: Mr. Dejun MA (CN)
Liaison Officer IEC SC 61J to ISO TC 299: Mr. Charalambos Freed (GR)

IEC TC 61 WG 44: Safety of robots for household and similar use
Chair: Mr. Dejun MA (CN); **Secretary:** Mr. Charalambos FREED (GR)
Standard: Draft based partially on IEC 63327

IEC SC 61J MT 3, IEC 63327: Safety standard for autonomous commercial floor treatment machines
Chair: Mr. Charalambos FREED (GR)
Secretaries: Mr. Kenneth WILLS (US); Mr. Leonard LETEA (CA)
Standard: IEC 63327; based on CSA/ANSI C22.2 No. 336-17

CSA C234: Safety electrically operated appliances
Chair: Mr. Charalambos FREED (CAN)
Standard: CSA/ANSI C22.2 No. 336-17

Commercial environment

Type and purpose of safety-critical function (SCF)	Minimum required performance level (PL) as described in ISO 13849-1	
	Type 1 machines	Type 2 machines
Drop-offs detection	PL = d	PL = d
Prevent intrusions into stopping/contact zones to prevent crushing + collision	PL = b	PL = d
Prevent exceeding autonomous mode speed	PL = b	PL = d
Provide locked state of drive wheels	PL = b	PL = b
Provide desired (emergency) switch-off	PL = b	PL = c
Provide desired stop category 0, 1, or 2	PL = b	PL = d

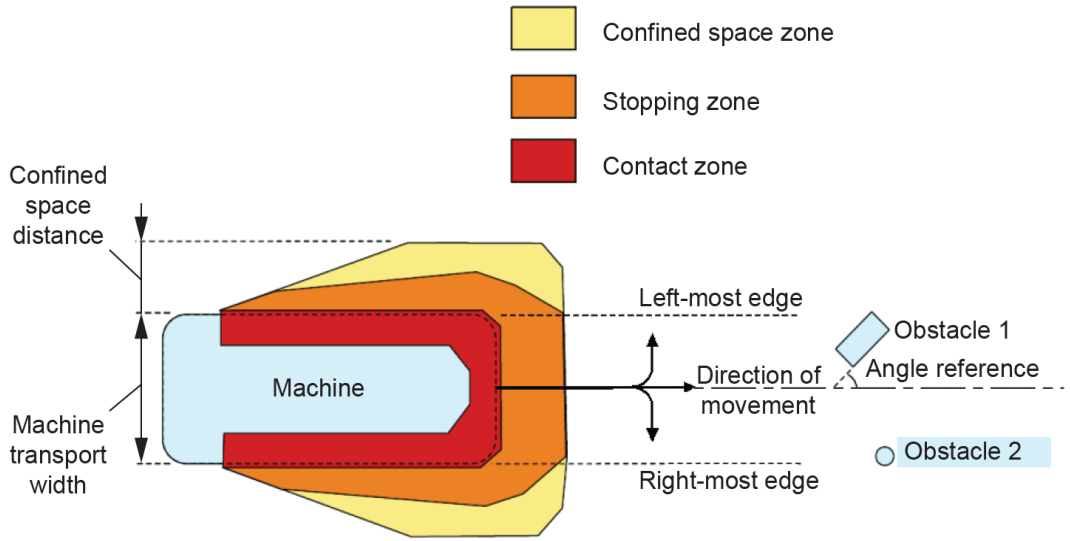
type 1 machine: velocity max. 3 km/h, height max. 50 cm and weight max. 20 kg
type 2 machine: other than a **type 1 machine**

PL and definition

ISO 13482: Robots and robotic devices — Safety requirements for personal care robots

Tests

Autonomous test – start appliance



Starting of motor-operated appliances

- Initial start-up/restart: passcode/key-protected control device, or equivalent.

General conditions for the tests: Obstacles detection in direction of motion

- Obstacles covered in black felt/coarse fabric. Reflectance between 5 - 10%:
  - obstacle 1 - cylinder Ø 200 mm + length of 600 mm, placed horizontally; obstacle 2 - cylinder Ø 70 mm + height of 400 mm, placed vertically.
- Lighting levels between 100 - 1000 lx.
  - In alignment with IEC TS 61496-4-2 and /-3 - Safety of machinery – Electro-sensitive protective equipment

Autonomous test – drop off

- Protection against drop-offs, e.g, staircases, unprotected drop-offs, in all travel directions.
- Test surface 11 ± 1 cm above adjacent surface.
  - Test conducted under most unfavourable conditions, based on sensor positions,
    - both starting from rest and in motion towards the abrupt surface elevation change.

Autonomous test – speed and stopping distance

Speed

Autonomous mode, open space environment, max. 6 km/h; confined space environment, max. 4 km/h.

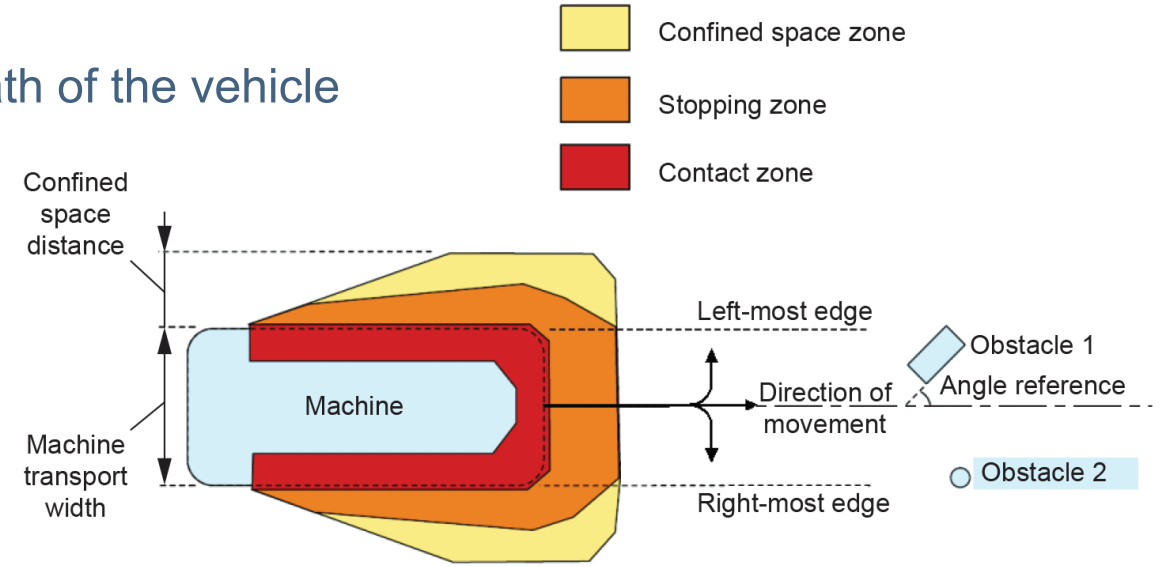
Stopping Distance

Measured with maximum rated automatic speed of machine in direction of test.

NOTE Stopping distance is based on a reaction time below 0,5 seconds.

Autonomous test – obstacle detection

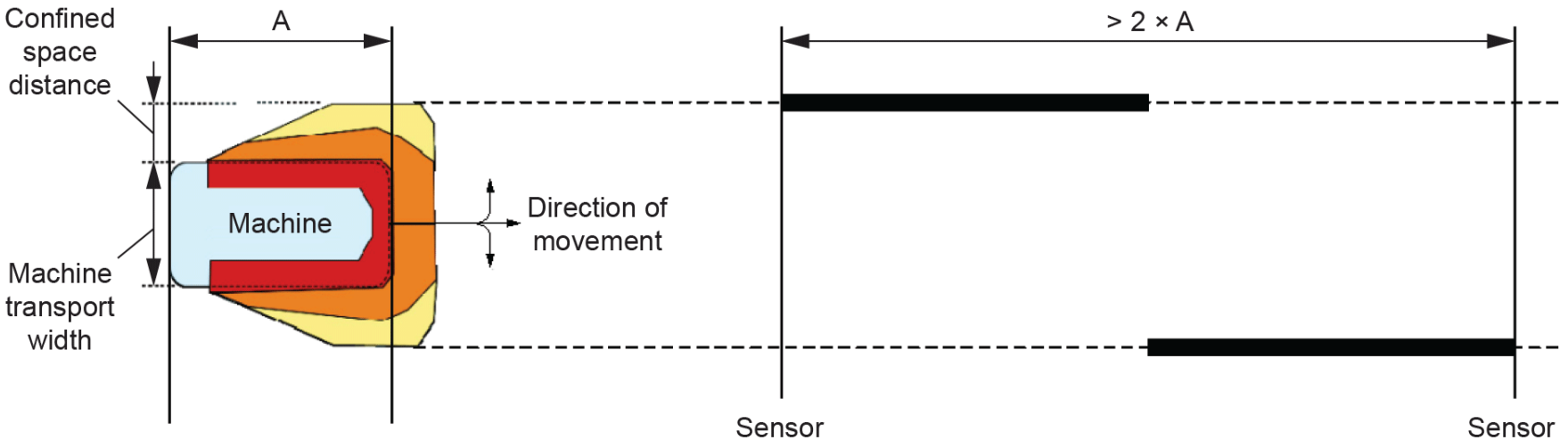
- **Initial start-up**
- Both obstacles in **contact** with machine in potential areas of motion → avoid contact.
- Objects **entering stopping zone**: either stop category 2 or obstacle avoidance
- Test obstacles in front of the machine; speed: Confined space + rated autonomous.
- Test obstacle 1: Laying down at 0°, 45°, and 90° to the path of the vehicle
  - @ > safe stopping distance
- Test obstacle 2: Set vertically at angles as above.
  - @ safe stopping distance range



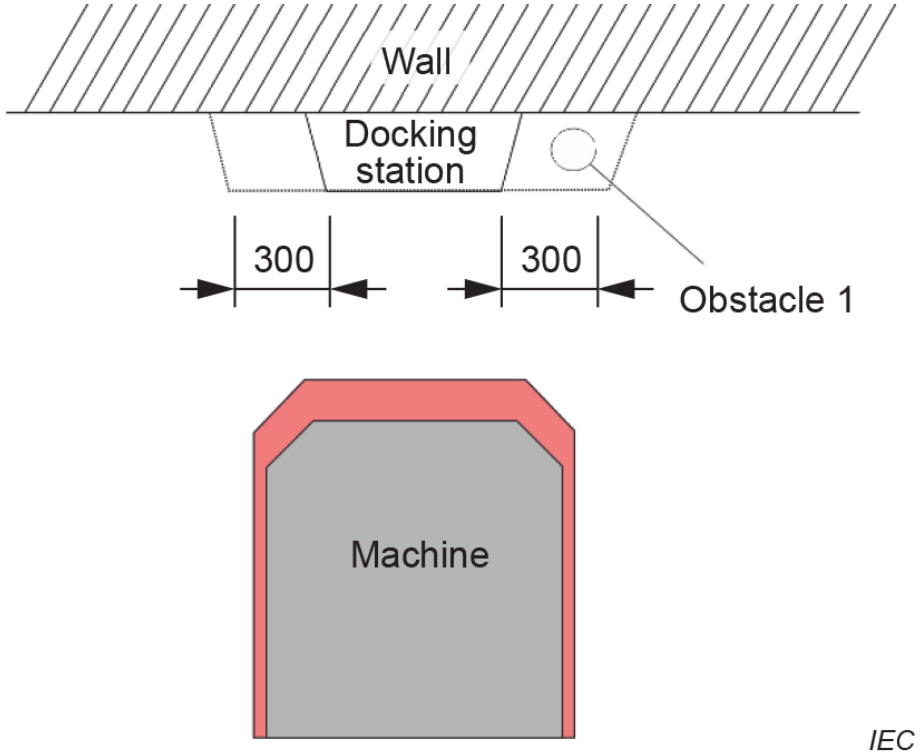
(illustration purposes only)

Autonomous test – confined space

- Two continuous walls or obstacles, each with a minimum length equal to the machine transport length and a minimum height of 1 m.
- Sensors are allocated at each end of the test area to measure the start and finish of the machine traversal (speed).
- Machine (GVW rating) moves with maximum open space speed and enters the confined space test area.
- Measured over three successful speed measurements.



Docking Station



IEC

Test setup:

- Modification of IEC 60335-1;
- Safety distances given in ISO 13857:2019
- During Docking process: acoustic or visual warnings,
- Velocity max. 0,05 m/s,
- Max. 0,2 m in linear direction to complete docking process,
- equipped with a detection system
- Back-siphonage: modification of IEC 61770;

Adding more „intelligence“

- Adding Artificial intelligence to enhance productivity / safety and reduce design complexity
- However,
  - Method needed to assess dependability to receive transparency and predictability of algorithms

Software and communication

- **Software** architecture, safety, error avoidance, updates, security/data integrity, remote communication →
  - **Annex R and U** with additional references to applicable standards
- **Attended vs unattended** appliances: additional safety requirements

IEC

IEC 60335-1

Edition 6.0 2020-09

Annex R
(normative)

Software evaluation

Annex U
(normative)

Appliances intended for remote communication through public networks

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IEC 60335-1 - excerpt

- 22.46 If programmable protective electronic circuits are used to ensure compliance with this standard, the software shall contain measures to control the fault/error conditions

  → Annex R

- 22.62 Remote communication through public networks shall not impair compliance with this standard.

  → Annex U

IEC 60335-1 - excerpt

Annex U
(normative)

Appliances intended for remote communication through public networks

The measures given in this annex are intended to avoid unauthorized access and the effects of transmission failures via **remote communication** through **public networks**, where compliance with this standard could be impaired.

However, in general, it does not cover aspects concerning confidentiality of data and consumer privacy.

IEC 60335-1 - excerpt

U.3.2 Remote communication shall be established, implemented and terminated by the appliance via software that provides

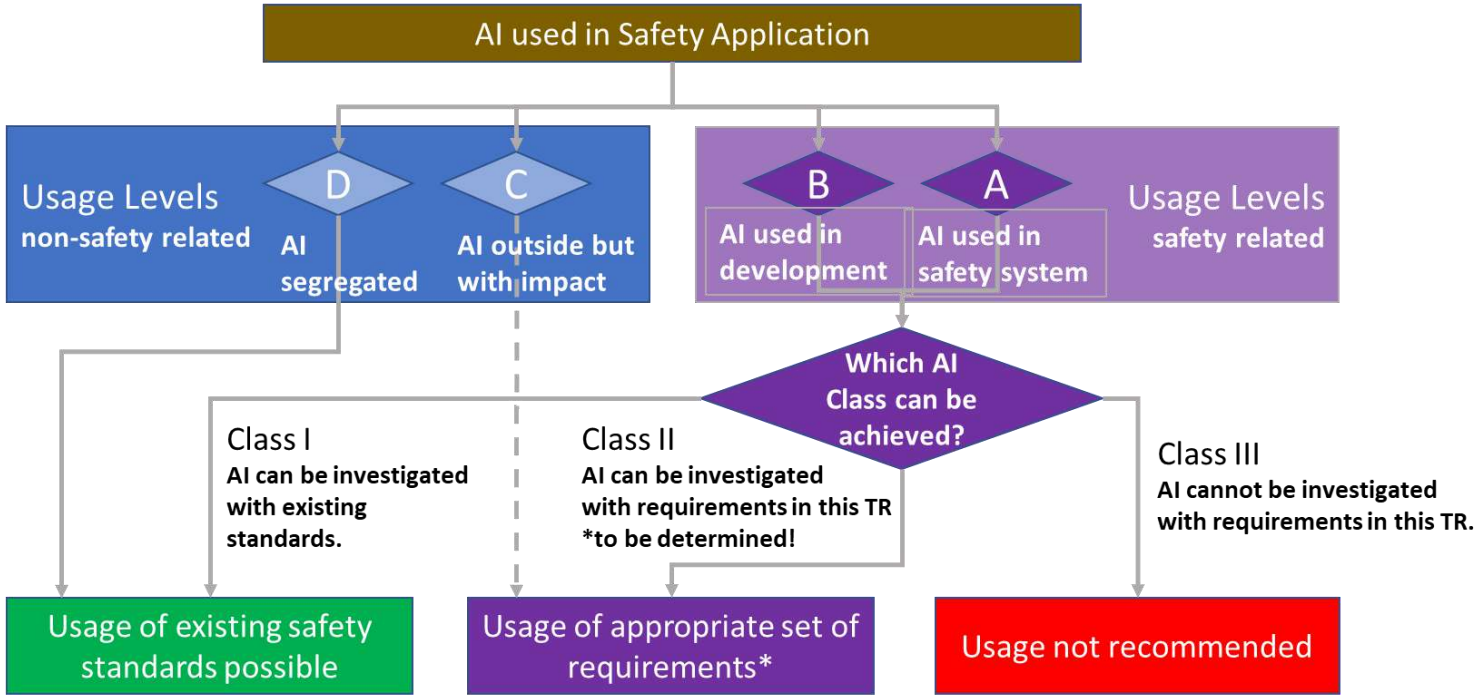
- data integrity protection concerning:
- data corruption;
- address corruption;
- wrong timing or sequence;

U.3.6 The safe operation of an appliance shall not depend on remote communication.

Compliance is checked by evaluation according to U. 3.2. In case of doubt, remote communication shall be rendered inoperative for the relevant tests of this standard.

Classifications

ISO-IEC TR 5469 proposes a classification scheme for AI used in safety related applications



Important: The set of requirements for ISO-IEC TR 5469 will be new and independent.

Thank you

Charalambos Freed

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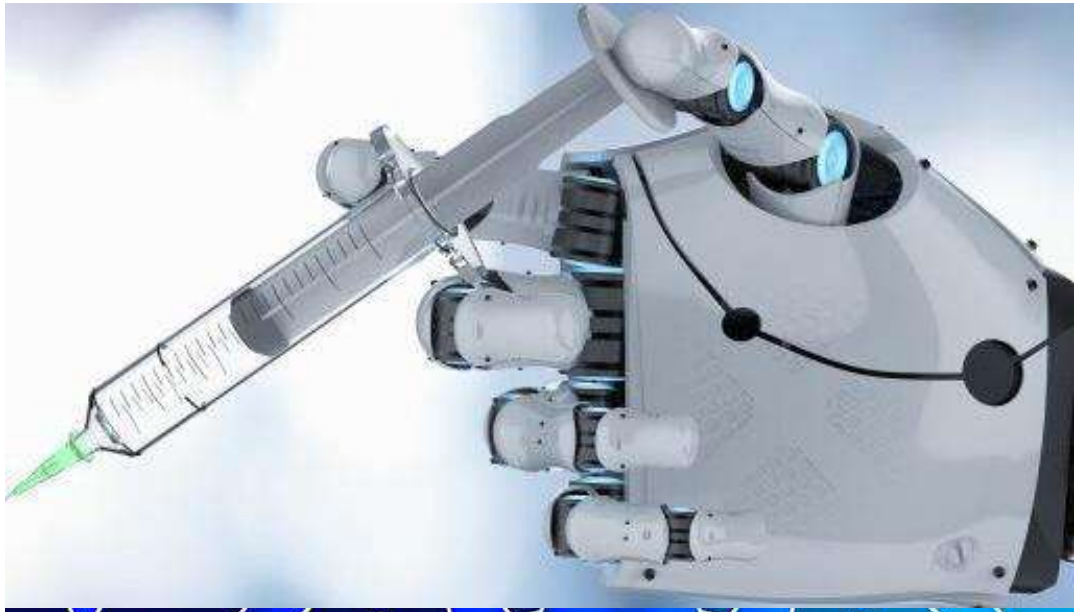
Nilfisk.com



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Development of SRD 63416 “Ethical Considerations of AI when Applied in the AAL Context”

Hajime Yamada

ISO JTC1 IEC
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Hajime Yamada

- Professor Emeritus of Toyo University, Japan
- HoD for Japan to IEC System Committee AAL (Active Assisted Living)
- HoD for Japan to ISO TC 314 (Ageing Societies)

Population ageing and the value of AAL

- **The global population is ageing.**
- *“United Nations World Population Prospects 2019”*
- *In 2018, for the first time in human history, persons aged 65 years or over outnumbered children under five years of age worldwide.*
- *In 2050 the 1.5 billion people aged 65 years or over worldwide will outnumber adolescents and youth aged 15 to 24 years (1.3 billion).*

- Reducing the burden of long-term care for older persons becomes a major policy issue in every country. **Active Assisted Living (AAL) systems help older persons' daily living so that they can live independently as long as possible.** AAL can be a solution to population ageing.

What AAL can do

- **For the well, AAL can provide an increase in**:
  - Convenience
  - Time-saving
  - Self-reliance
  - Ability to monitor their own health
  - Enjoyment of life

- **For the vulnerable, AAL can reduce**
  - Fear - of falls, of adverse events, of dying and no-one knowing
  - Frustration - the loss of ability to do ordinary tasks
  - Forgetfulness - medication, appointments, cooking, location…
  - Social isolation

Establishment of IEC SyC AAL in 2015

- The Systems Committee shall:
- Create a vision of Active Assisted Living that takes into account the evolution of the market
- Foster standardisation which: enables usability and accessibility of AAL systems and services
- **Enables cross-vendor interoperability of AAL systems, services, products and components**
- **Addresses systems level aspects such as safety, security and privacy**
- Communicate the work of the SyC appropriately to foster a strong community of stakeholders

Organization and participation in IEC SyC AAL

Chair: U. Haltrich (DE)/Sec.: M. Siket (CO)

- 14 P members: CA, CN, FR, DE, IN, IT, JP, KR, NL, NZ, SE, CH, GB, US
- 12 O Members: AT, BE, HR, CZ, DK, FI, HU, MY, NO, RU, SG, ES

- AG 1: Chair's Advisory Group
- JAG 8: Joint Advisory Group linked to TC 100 and TC 124

- WG 1: User Focus
- WG 2: Architecture and Interoperability
- WG 3: Quality and Conformity assessment
- WG 4: Regulatory Affairs
- WG 5: AAL in the connected home environment
- WG 7: Cooperative multiple systems - Functional safety
- MT 6: IEV - Part 871

AAL use case two-dimensional classification

- **Use case category**
  - Prevention and management of chronic long-term conditions
  - Social interaction
  - Mobility
  - Health & wellness
  - (Self-)management of daily life activities at home
- **AAL care recipient's level of assistance**
  - Level 0: Independent
  - Level 1: Some assistance
  - Level 2: Assistance with IADL (transportation, housekeeping, medication management, etc.)
  - Level 3: Assistance with ADL (walking, bathing, grooming and getting dressed, continence and eating, etc.)

AAL use case examples

- **Personal Health check**
- The care recipient wears, or is monitored by, sensors that collect vital signs and transmit these to a monitoring centre. The system uses AI to monitor the incoming data, assesses any changes in ongoing physical or cognitive health or potential concerns, notifies the user and/or physician of these concerns.

- **Wandering Detection and Diversion (WDD) for persons with Dementia**
- In some cases persons with dementia are exit seeking and frequently try to leave their residences. … A WDD system may interact with the person to dissuade them from exiting (e.g. encourage a return to bed during the night). …

Cost effectiveness of AAL system

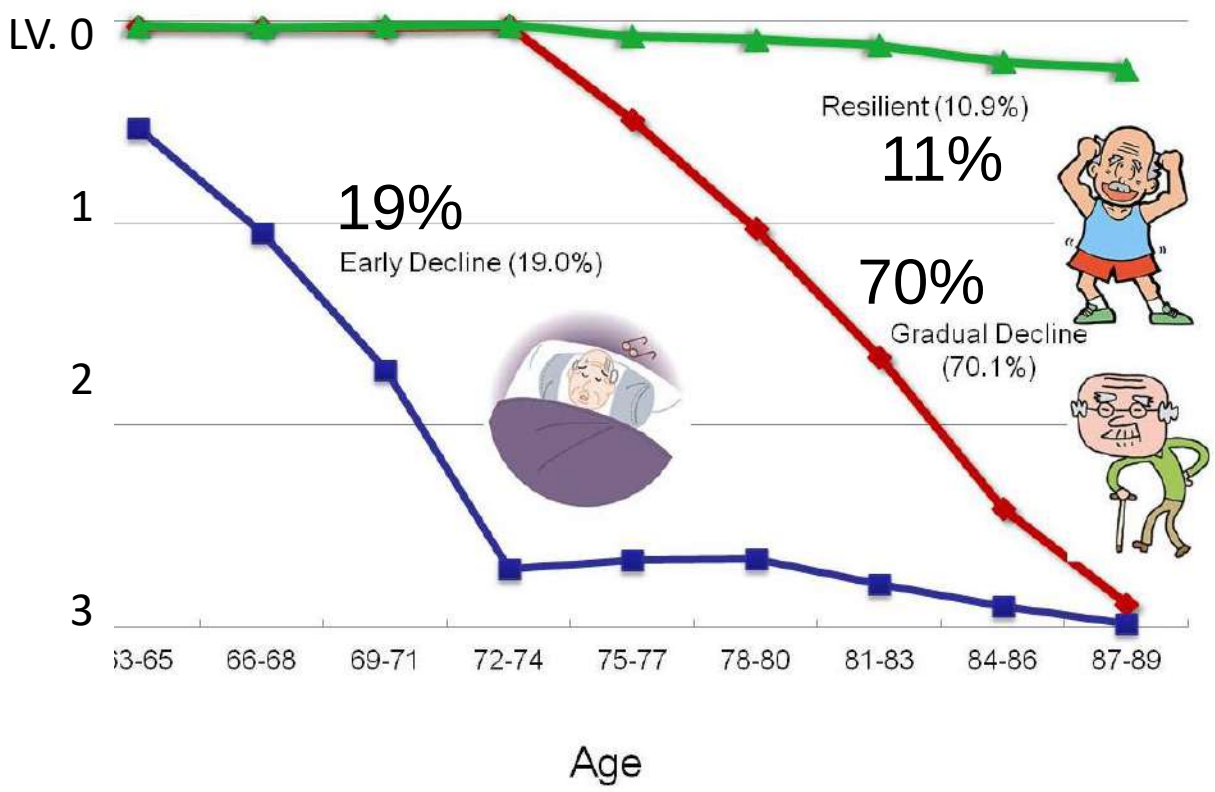
(IEC SRD 63234-2:2020)

- In case of potential concerns, “Personal Health check” system displays an ‘Alert’ to a Clinician/Nurse at the centre.
- If deemed appropriate, the Clinician/Nurse will contact the patient or dispatch a homecare nurse to visit the patient.
- Cash Flow Analysis Scenario A – **Ramp up to 100,000 patients in five years demonstrates Return on Investment of 172%.**
- Cash Flow Analysis Scenario B – Ramp up to 10,000 patients in five years demonstrates Return on Investment of 147%.

Changing conditions of AAL care recipients

- The AAL care recipients' conditions change over the years.
- With this change, **the degree of physical activity may decline and simultaneously their cognition and self-judgment ability may also decline.**

- *Cluster analysis on aging of Japanese male (H. Akiyama)*



Considerations necessary in the context of AAL: Prior consent

- Since many AAL systems use the user's personal data to provide services to the AAL care recipient, the consent should be obtained in advance regarding the use of AAL system.
- **No matter what level the AAL care recipient is, the principle of protecting the dignity of that person shall not be violated.**
- For level 0 AAL care recipient, the prior consent of the user can be obtained without problem.
- In the case of Level 3 AAL care recipient, it is appropriate to seek the **consent of not only the AAL care recipient but also of designated parties such as family members or other substitute decision makers.**

Considerations necessary in the context of AAL: Autonomy or safety

- All individuals have the right to engage in activities that may put themselves at risk.
- However, as cognition declines, users may make a request of a system that puts their own safety at a higher level of risk and the **AI must determine if the level of risk is still appropriate before acting while maximizing the user's autonomy.**

- The AAL care recipient requests assistance to go for walk outside on a cold day,
- **the AI system must decide:**
  - to allow this request without notification to other family members (respecting autonomy and privacy); or
  - to reject this request for the safety of the AAL care recipient.

Considerations necessary in the context of AAL: Fail safe

- When the “Personal Health check” system asks to dispatch a homecare nurse to visit the patient,
- At the same time if the Wandering Detection and Diversion system locks the door of the person’s house,
- What will happen?

- Multiple AAL systems operate simultaneously for the AAL care recipient **must not be independent but communicate each other and operate based on the principle of Fail Safe.**

Conclusions: The Needs of developing guidance document for the use AI in AAL

- The use of AI in AAL must consider ethical considerations such as privacy, accountability, safety and security, transparency and explainability, fairness and non-discrimination etc. that are provided by various standards and consortia activities.
- In addition, the use of AI in AAL must take into account declines of physical, cognitive and/or self-judgment abilities of AAL care recipients.
- **SyC AAL needs to develop an ethical document treating issues such as who to ask prior consent, balance between safety and autonomy, and fail safe.**

Thank you!

AI Powered UAV and Future Prospects

Kenzo Nonami, Ph.D

Chairman of Japan Drone Consortium and Professor Emeritus Chiba University, Japan

President of Advanced Robotics Foundation, Japan

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SC 42 – Artificial Intelligence

Introduction

There are a wide variety of AI applications in the field of unmanned aerial vehicles. In particular, the application of AI to the autopilot section, which is the brain of UAVs, is the most important and most urgent field. Manned aircraft make various decisions when a skilled pilot experiences an anomaly. On the other hand, UAVs are now judged by those who are operating on the ground. This makes it insufficient to deal with abnormalities. It is necessary for the edge computer mounted on the aircraft to provide guidance, which is the role of the pilot. This is AI technology. This makes pilotless operation feasible.

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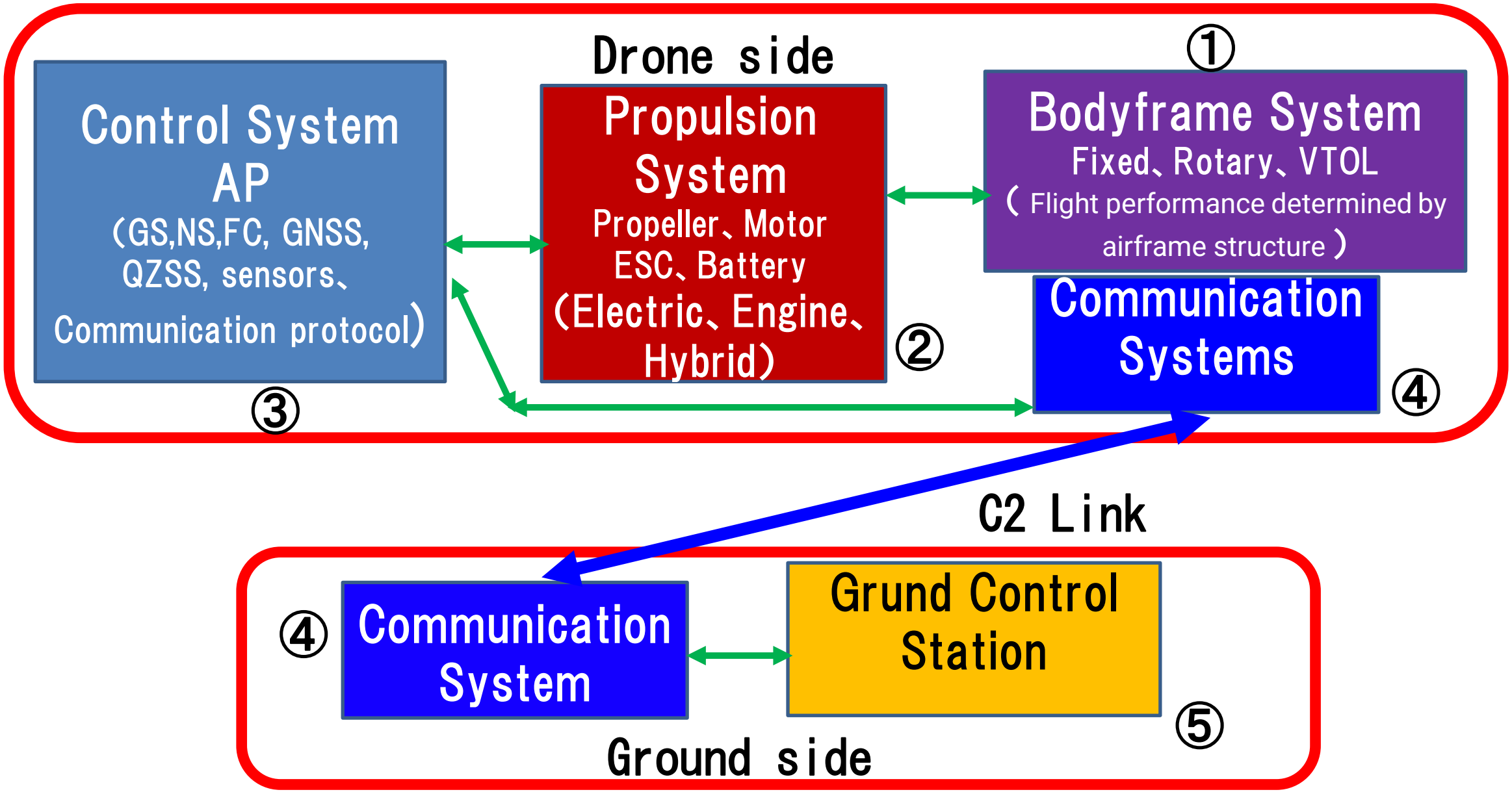
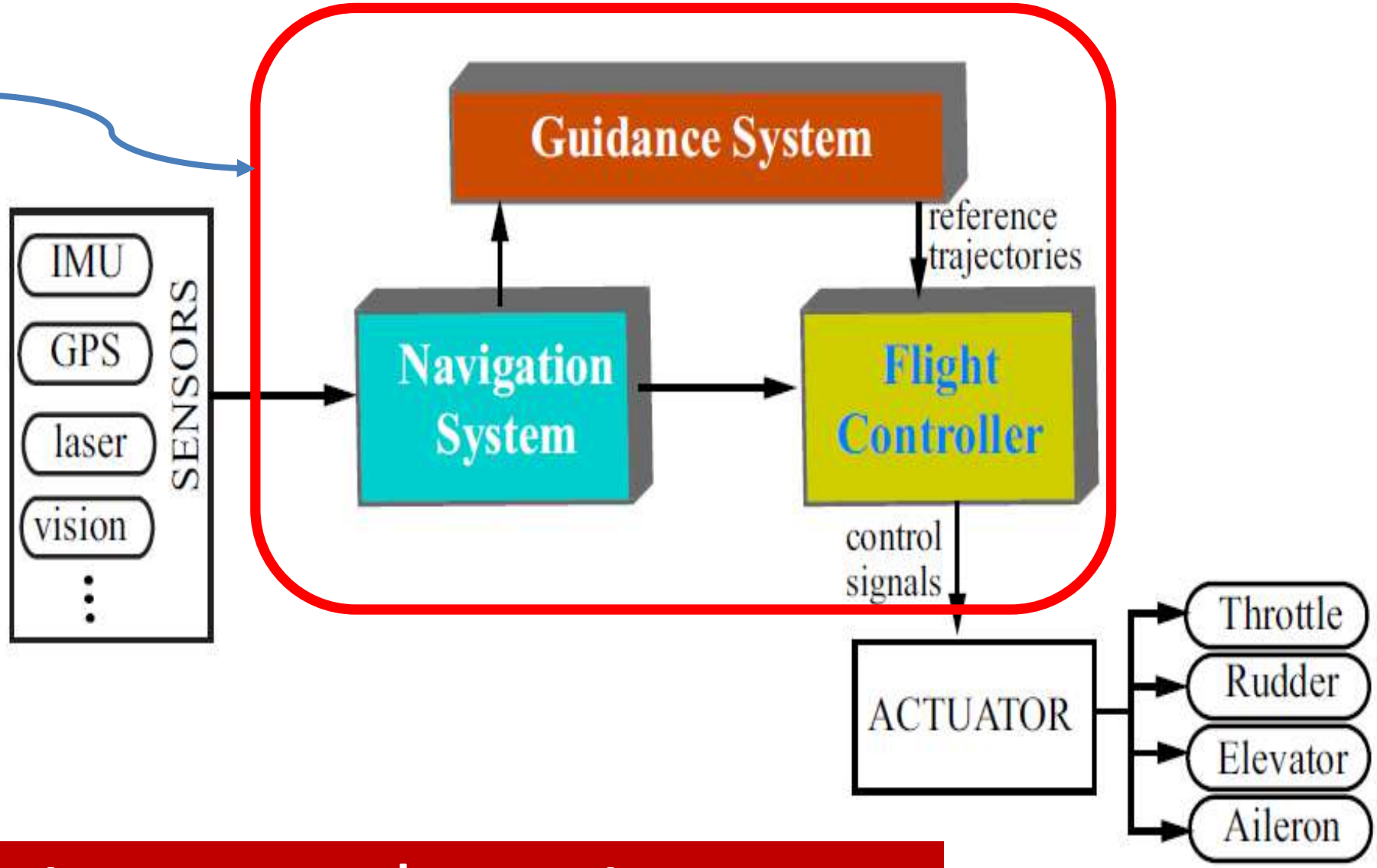
Relationships with the five components of the drone



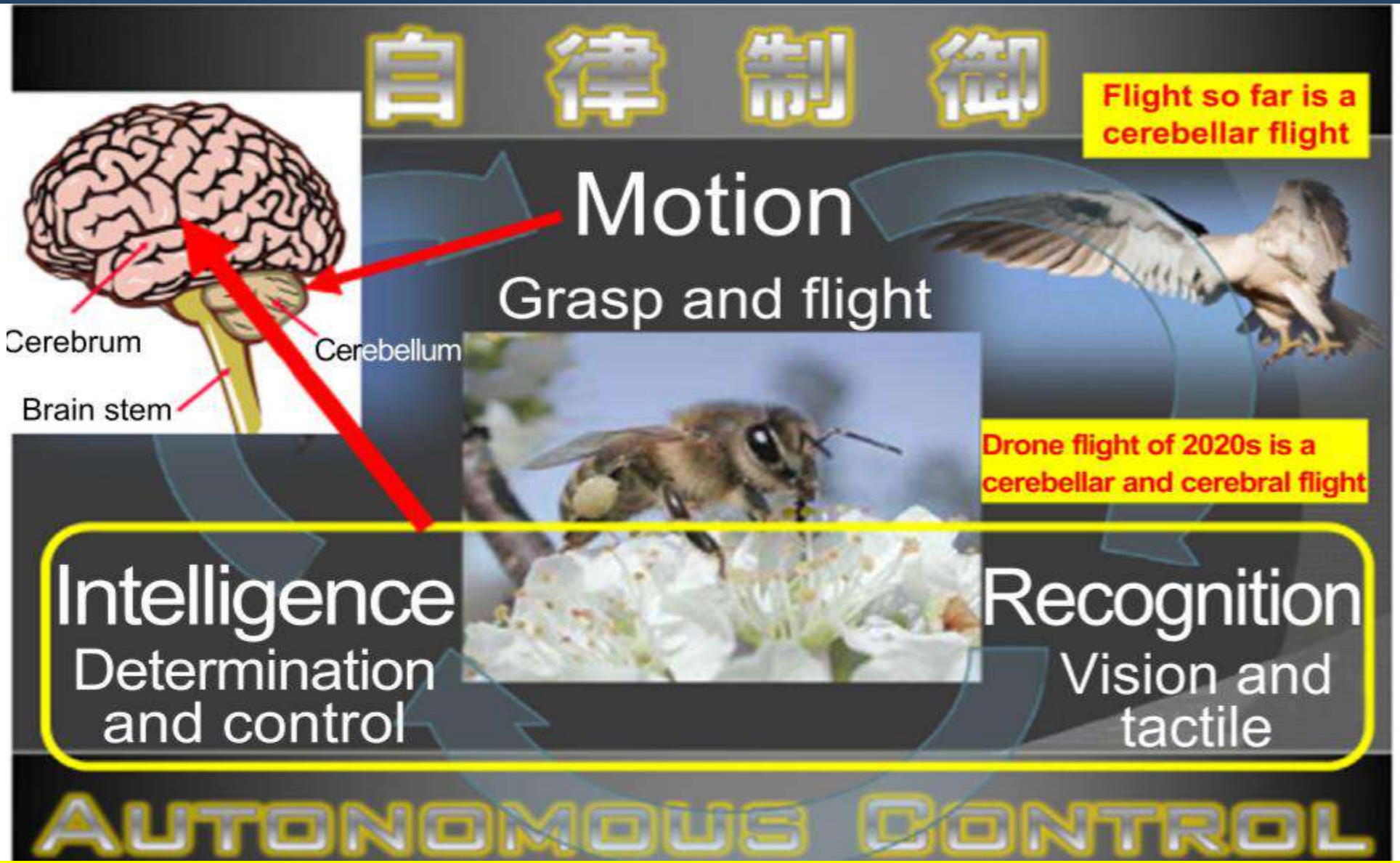
Autopilot consisting of GS, NS and FC

Autopilot(AP)



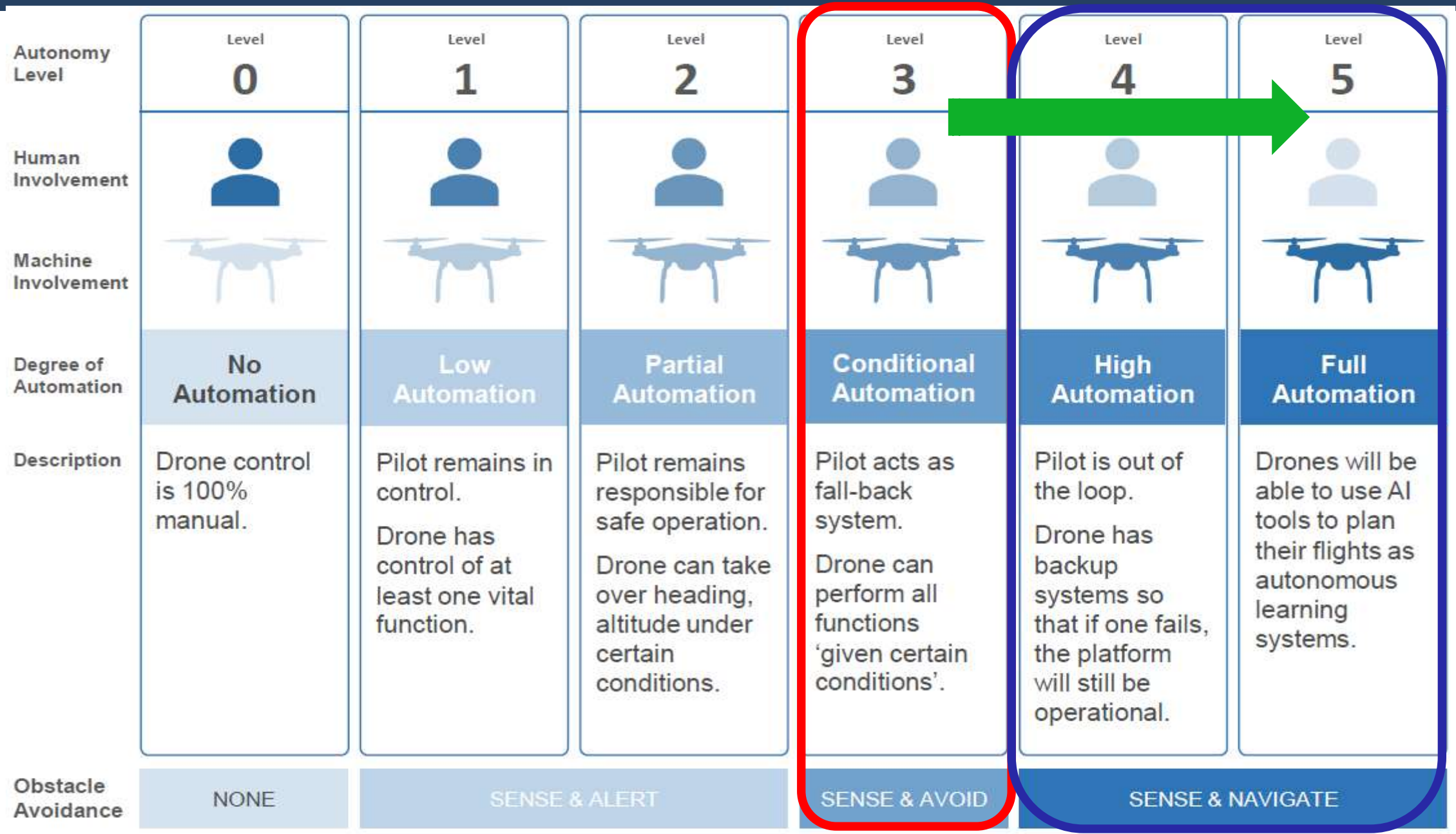
Current technology : AP=NS＋FC without GS

Revolution of Autonomy & Prospect of Celebrum AP（AI Pilot）



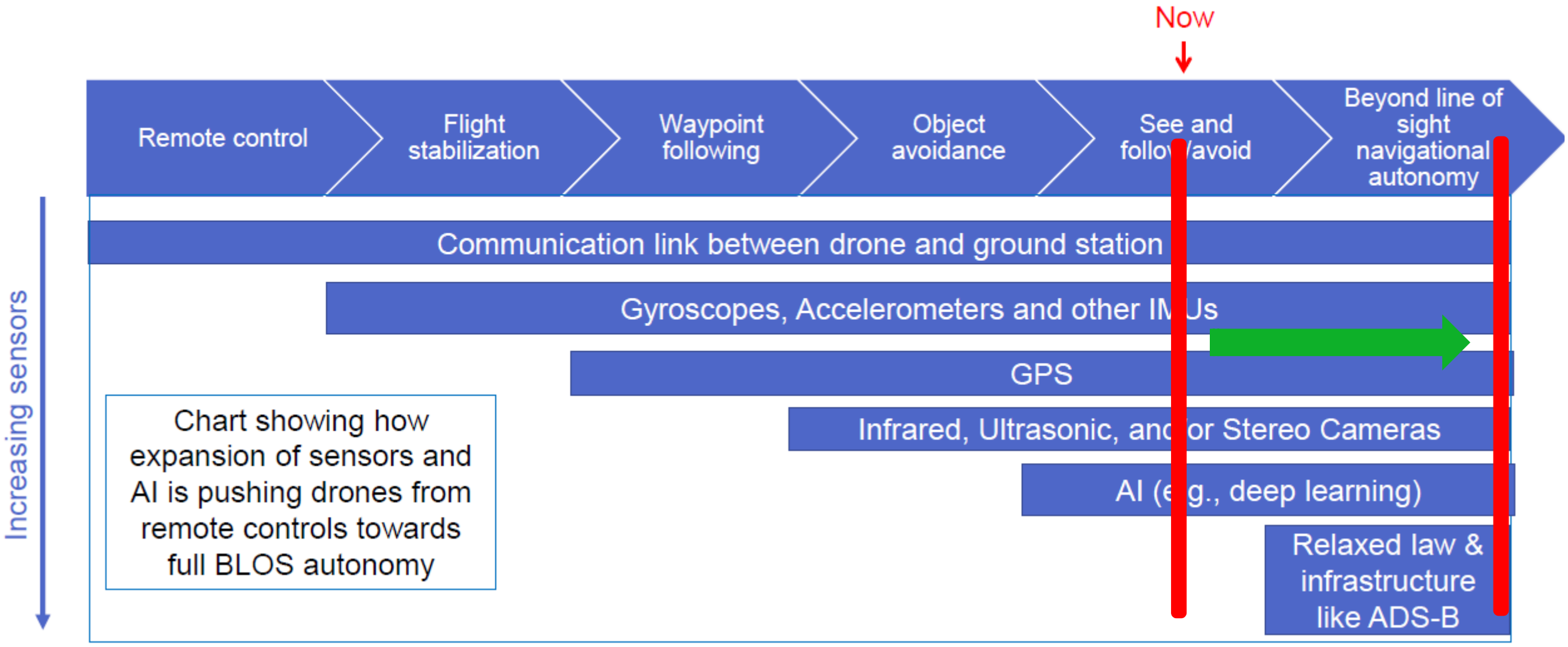
Ideal state of autonomous control in near future (Bio-inspired flight)

5 Levels of Autonomy & Revolution for Celebrum AP



Revolution of Autonomy & Prospect of Celebrum AP

Sensor fusion: towards navigational autonomy



Level 5 Flight as Redundant Celebrum AP and AI Implementation

3rd Stage

Automatic flight route generation and search for the optimal route by AI

Positioning
GNSS, QZSS(CLAS),
Non-GNSS environment
(Vision based)

2nd Stage

Collision avoidance(DAA)
Manned and unmanned aerial vehicles, birds, power lines, trees
(By deep learning by AI Flying smarter every day)

1st Stage

◆Takeoff control, landing control, attitude stabilization control,
◆ Distance control for multiple aircrafts

◆ AI conducts a health check to detect abnormalities during flight Redundant system as control when an error occurs (One Fail Operative Control)

◆ Implementation of AI for response to local sudden weather events

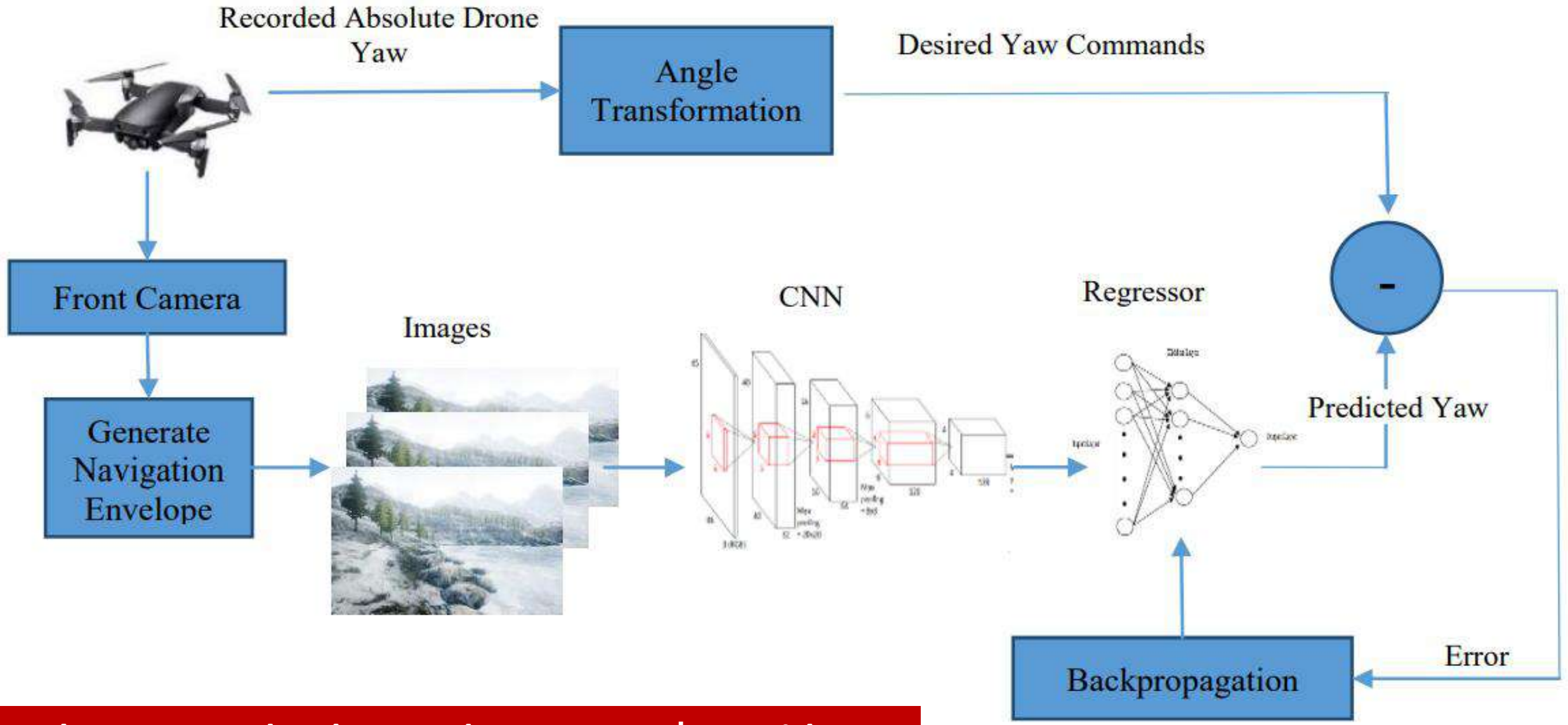
◆ Control to determine and guide the emergency landing point with AI when an abnormality occurs

◆ AI implementation and redundant Celebrum AP for the urban flight as Level 5

Technical challenges for evolution to cerebral drones

1. Natural environment (wind resistance, low temperature resistance, high temperature resistance, rain resistance, snow resistance, dust resistance, lightning resistance)
2. Flight in GNSS-resistant lost environment (autonomous flight in non-GPS environment, Level 5)
3. Airworthiness (redundant AP, reliability, durability, safety and AI implementation, Level 5)
4. Ground Station GCS Trouble (Completely Autonomous Flight Control, Level 5)
5. Communication resistance trouble (disruption, jamming, cyber security, Level 5)
6. Obstacle autonomous avoidance and real-time routing (SAA & RT-TP, Level 5)
7. Flight performance 1 (long distance, long time flight, high speed flight, 100km / 1 hour / 100km /h))
8. Flight performance 2 (high-precision landing, safe emergency landing function, within 50 cm))
9. Flight performance 3 (payload increase, transport capacity of about 10 kg)

Collision Avoidance by CAP and AI Implementation with Yaw Control



Cerebrum AP technology and AI : AP=NS＋FC with GS

Toward Low-Flying Autonomous MAV Trail Navigation using Deep Neural Networks for Environmental Awareness

Autonomous Flight Over 250m Trail

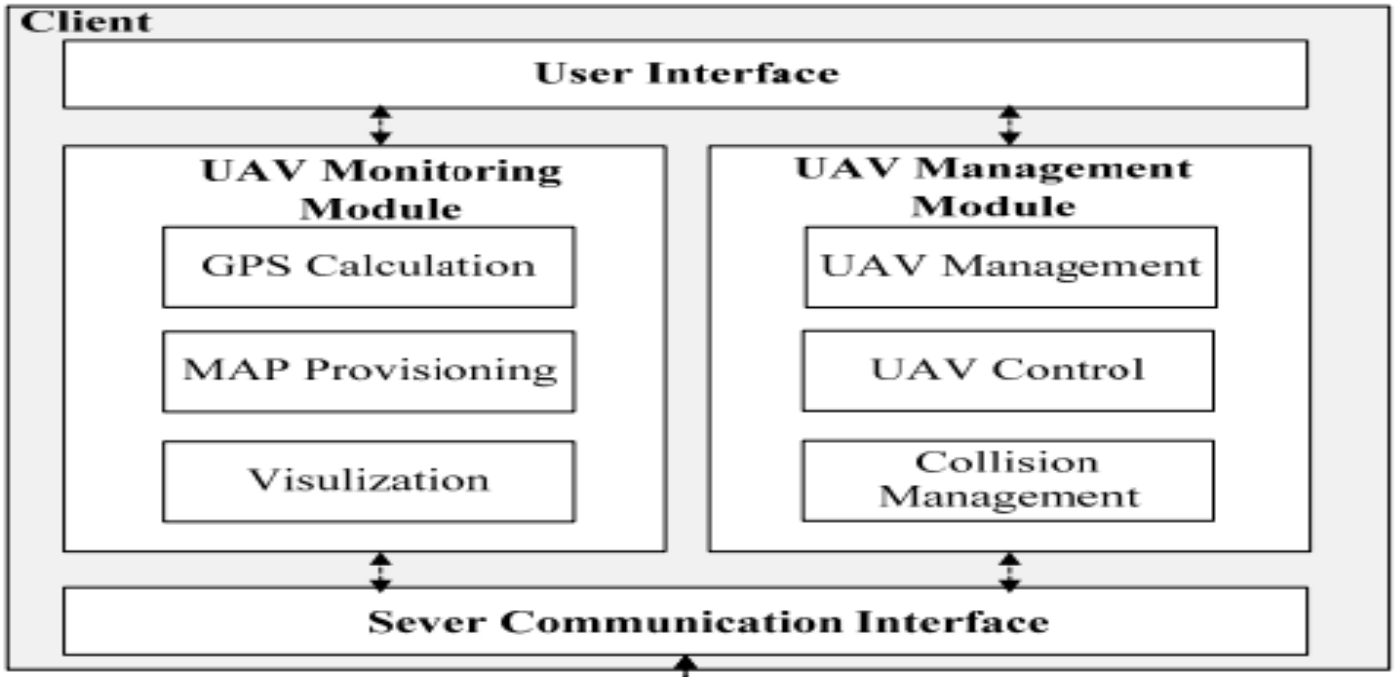
Nikolai Smolyanskiy, Alexey Kamenev, Jeffrey Smith, Stan Birchfield

NVIDIA Corporation

arXiv:1705.02550 [cs.RO], May 7, 2017

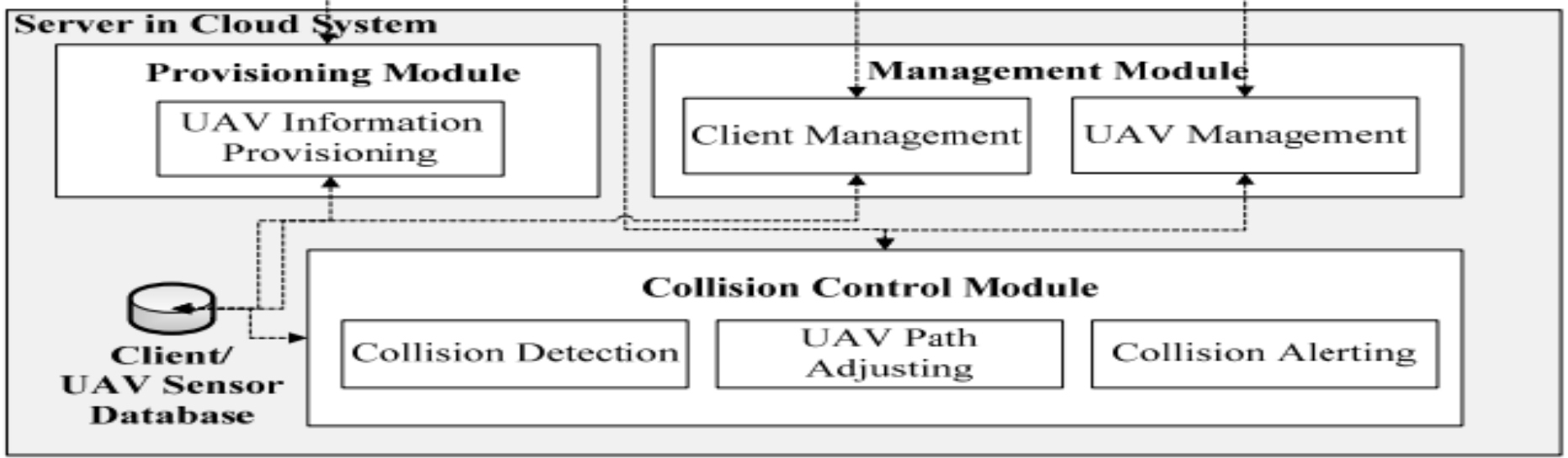
AI drone flying in an unknown environment

Collision Avoidance by CAP and AI Implementation with Edge and Cloud



Edge Computer (CAP)

- Short-term collision avoidance
- Physical collision avoidance
- Return to the original route



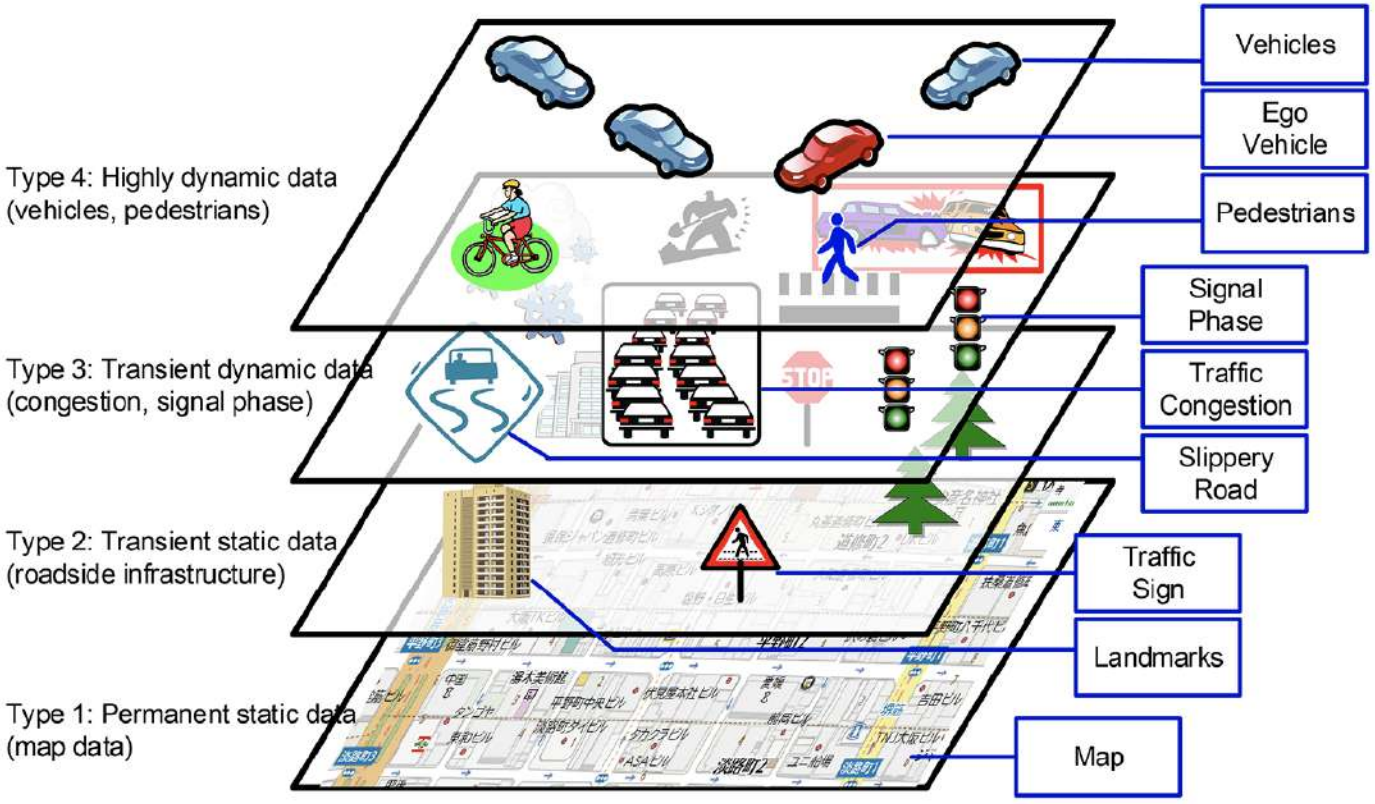
Cloud Computer (UTM)

- Long-term collision avoidance
- Planned collision avoidance
- Airspace separation
- Automatic route generation
- By new route flight


AI DRONE
faster than HUMAN?

Dynamic Map for Autonomous Vehicles VS Dynamic Map for Autonomous Flight Control of Drone

Dynamic Map for Autonomous Driving



Dynamic Map for Autonomous Drone

Type 4: Highly dynamic data
- Airspace: drones, helicopter, manned aircraft, birds, weather report, UTM info, ATM info, Airspace info
- Ground: people, cars

Type 3: Transient(Semi) dynamic data
- Airspace: wind, precipitation, telecommunication info, drone traffic info
- Ground: crowd, drone station info

Type 2: Transient(Semi) static data
- Ground: drone landing spot info. landing spot traffic info

Type 1: Permanent static data
- Airspace/Ground: high precision 3D map data, powerlines, building data, trees and vegetation data, emergency landing area

- Data in dark red can be efficiently processed by AI (Deep Learning) using visual/thermal sensor data
- Note that drones need to consider “Ground” (1) to find a suitable landing spot, or (2) to estimate risk(GRC, ARC), e.g., risk of falling on people → see SORA

Shimada, H., Yamaguchi, A., Takada, H. and Sato, K. (2015) Implementation and Evaluation of Local Dynamic Map in Safety Driving Systems. Journal of Transportation Technologies, 5, 102-112. http://dx.doi.org/10.4236/jtts.2015.52010

Industrial Utilization for Drone of AI with Dynamic Map

Objective: Creation of Dynamic Map (DM) by Drone

DM is the result of a mapping technology with

Input: **Example 4：Industrial utilization of AI by Dynamic Map**

◆Video feed from camera attached to drone

Output:

◆ Real-time categorization (detection, recognition) and tracking of each object and object behavior from video feed

Industrial Utilization for Drone of AI with Dynamic Map (cont'd)

These services will use dedicated data analytics algorithms to predict traffic, movement patterns, etc.

DM-based Services	Delivery	Traffic/Crowd Management	Surveillance / Disaster Response

Count & track vehicles at construction site

Estimate traffic condition from vehicle trajectories

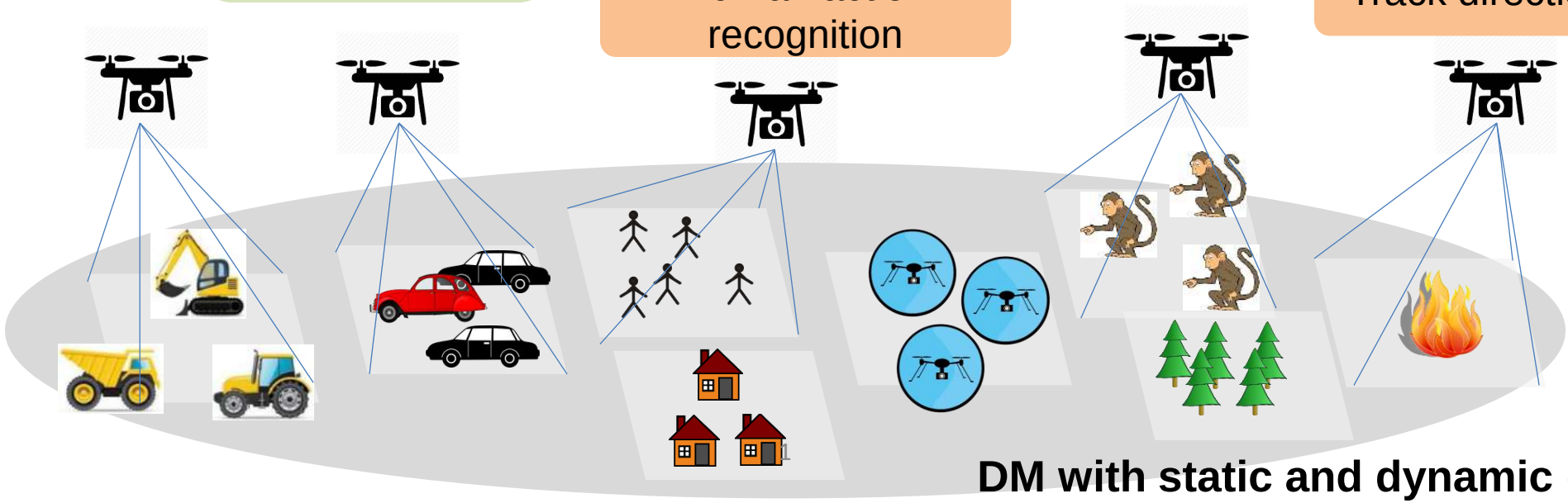
Estimate crowd for safe flight path

Human action recognition

Track movement of monkeys

Estimate position of fire for safe delivery

Track direction of fire

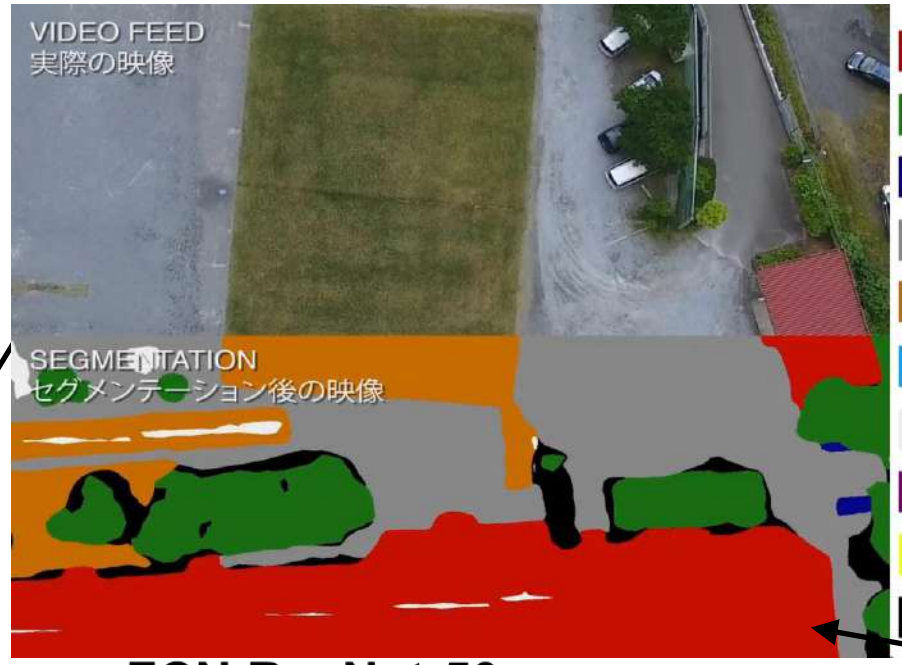


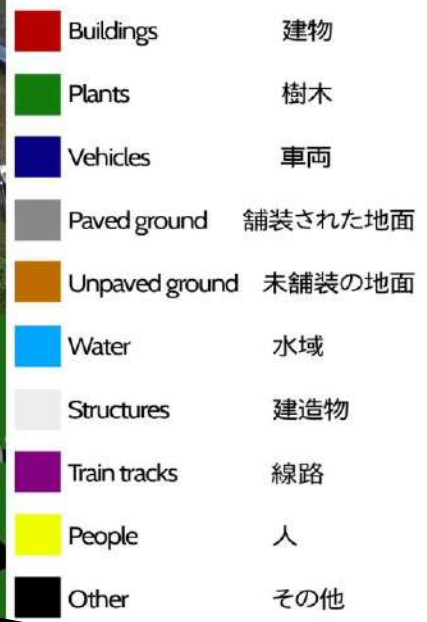
DM with static and dynamic objects

Situational Awareness of AI with Dynamic Map

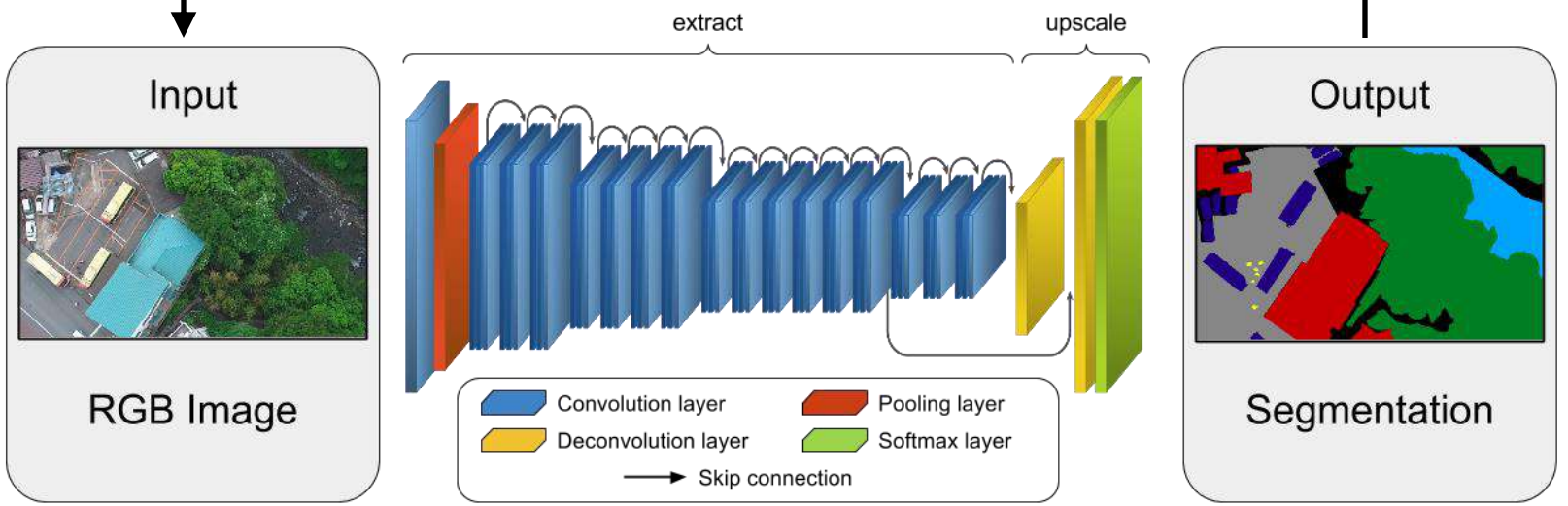
- Semantic segmentation (pixel-wise labeling) of video stream

Input video frame by frame





FCN ResNet-50 with skip connections

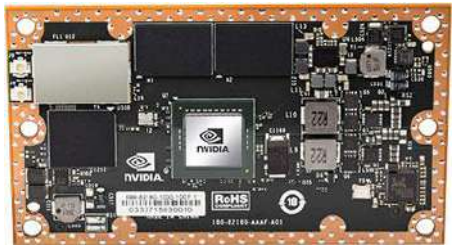


Situational Awareness of Moving Objects on Superchip

Video Frame | Segmentation | Confidence

"White" color: high confidence in segmentation results

Hardware



NVIDIA Jetson TX1 credit card sized chip (1TFLOP/s)

Result: 3 frames per sec (non-optimized code) → real-time

Surveillance by Deep Learning

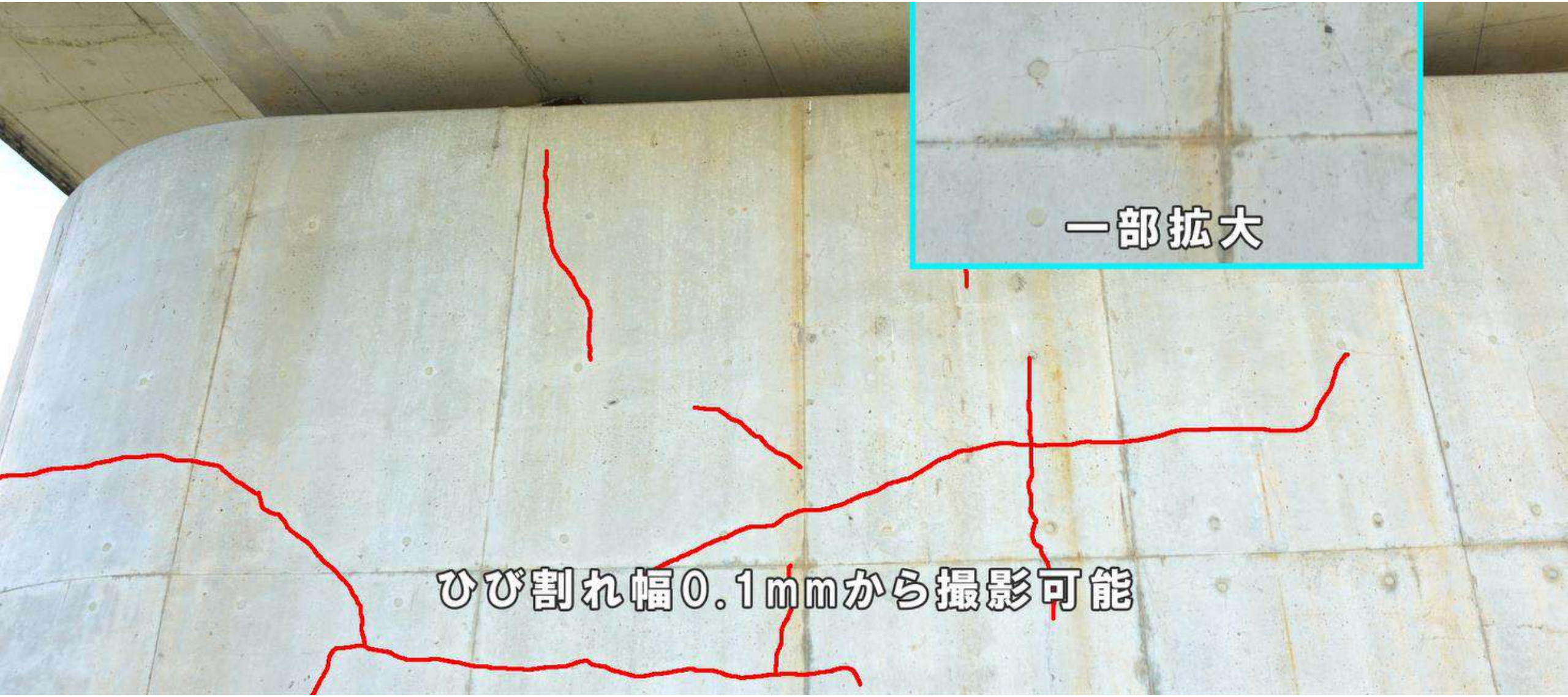
Multi-Person Detection

- Trained on resized images (512x512) for 20K iterations
- Single Shot MultiBox Detector (SSD) 72.3% mean Average Precision (mAP)

Animation of Annotated Dataset

Abnormality Detection for Bridge Pier

Abnormality Detection for Bridge Pier (cont'd)



Capability of AI Technology for UAV (1)

Manufacturing Process of Drone

1. Parts check, quality inspection and quality assurance in the drone manufacturing process using AI
2. Assembly process check, quality inspection and quality assurance in drone assembly process using AI

AI based Drone Flight (Flight replacing manned pilots with AI)

1. Health monitoring during AI drone flight, abnormality diagnosis, abnormality detection and cause investigation
2. AI based Guidance and Path planning using time-environment dynamic map
3. Searching for a crash landing point and determining a crash landing when an abnormality occurs

UTM

1. Airspace management using AI
2. Collision avoidance using AI
3. Take off and landing management using AI
4. Weather check during drone flight using AI
5. Dynamic map creation with AI

Pilot License Procedures

1. School examiner certification
2. School operator skill certification
3. Paper test judgment

Capability of AI Technology for UAV (2)

Utilization of AI in precision agriculture

1. Analysis of growth surveys and disease outbreaks in precision agriculture using Deep learning AI
2. Determining the optimal harvest time
3. Others

Utilization of AI by dynamic map

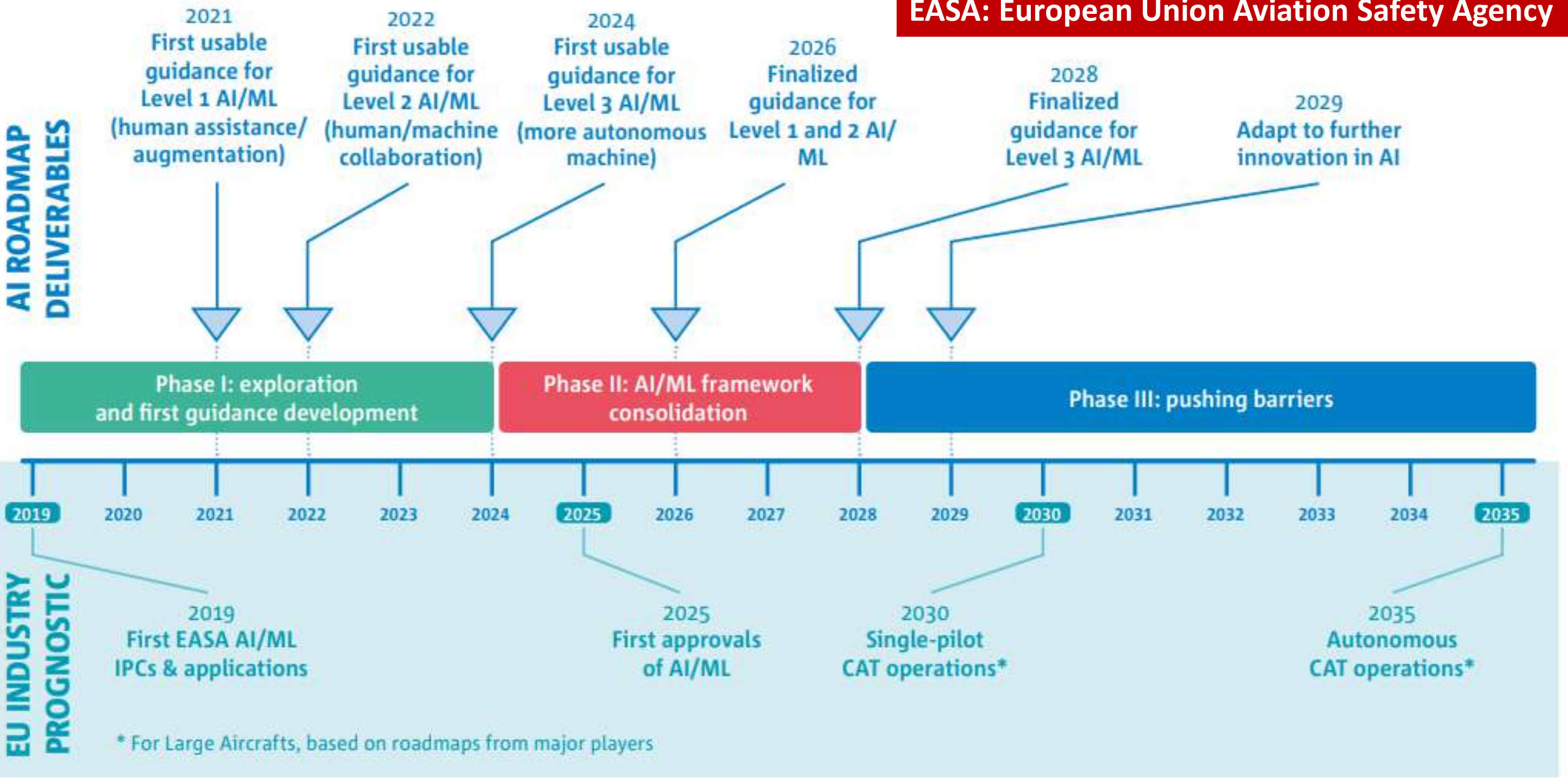
1. These services will use dedicated data analytics algorithms to predict traffic, movement patterns, disaster responses, etc.
2. Delivery service and optimization
3. Warehouse management
4. Precision 3D mapping and database
5. Security
6. Aerial survey and construction
7. Precise whether report
8. Others

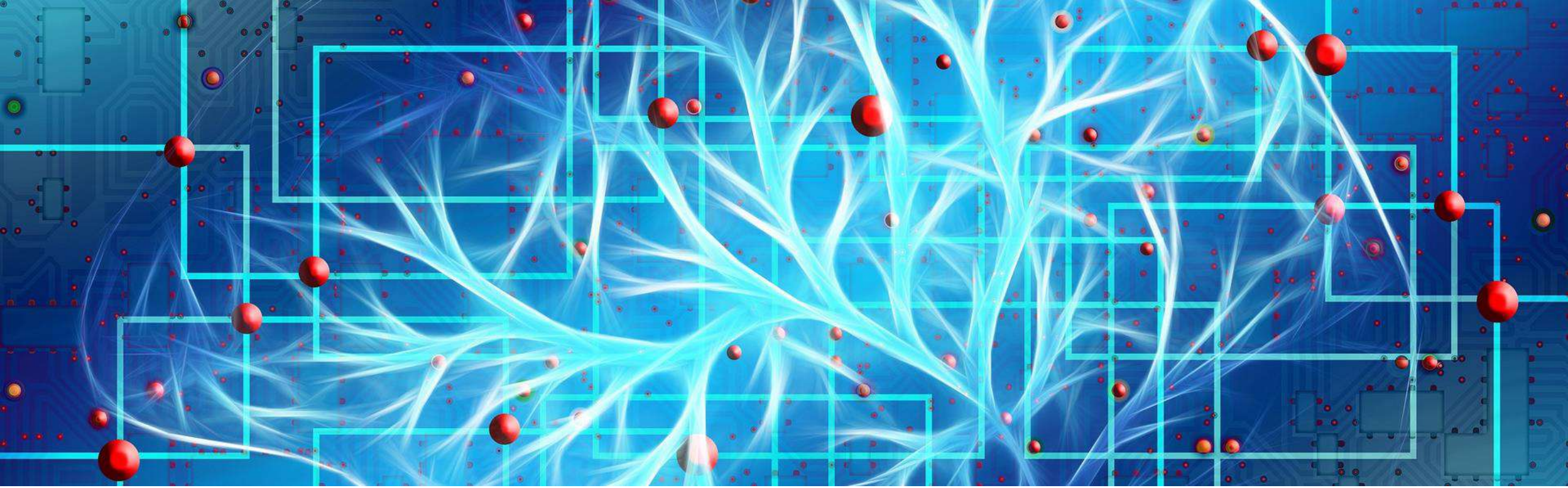
Inspection of infrastructure equipment using AI

1. Abnormality detection for bridge, tunnel, building, tower and chemical plant, etc (See example 5)
2. Advanced maintenance and operation
3. Others

EASA AI Roadmap

EASA: European Union Aviation Safety Agency





Summary

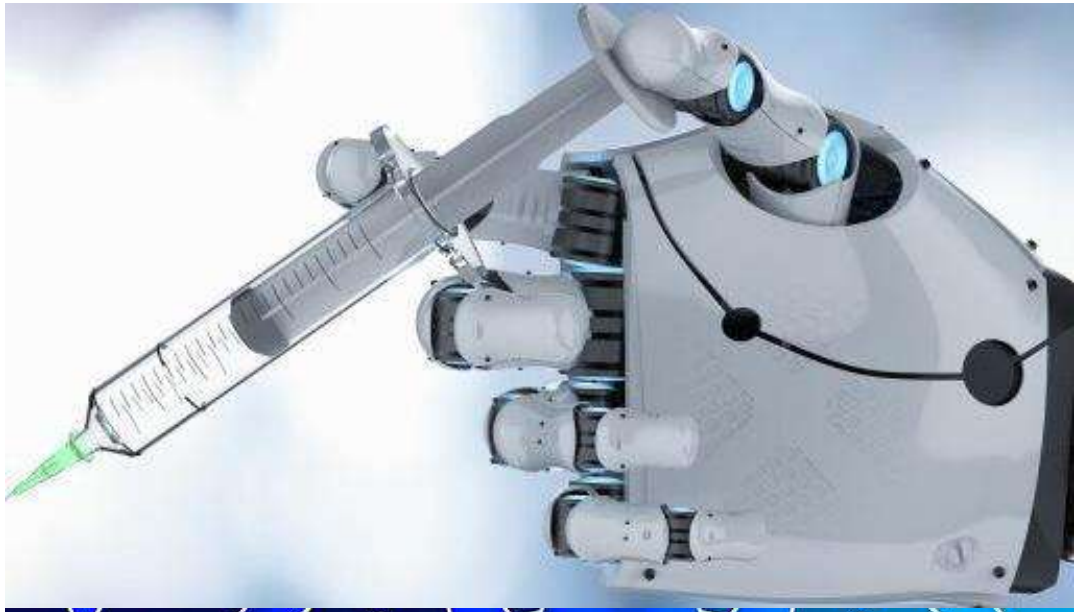
Research and development of cerebral drones is being carried out all over the world in fierce competition through industry-academia-government collaboration. By the end of the 2020s, drones that require no human operation may appear. It will be a real “industrial revolution of the sky”. At that time, the world will change games with AI technology innovation.

Thank you

Kenzo Nonami、Ph.D

nonami@faculty.chiba-u.jp

URL: https://arf.or.jp



Use cases and AI application guidelines in international standardization

Dr. Fumihiro Maruyama

Convenor, SC 42/WG 4

National Institute of Advanced Industrial Science and Technology

ISO JTC1 IEC
INFORMATION TECHNOLOGY STANDARDS
SC 42 – Artificial Intelligence

Introduction

- SC 42/WG 4
- AI use cases (ISO/IEC TR 24030)
- Guidelines for AI applications (ISO/IEC CD 5339)
- AI system life cycle processes (ISO/IEC CD 5338)

ISO JTC 1 IEC
INFORMATION TECHNOLOGY STANDARDS
SC 42 – Artificial Intelligence

Structure of SC 42

WG 1	Foundational standards
WG 2	Big data
WG 3	Trustworthiness
WG 4	Use cases and applications
WG 5	Computational approaches and computational characteristics of AI systems
JWG 1	JWG SC 42 – SC 40: Governance implications of AI
JWG 2	JWG SC 42 – SC 7: Testing of AI-based systems
AG 3	AI standardization roadmapping
AHG 1	Dissemination and outreach
AHG 2	Liaison with JTC 1/SC 38
AHG 4	Liaison with JTC 1/SC 27

ISO JTC 1 IEC
INFORMATION TECHNOLOGY STANDARDS
SC 42 – Artificial Intelligence

SC 42/WG 4 “Use cases and applications”

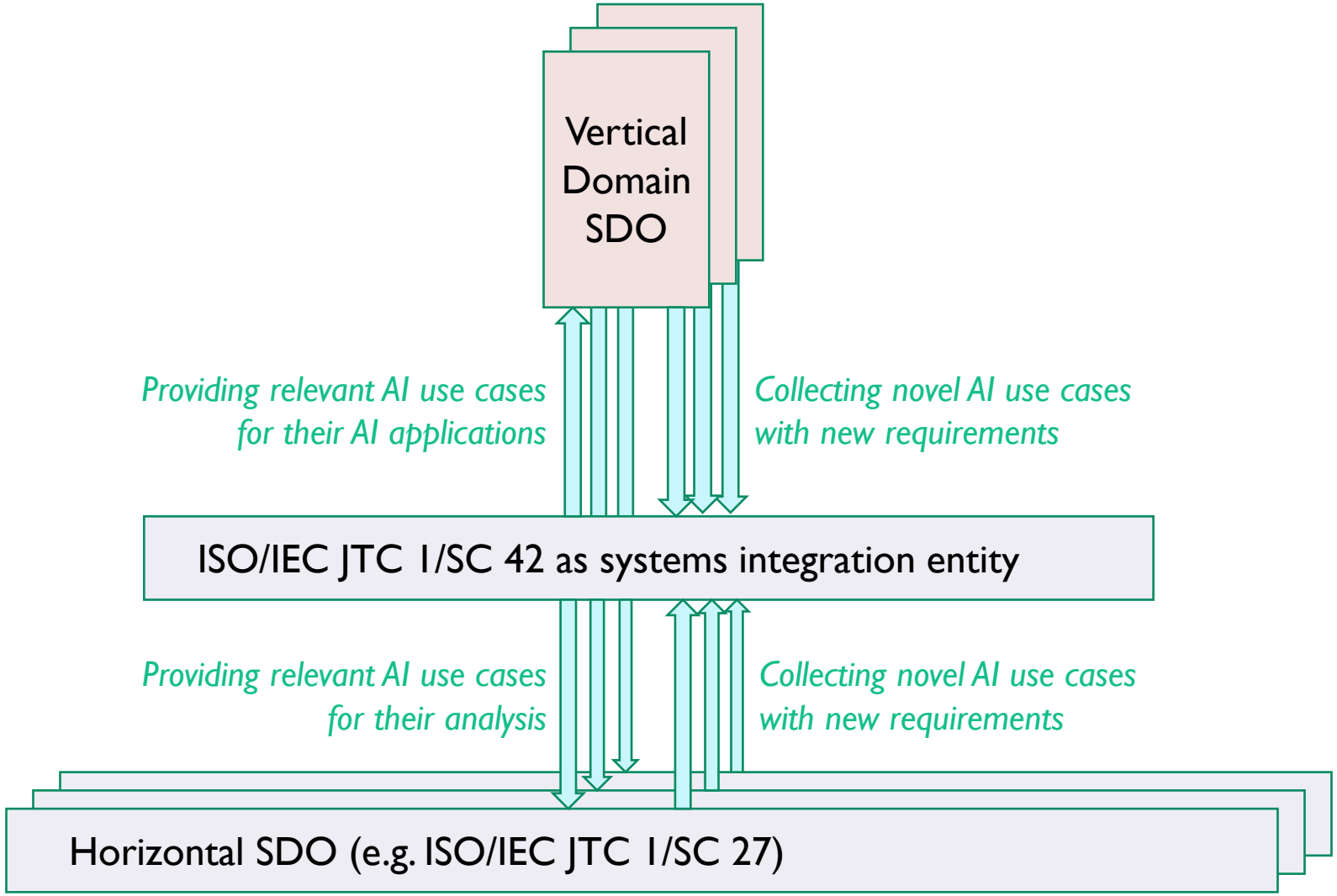
- Overview
  - Identify AI application domains, context of AI use in those domains and develop guidance
  - Collect representative use cases and analyze them for derived requirements
- Officers
  - Convenor: Fumi Maruyama
  - Secretary: Nobu Hosokawa
  - Project Editors:
    - Yuchang Cheng (ISO/IEC CD 5338 – AI system life cycle processes, ISO/IEC TR 24030 – Use cases)
    - Shrikant Bhat (ISO/IEC CD 5339 – Guidelines for AI applications)

ISO/IEC TR 24030 Artificial Intelligence – Use cases

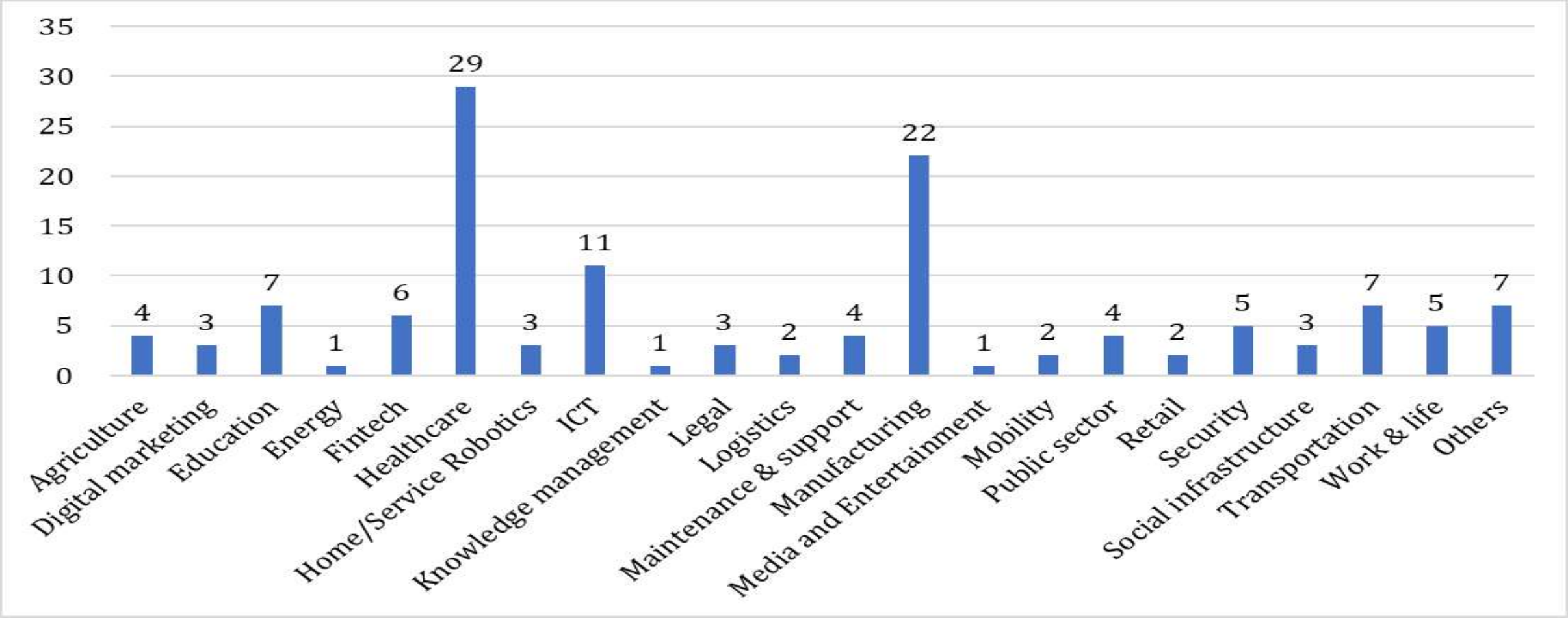
- Technical report with 132 use cases from NBs and liaison organizations
  - Main body with 100+ pages including use case summaries
  - Use case details with 360+ pages in electronic attachment
- Published in May 2021.
- Utilization of use cases
  - Provided vertical domain SDOs with use cases in their domain
  - SDOs took the use cases and analyzed them for their purpose
    - PWI 6089 - Impact of AI on security and privacy by ISO/IEC JTC 1/SC 27/WG 5

SDO: Standards Developing Organization

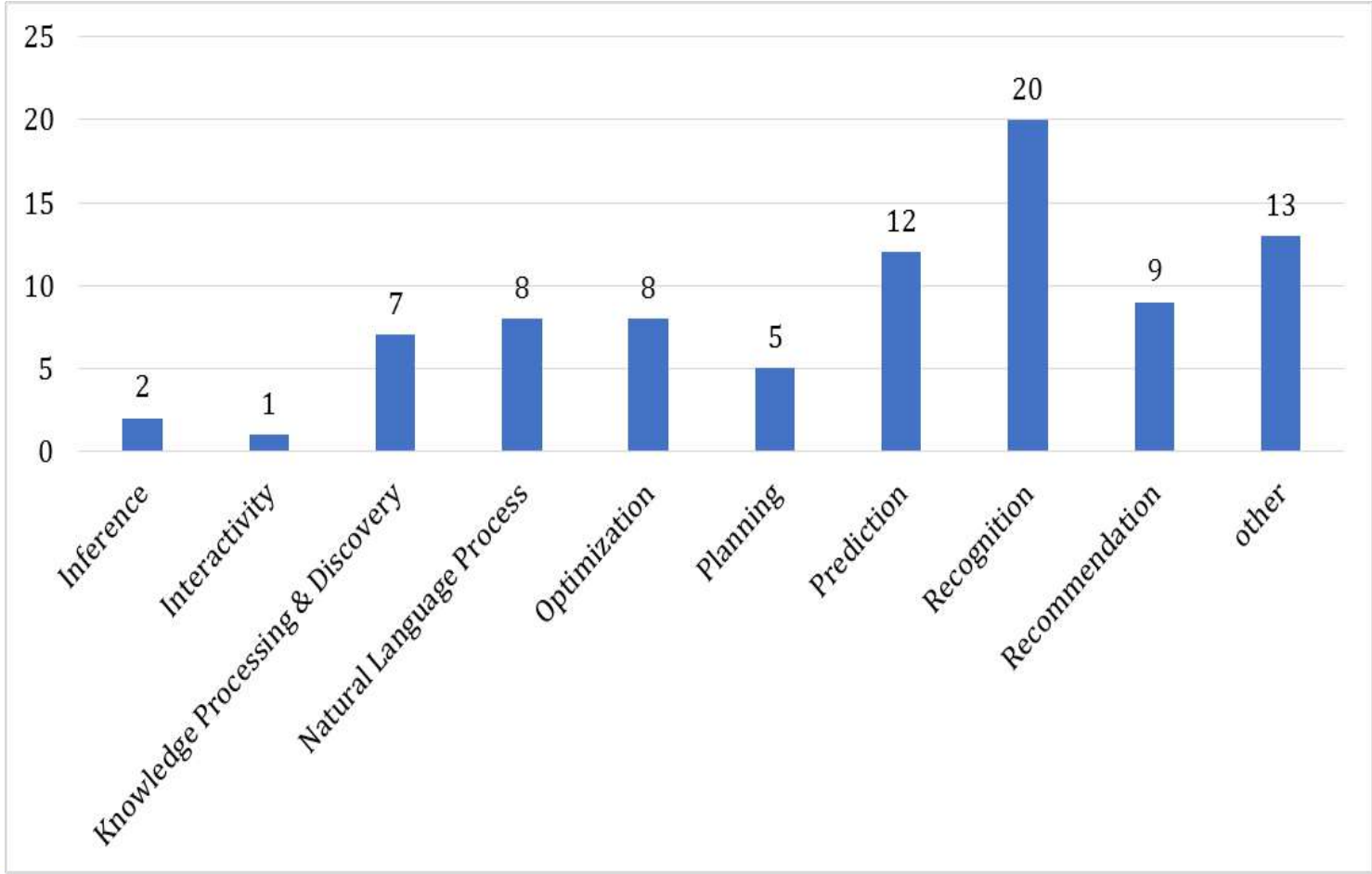
Collaboration through exchange of AI use cases



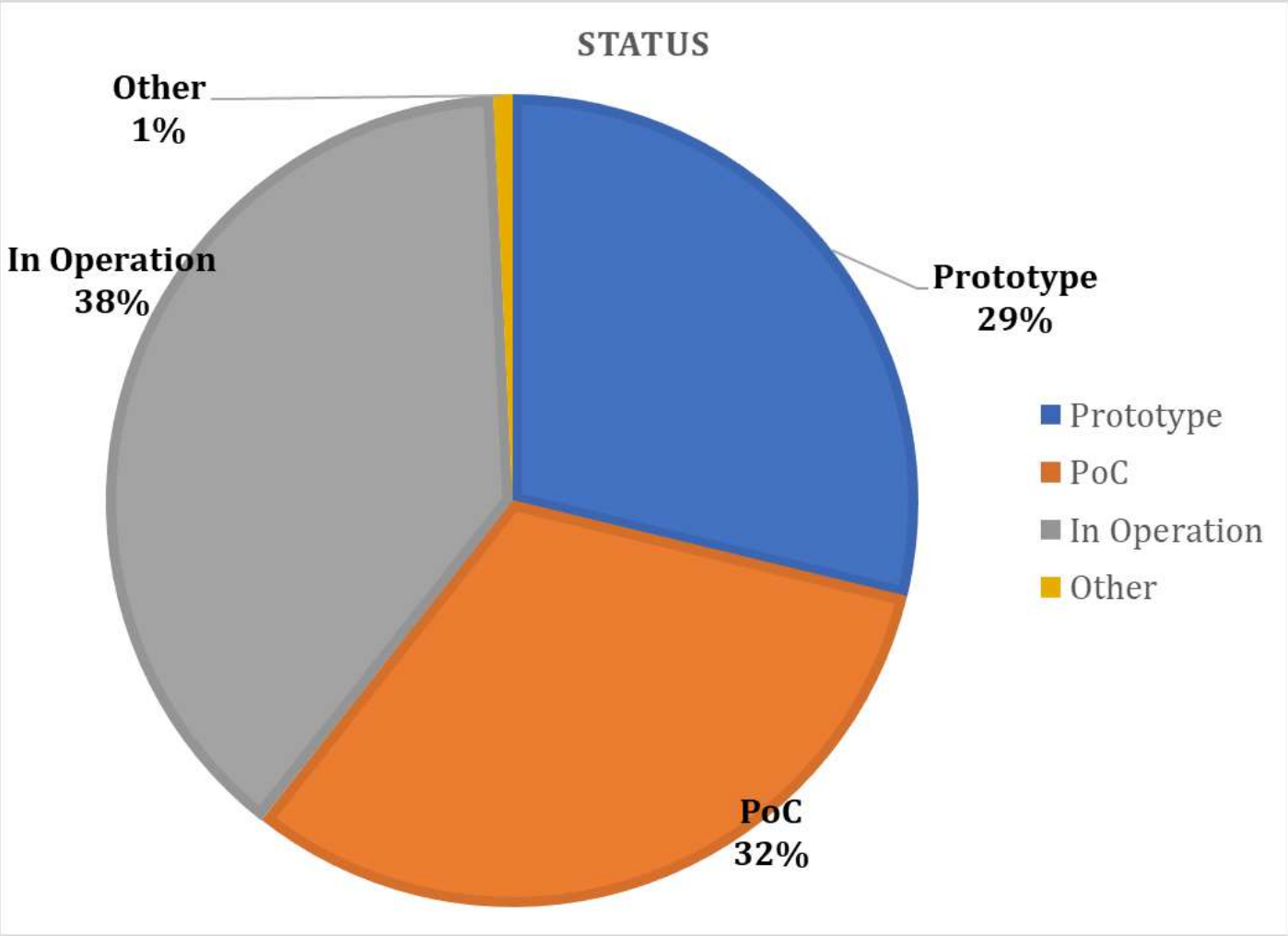
Application domain



AI task

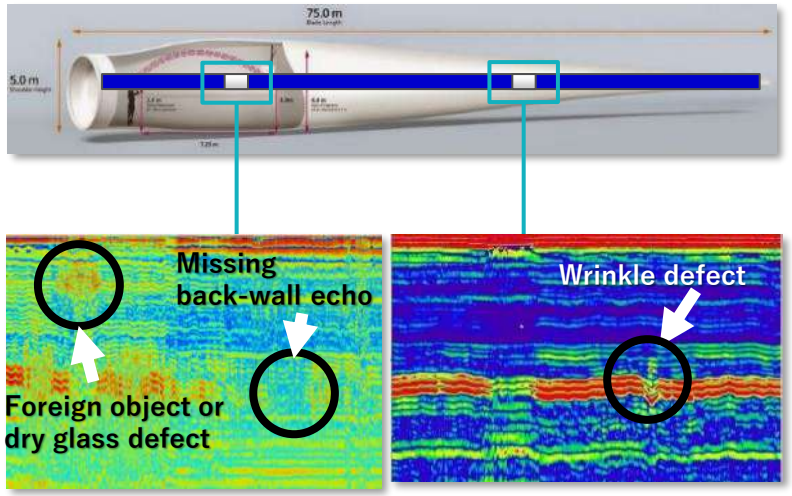

25
20
15
10
5
0
2
1
7
8
8
5
12
20
9
13
Inference
Interactivity
Knowledge Processing & Discovery
Natural Language Process
Optimization
Planning
Prediction
Recognition
Recommendation
other

Use case status



Example use case “AI solution to quickly identify defects during quality assurance process on wind turbine blades”

- AI system automatically detects defects from ultrasonic testing scanning data through deep learning capabilities.
  - It achieved high coverage (more than 95%) of various defects.
- Human inspectors only need to examine the parts of the blade that are flagged by the AI system.
- This solution enabled the same inspector to do 4 to 5 blades per day instead of 1 previously.



Example use case in template (1 of 3)

1.ID	4
2. Use case name	Detecting defects during quality assurance process on wind turbine blades
3. Application domain	manufacturing
4. Deployment model	on-premise systems
5. Objective(s)	To find an accurate and efficient solution to detect defects without compromising the detection of in-material damage and risking a loss in the manufacturer's reputation.
6. Narrative	This AI solution can automatically detect defects in produced wind turbine blades through "imagification", which transforms raw data from the non-destructive ultrasonic testing (UT) scanner into image data based on RGB where deep learning-based image recognition can be applied effectively. It achieved high coverage (see 9. KPIs) of more than 95 % for various defects, e.g. detecting missing back wall echo, foreign objects, dry glass defects and wrinkle defects. Quality controllers can focus their efforts on suspicious regions and disregard all clean data; humans are only expected to examine the regions of blades that are flagged as suspicious by the AI solution. Since it achieved low split (see 9. KPIs) of less than 20 %, it reduced evaluation time for UT scanning data by 80 %. Each blade can be up to 75 meters in length and takes a highly skilled professional quality controller up to 6 hours to evaluate the UT scanning data in the quality assurance process. With 5,000 blades produced every year, that adds up to a saving of almost 32,000 person-hours, which translates into significant cost savings, reduced production lead times, and increased productivity. Today, there is a shortage of ultrasonic engineers and inspectors. This solution enabled the same inspector to do four to five blades per day instead of one previously.

Example use case in template (2 of 3)

7. Stakeholders and stakeholder considerations	The manufacturer is the customer who wants to enhance the efficiency of the quality assurance process on wind turbine blades while maintaining the quality level of the products. The actual users of the solution are quality controllers and inspectors of produced wind turbine blades. The producer is responsible for deploying an AI solution capable of solving the above problem of efficiency. The provider is responsible for developing an AI system for the solution. Other stakeholders include utility companies and neighborhood communities.
8. Data Characteristics	UT Scanning Data Source: UT scanner Type: ultrasonic data from scanner vendor Velocity: batch Variety: single source Variability: static Quality: high
9. Key performance indicators (KPIs)	Coverage (for accuracy): Proportion of the defects automatically reported without manual inspection. Ideal target is 95 %. Split (for efficiency): Proportion of the regions of the blade that are flagged as suspicious and asking for manual inspection. The less split, the more efficient the total quality assurance process becomes.

Example use case in template (3 of 3)

10. Features of use case	Task(s)	recognition
	Level of automation	partial automation
	Method(s)	deep learning
	Platform	deep neural network
	Topology	convolutional neural network
11. Threats & vulnerabilities	Changes in defects of in-material damage over time	
12. Challenges and issues	Challenges: Achieve the same level as ultrasonic accredited engineers for detecting critical defects. Issues: – lack of defect data per defect type; – how to create good images for deep learning from UT raw data; – back wall detection.	
13. Trustworthiness considerations	The solution does not have 100 % reliability. That is where human-machine teaming comes into play. It also lacks robustness and resilience. That is why it needs continuous validation (monitoring and retraining). Although the solution lacks explainability, the human-machine team has explainability, i.e. the human quality controller and inspector can explain on behalf of the team.	
14. Use of standards; standardization opportunities	This use case is a good example of human-machine teaming. It provides standardization opportunities for empowerment and escalation for human-machine teaming.	
15. Relevant SDGs	Affordable and clean energy	

Revision of ISO/IEC TR 24030

- Scope: This document provides a collection of representative use cases of AI applications in a variety of domains. (unchanged)
- Time period: 18 months from November 2021
- Rationale:

  1) More use cases should be collected to cover more domains and contexts. We have already received additional use cases. More NBs and liaison organizations are expected to contribute new use cases.

  2) "In operation" use cases in TR 24030:2021 will be migrated to the updated template where possible.

  3) Recent use cases should be collected.

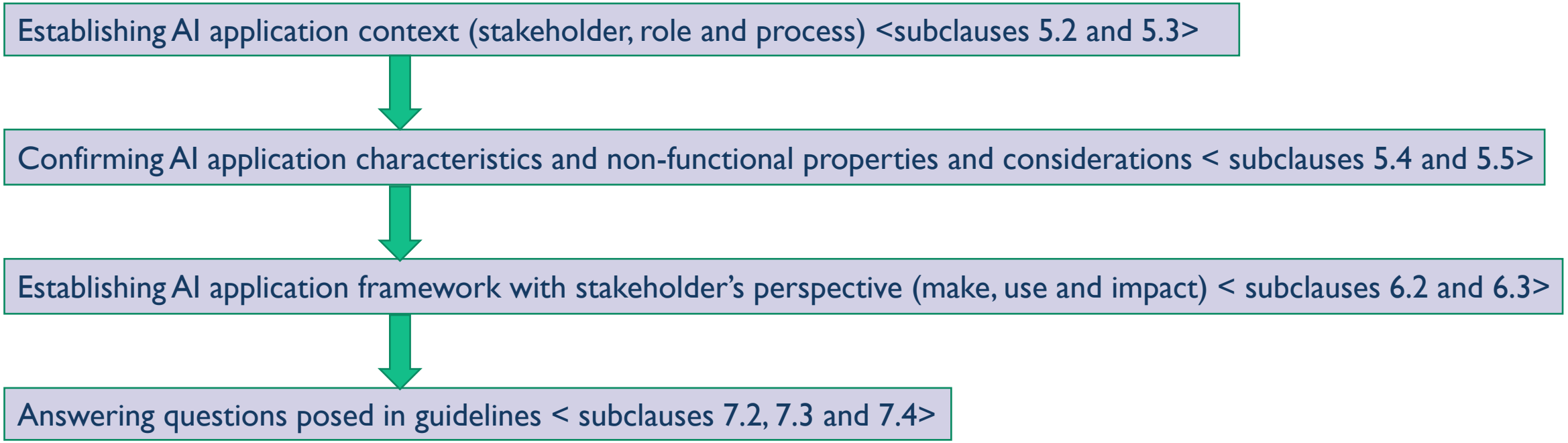
ISO/IEC TR 24030 ed.2

- Finished the first-round use case collection in February 2022 with the updated use case template.
- Started the second-round use case collection with the deadline of 30th June 2022.
- Seeking recent in-operation use cases with emphasis on the following application domains that are underrepresented by the current set of use cases:
  - *Construction, Digital Marketing, Home/Service Robotics, Knowledge Management, Legal, Logistics, Low-Resource Communities, Media and Entertainment, Mobility, Security*

ISO/IEC CD 5339 – Guidelines for AI applications

- Provides a macro-level view of an AI application to facilitate its understanding, development and use among all stakeholders.
- Includes:
  - Approach to identifying an AI application's stakeholders, context, functional characteristics and non-functional characteristics;
  - AI application framework that can be used to answer the question: "What are the characteristics and considerations of an AI application?";
  - Guidelines for AI applications based on the make, use and impact perspectives.
- Should be the first document to refer to when developing/using an AI application.
  - Provides references to relevant standards SC 42 and other SDOs are developing.

Developing/using an AI application with ISO/IEC 5339



AI application framework

Perspectives		*Make*	*Use*	*Impact*
Stakeholders		Table 1 (1 of 2)		Table 1 (2 of 2)
Context	Who			
	What			
	How			
	When			
	Where			
	Why			
	Subclause references			
All non-functional	Properties			
	Considerations			
Subclause references				

● = Stakeholder's role(s) in context

AI Characteristics	Processes	What	How	Subclause references
Table 2				

ISO JTC 1 IEC
INFORMATION TECHNOLOGY STANDARDS
SC 42 – Artificial Intelligence

Example use case in framework (1 of 3)

Perspectives		Make			
Stakeholders		AI producers	Data providers	AI developers	AI application providers
Context	Who	Fujitsu Limited	Ultrasonic scanner vendor	Fujitsu Limited	Fujitsu Limited
	What	Responsible for the entire system	Provides data from ultrasonic scanners	Develops the AI system including the trained model	Takes the developed AI system and provides it as an AI application
	How	Built, Applies, Updated	Built	Built	Built
	When	All Stages	Design, Develop, Verify, Validate	Design, Develop, Verify, Validate	Deploy, Operate, Monitor
	Where		Producer	Producer	Customer Premises
	Why	The producer is expected to provide a good AI application for the customer because of a good understanding of the objective and requirements of the AI application through dialogues with the customer.			

Example use case in framework (2 of 3)

Perspectives		Use		Impact	
Stakeholders		AI customers	AI users	Community	AI regulators and policy makers
Context	Who	Wind turbine manufacturer	Professional quality controller, inspector of manufacturer	Utility companies, users and neighbours of wind turbine	European Commission's Director-General (DG) for Internal Market, Industry, Entrepreneurship and SMEs
	What				
	How	Applies	Applies		
	When	Deploy, Operate, Monitor	Deploy, Operate, Monitor	Deploy, Operate, Monitor	Deploy, Operate, Monitor
	Where	Customer Premises	Customer Premises		
	Why	Any defects when a blade is in operation will not only prove catastrophic but also inflict major damage to the manufacturer's reputation. The manufacturer produces over 5,000 wind turbine blades every year for use in on and off shore wind farms. Each blade can be up to 75 meters in length and takes a highly skilled professional quality controller up to 6 hours to evaluate the scanning data in the quality assurance process. With the AI system the evaluation time is reduced by 80%, which translates into cost savings, reduced production lead times, and increased productivity.	Professional quality controllers and inspectors of the manufacturer are interested in their increased productivity with the AI application as well as the performance (accuracy) of the AI application.	Neighbours of the wind turbine sites are apprehensive about any damage caused by a defective wind turbine.	The regulator makes sure of safety of products with the regulations for manufacturing process of huge products such as wind turbine blades and liability of defective products.

Example use case in framework (3 of 3)

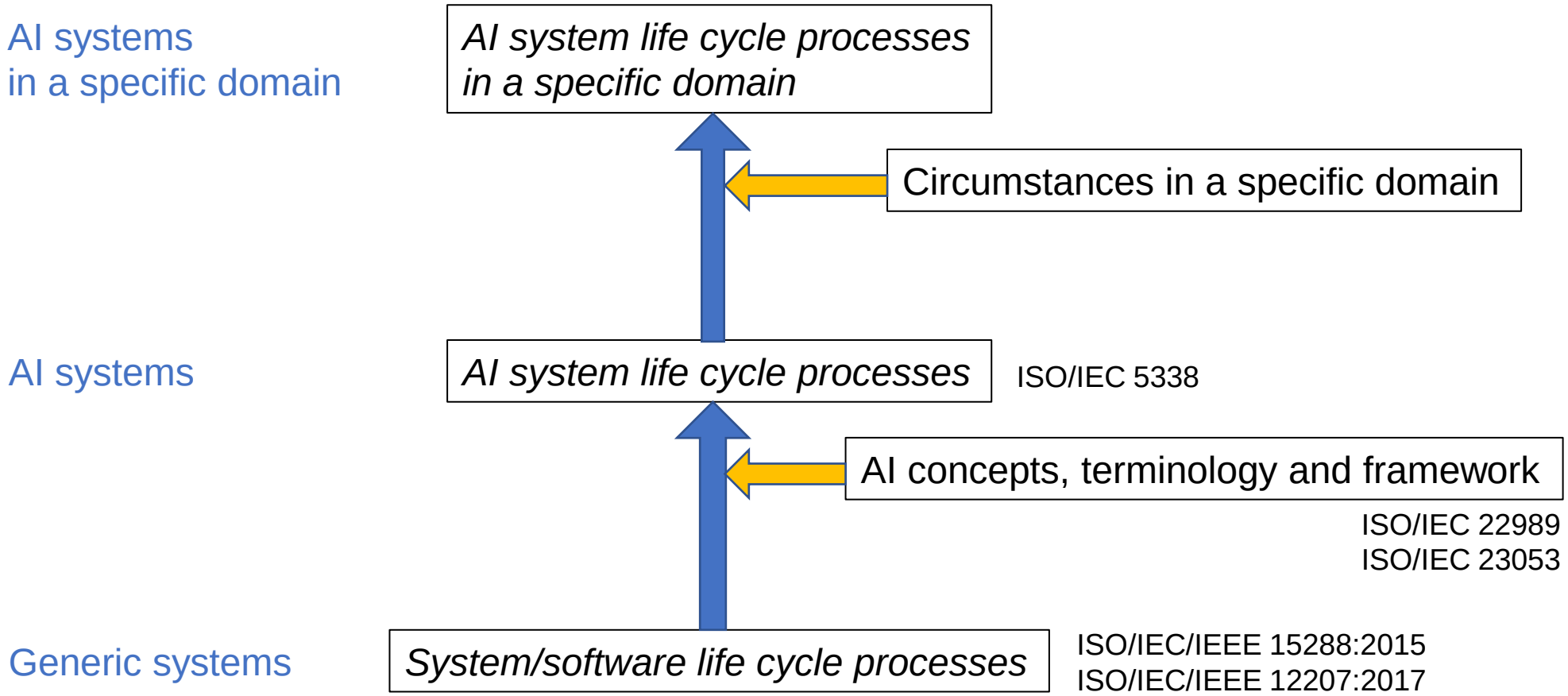
AI Characteristics	Processes	What	How
Built with the capabilities of an AI system that implements a model to acquire information and processes with or without human intervention by algorithm or programming	Training phase – algorithmic processes	Deep learning and imagification	Transforms raw data (ultrasonic testing scanning data) into image data using RGB
Applies optimizations or inferences made with the model to augment decisions, predictions or recommendations in a timely manner	AI application (Fujitsu F|AIR platform) – execution phase	Detect defects	Inspecting non-destructive ultrasonic testing scanning data
	Decision-making	Quality control or inspection decision-making	Decision-making is done through human-machine teaming. The AI system can detect defects with high coverage (more than 95%) of various defects. Humans are only expected to examine the regions of the blade that are flagged by the AI system. For example, detecting missing back wall echo, foreign object of dry glass defect, wrinkle.
Updated and improvements made to the model, system or application by evaluation of interaction outcomes	Continuous validation	Deep learning and imagification	Outcomes are monitored until certain period of time has passed since the last training or retraining or a new production process is introduced.

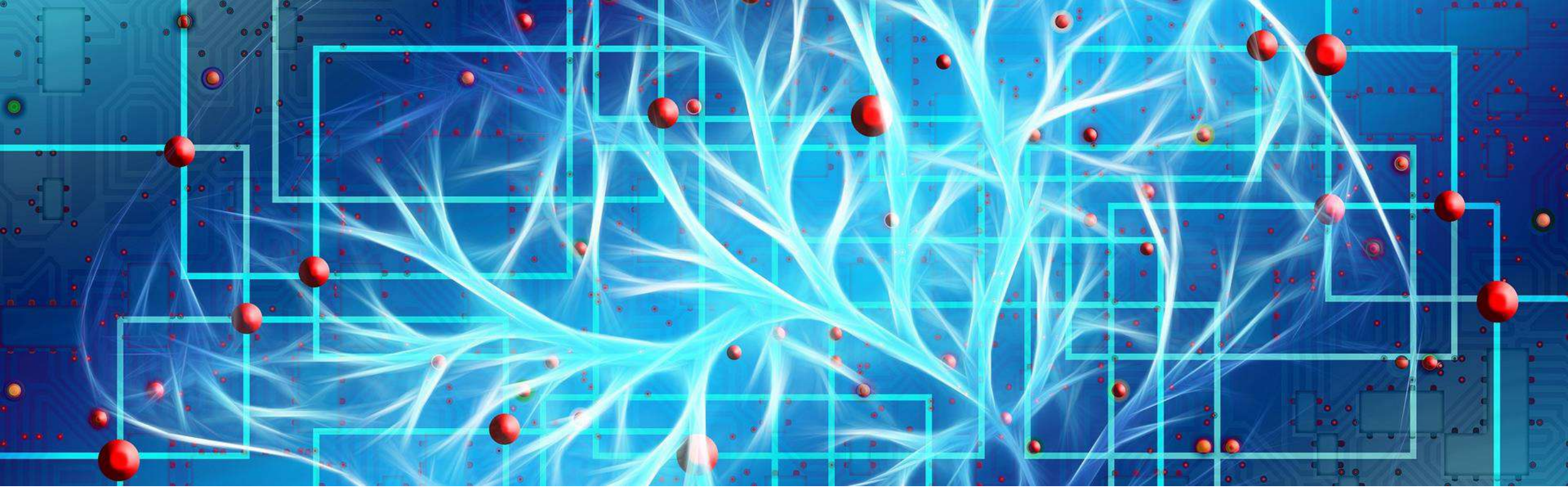
ISO/IEC CD 5338 – AI system life cycle processes

- Defines a set of processes and associated concepts for describing the life cycle of AI systems based on machine learning and heuristic systems.
- Is based on ISO/IEC/IEEE 15288:2015 and ISO/IEC/IEEE 12207:2017 with modifications and additions of AI-specific processes from ISO/IEC 22989 and ISO/IEC 23053.

ISO/IEC/IEEE 15288:2015: Systems and software engineering — System life cycle processes
ISO/IEC/IEEE 12207:2017: Systems and software engineering — Software life cycle processes
ISO/IEC 22989: Information technology — Artificial intelligence — Artificial intelligence concepts and terminology
ISO/IEC 23053: Framework for Artificial Intelligence (AI) Systems Using Machine Learning (ML)

Life cycle processes for AI systems in a specific domain





Summary

AI use cases, guidelines for AI applications and AI system life cycle processes are useful tools for collaboration among all stakeholders.

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SC 42 – Artificial Intelligence

Thank you

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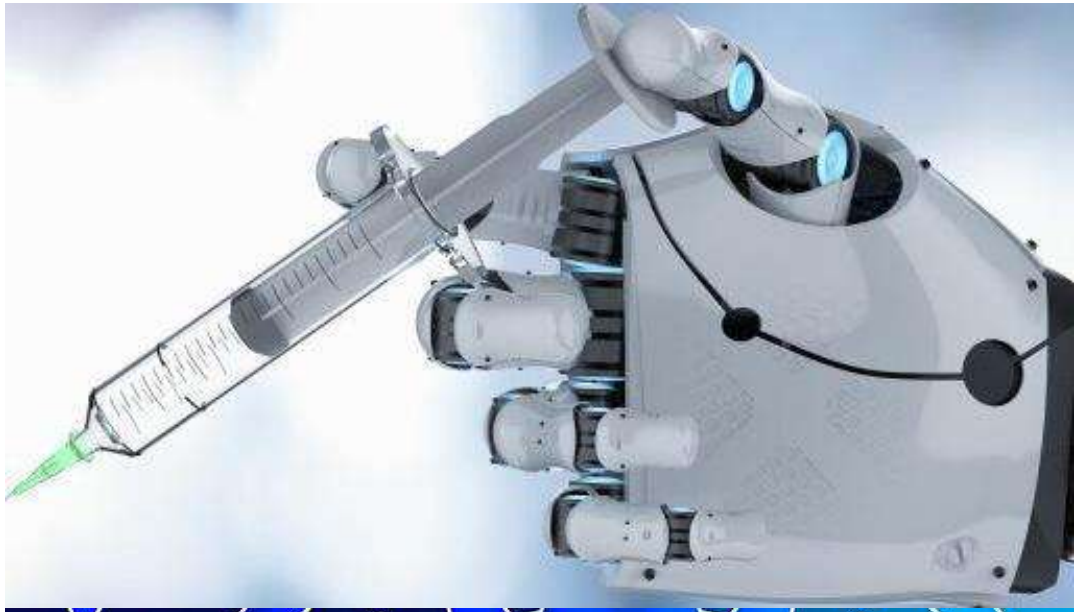
https://www.aist.go.jp/index_en.html



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INFORMATION TECHNOLOGY STANDARDS
SC 42 – Artificial Intelligence

Dr. Jochen Friedrich – IBM Technical Relations Europe
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AI Standardisation supporting regulatory needs

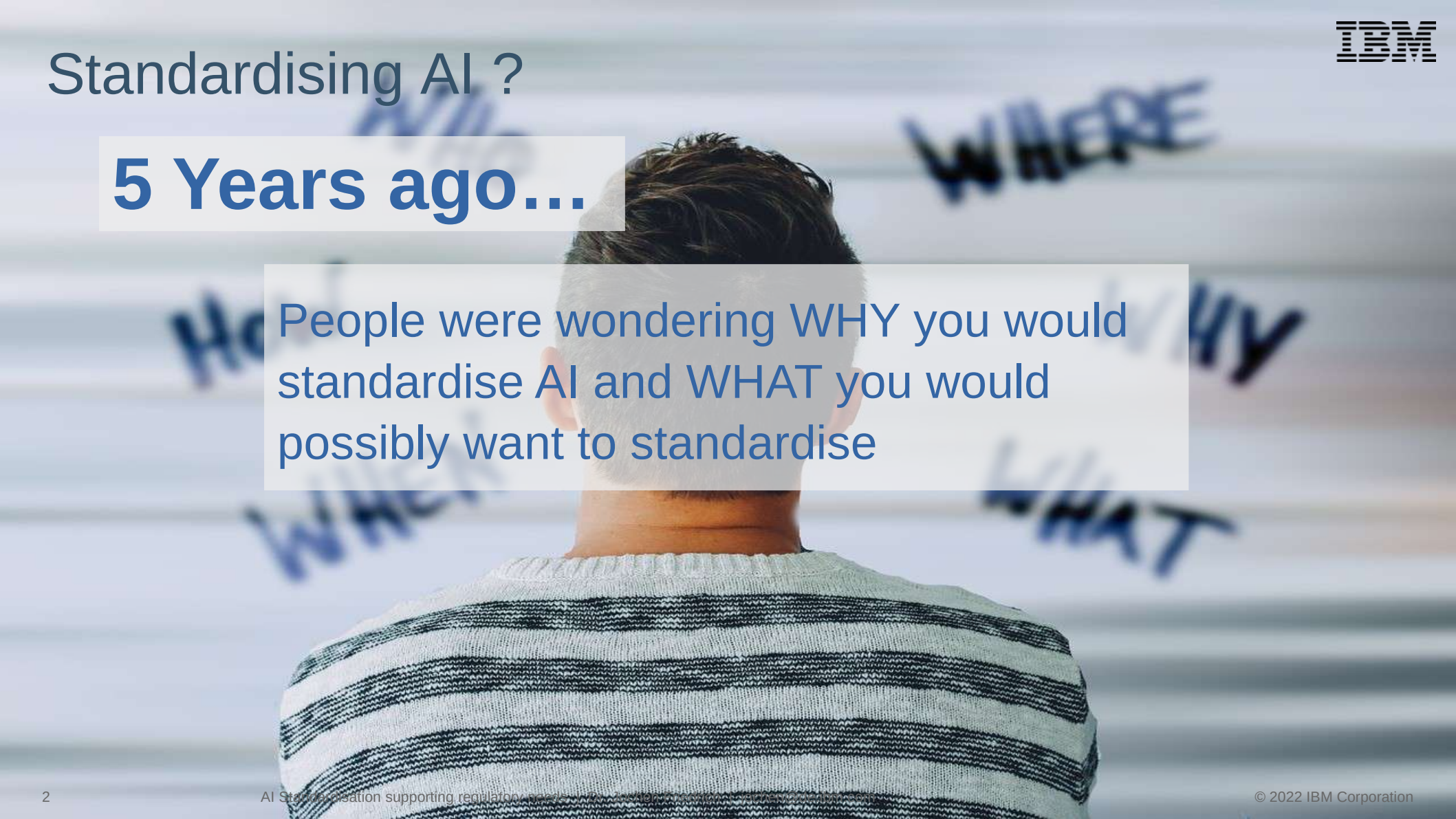
Workshop of ISO/IEC JTC 1 SC 42

25 May 2022

Standardising AI ?

5 Years ago…

People were wondering WHY you would standardise AI and WHAT you would possibly want to standardise



Standardising AI – Two Aspects: Compare to Machinery

Example of machinery:

You don't standardise how the machine works

But you standardise the input, the output and the external factors around the machine

Standardising AI – Two Aspects: Ethics

AI has brought the topic of ETHICS into standardisation.

How do Humans and AI systems work hand-in-hand

Which are ethical impacts of running and using AI systems

What needs to be addressed for ensuring “ethical AI”

Who takes decisions and holds responsibility

Good AI

Bad AI

Pioneers in AI Standardisation – IEEE and ISO/IEC JTC 1

THE IEEE GLOBAL INITIATIVE ON ETHICS OF AUTONOMOUS AND INTELLIGENT SYSTEMS

The IEEE Global Initiative's mission is, to ensure every stakeholder involved in the design and development of autonomous and intelligent systems is educated, trained, and empowered to prioritize ethical considerations so that these technologies are advanced for the benefit of humanity.

[https://standards.ieee.org/industry-connections/ec/autonomous-systems/]

ISO/IEC JTC 1 SC 42

ARTIFICIAL INTELLIGENCE

Serve as the focus and proponent for JTC 1's standardization program on Artificial Intelligence

Provide guidance to JTC 1, IEC, and ISO committees developing Artificial Intelligence applications

[https://www.iso.org/committee/6794475.html]

IBM Policy Lab: Precision Regulation for Artificial Intelligence

5 policy imperatives for companies, based on whether they are a provider or owner (or both) of an AI system

Designate a lead AI ethics official

Responsible for trustworthy AI

Accountable for internal guidance and compliance mechanisms

Oversee risk assessments and harm mitigation strategies

Different rules for different risks

Initial high-level assessment of the technology's potential for harm

In-depth and detailed assessment for higher-risk applications

Document assessment processes in detail to be auditable, and retain them for a minimum period of time

Don't hide your AI

Promote transparency is through disclosure

Make purpose of an AI system clear to consumers and businesses

Explain your AI

Maintain audit trails surrounding input and training data

Make available documentation informing about confidence measures, levels of procedural regularity, error analysis

Test your AI for bias.

Responsibility that AI systems are fair and secure

Take remedial actions as needed, both before sale or deployment and after an AI system is operationalised

See https://www.ibm.com/blogs/policy/ai-precision-regulation/

US Policy Initiatives Around AI

NATIONAL ARTIFICIAL INTELLIGENCE INITIATIVE ACT OF 2020 (DIVISION E, SEC. 5001)

AI IN GOVERNMENT ACT OF 2020 (DIVISION U, TITLE I)

EO 13859, MAINTAINING AMERICAN LEADERSHIP IN AI

EO 13960, PROMOTING USE OF TRUSTWORTHY AI IN FEDERAL GOVERNMENT

OMB (EO Office of Management and Budget) GUIDANCE FOR THE REGULATION OF AI
NATIONAL ARTIFICIAL INTELLIGENCE INITIATIVE ACT OF 2020 (DIVISION E, SEC. 5001)

- ➔ ensure continued U.S. leadership in AI R&D
- ➔ lead the world in the development and use of trustworthy AI systems in public and private sectors
- ➔ prepare the present and future US workforce for the integration of artificial intelligence systems across all sectors of the economy and society
- ➔ support opportunities for international cooperation with strategic allies on R&D, assessment, and resources for trustworthy AI systems

[https://www.ai.gov/legislation-and-executive-orders/]

European Union High Level Expert Group on AI

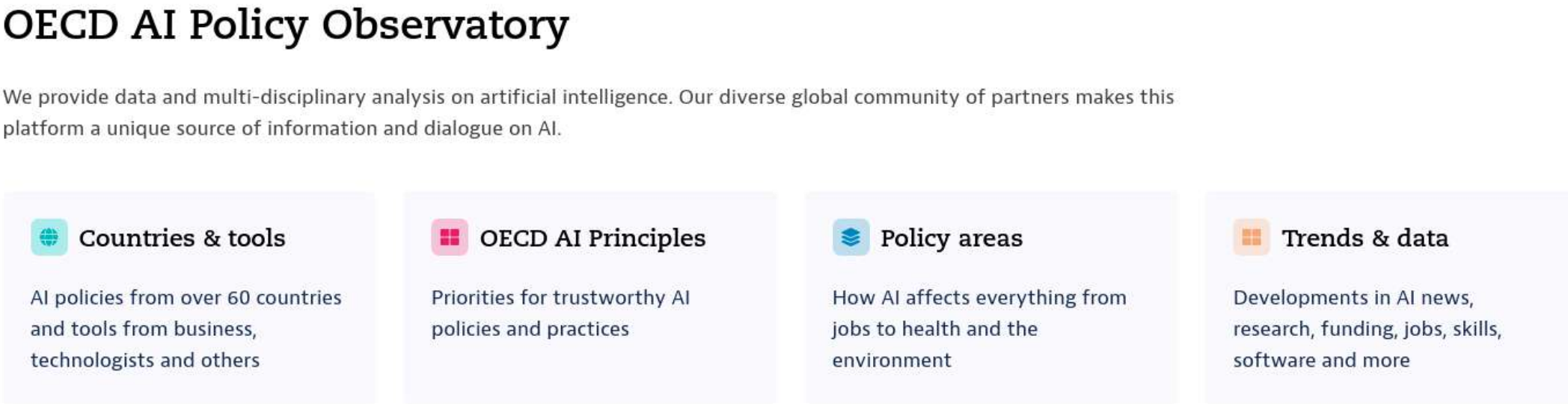
Ethics Guidelines on Artificial Intelligence:

The Guidelines put forward a human-centric approach on AI and list 7 key requirements that AI systems should meet in order to be trustworthy.

- Human agency and oversight
- Technical robustness and safety
- Privacy and Data governance
- Transparency
- Diversity, non-discrimination and fairness
- Societal and environmental well-being
- Accountability

[https://ec.europa.eu/futurium/en/european-ai-alliance/ai-hleg-steering-group-european-ai-alliance.html]

OECD.AI – Focus on AI with a Broad Scope



[https://oecd.ai/en/]

Good governance and ethical standards are of key interest for the provision and adoption of AI technologies.

Governments around the world look at promoting the uptake of AI technologies and ensuring leadership and societal benefits of AI via appropriate regulatory and policy measures.

Open and voluntary standardisation has come a good way in providing relevant standards for ensuring high-quality, trustworthy and ethical AI systems.

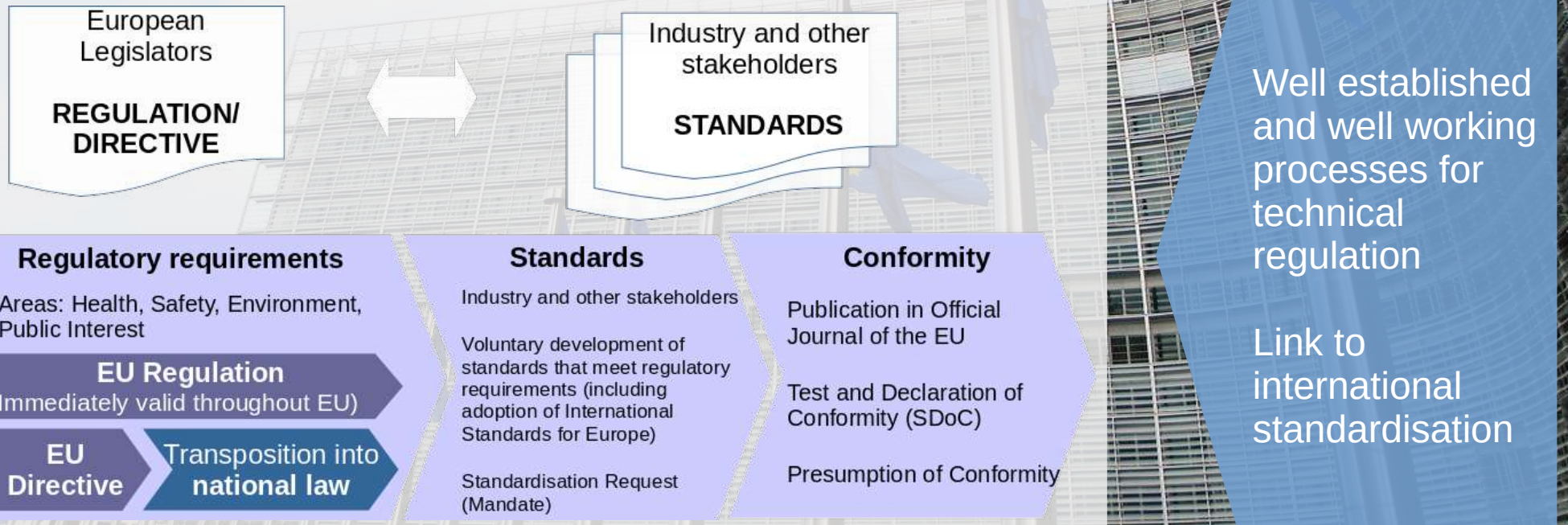
Open and voluntary standards play a key role for delivering “good AI”.

AI Regulation and Standardisation

European Commission issued a proposal for an AI regulation

It includes a risk-based approach and is modelled according to the New Legislative Framework, i.e. with harmonised European Standards as a basis for demonstrating compliance.

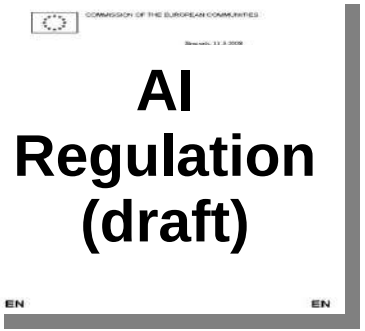
EU New Legislative Framework (NLF)



Well established and well working processes for technical regulation

Link to international standardisation

New regulated areas: Artificial Intelligence



https://ec.europa.eu/newsroom/dae/items/709090

Article 40 – Harmonised standards

High-risk AI systems which are in conformity with harmonised standards or parts thereof the references of which have been published in the Official Journal of the European Union shall be presumed to be in conformity with the requirements set out in Chapter 2 of this Title, to the extent those standards cover those requirements.

A “Back Stop” in the Draft Regulation on AI

Article 41 – Common specifications

1. Where harmonised standards referred to in Article 40 do not exist or where the Commission considers that the relevant harmonised standards are insufficient or that there is a need to address specific safety or fundamental right concerns, the Commission may, by means of implementing acts, adopt common specifications in respect of the requirements set out in Chapter 2 of this Title. Those implementing acts shall be adopted in accordance with the examination procedure referred to in Article 74(2).

EU Draft Regulation on AI – Essential Requirements

Essential requirements as laid down in EU Draft Regulation, Chapter 2, Articles 9-15:

- Risk management system
- Data and data governance
- Technical documentation
- Record-keeping
- Transparency and provision of information to users
- Human oversight
- Accuracy, robustness and cybersecurity

ISO/IEC JTC 1 SC 42 has work ongoing on all of these topics and issues

Objective must be to have international standards supporting regulatory and policy needs globally

Ideally international standards will be accepted as European standards

EU Rolling Plan for ICT Standardisation – Chapter on AI

Developed by the European Commission in collaboration with the EU Multi-Stakeholder Platform for ICT Standardisation, an expert advisory group of the European Commission

Covering 35+ policy areas and identifying standardisation needs for supporting policy objectives

Invitation to ICT standardisation community to get active on standardisation: “Actions” in part B of each chapter

Does not cover standards for EU regulation

PDF version: https://ec.europa.eu/docsroom/documents/49834

Web version: https://joinup.ec.europa.eu/collection/rolling-plan-ict-standardisation/rolling-plan-2022

Actions on AI in the EU Rolling Plan for ICT Standardisation (1/2)

Action 1 SDOs should establish coordinated linkages with, and adequately consider European requirements or expectations from initiatives, including policy initiatives, and organisations contributing to the discourse on AI standardisation. This in particular includes the contents of the EU proposal for an AI Regulation and of the standardisation request on AI issued by the European Commission in 2022 as well as the orientations set in the 2021 review of the Coordinated Plan

Action 2 SDOs should further increase their coordination efforts around AI standardisation both in Europe and internationally in order to avoid overlap or unnecessary duplication of efforts and aim to the highest quality to ensure a trustworthy and safe deployment of this technology.

Action 3 ESOs should coordinate with the Commission and appropriately direct their activities to ensure that the objectives set in the standardisation request on AI issued in 2022 are adequately and timely fulfilled

Action 4 Taking into account the cross-sectorial aspects of the proposed AI Regulation and the interactions between the AI Regulation and existing or future sectorial safety legislation (for example the proposed new EU Regulation on machinery products), ESOs shall devote specific attention to the elaboration of standards on the methodology of risk assessment of cyber-physical products powered by AI and on the testing framework.

Actions on AI in the EU Rolling Plan for ICT Standardisation (2/2)

Action 5 SDOs should appropriately consider cybersecurity and related aspects of artificial intelligence, to identify gaps and develop the necessary standards on safety, privacy and security of artificial intelligence, to protect against malicious artificial intelligence and to use artificial intelligence to protect against cyber-attacks

Action 6 EC/JRC to coordinate with SDOs and other initiatives on developing a standardisation landscape and gap analysis for AI. This work should include recommendations for an action plan

Action 7 Stakeholders in open source to identify relevant open source projects in the field of AI, e.g. providing tools for testing, benchmarking etc.

Challenges

There are challenges ahead for regulation making use of standardisation in the area of AI

We should address the challenges in a constructive way

We should look at best practices and good examples for solving issues that are seen

Challenges – Ethics, Values and AI Standardisation

Values are set by law and reflect ethics

Standards provide technical ways to fulfill requirements set by law

Standards don’t set values per se but will have to provide ways to enable operation according to values

Standards must comply with values and law and must not undermine law

Standards don’t set ethics but define paths for operating in an ethical way

Challenges – Updating and Self-Learning

The traditional use case:
Placing a product on the market

The new situation:
Operating a system

Standards for AI are process oriented, inter alia defining requirements for ensuring compliance of an AI system throughout the entire life-cyle

New methods for conformity assessment may have to be developed over time taking into account specifics of software systems

Difference between stand-alone AI systems and embedded AI systems

Challenges – Market Surveillance

Market surveillance is critical for the functioning of the system.

What is required so that market surveillance authorities can properly assess compliance of AI systems?

Do conformity assessment procedures need to evolve?

Which information do market authorities require (source code?; algorithms?; …)

Where do we need to get to?

Regulators around the world should rely on international standards for addressing and supporting regulatory needs and policy objectives

Standards provide a proven method for defining the way on how technology must be built for fulfilling regulatory requirements

Standards provide a proven basis for self-assessment of conformity for bringing trusted, secure and safe technology to the market

Open Source – Complementing Standardisation

Tools and technologies developed in Open Source are available and should be considered to support and complement standardisation

Standardisation organisations and open source communities should partner on identifying areas for synergy

Community creation around standards provides for fast feedback cycles and innovative technology improvements

Collaboration is key

Experts are rare

Standards bodies need to collaborate to maximise synergy and avoid duplication of efforts

ISO/IEC JTC 1 SC 42 has a lead role internationally but should also take an obligation for promoting collaboration

New methods, e.g. open source technologies, need to be considered and partnering needs to be done

Thanks very much for your attention

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Developing a TS on assessment of ML classification performance

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Accenture Federal Services

Lingzhong Meng
Chinese Academy of Sciences

ISO JTC 1 IEC
INFORMATION TECHNOLOGY STANDARDS
SC 42 – Artificial Intelligence

Why does “Machine Learning Classification Performance Assessment” matter?

Problem Statement

- To *ensure fairness* and *reduce bias* in ML systems, consistent approaches and methods can be applied to ML classification performance assessment
- *We need to be able to compare results across different evaluation regimes*

Approach

- SC 42 developed a Technical Specification - *ISO/IEC 4213* - that provides methodologies for binary, multi-class, and multi-label classification use cases
- Anticipated publication in Q2 2022
- Builds on foundational concepts in ISO/IEC 22989

ML classification types addressed in TS 4213

Binary	Multi-Class	Multi-Label
• Each sample labelled as one of two mutually exclusive classes • Often positive or negative with reference to a categorization *Example – ML classification software learns to mark email as "spam" or "not spam" based on feedback from email recipient*	• Each sample labelled as one of three or more mutually exclusive classes *Example – ML classification software learns to categorize images as "dog", "cat" or "other" based on labels assigned by a human reviewer*	• Each sample can be labelled as one or more classes – labels not mutually exclusive • Sample can have multiple labels • ML model can predict some labels correctly, but fail to predict other correct labels • ML model can predict some labels correctly, but predict others incorrectly *Example - ML classification software learns to categorize text as one or more of opinion, news, hostile, misinformation or disinformation based on labels assigned by a human reviewer*

How can you use TS 4213?

Specifies methodologies for measuring classification performance of machine learning models, systems and algorithms

Questions that TS 4213 helps answer

- How "good" is the model?
- How reliable are its predictions?
- What is the expected frequency and size of errors?
- What is the best-performing model out of N alternatives?
- Does the model perform well over time with noisy or new production data

Evaluation concepts that TS 4213 includes

- Data representativeness and bias
- Pre-processing
- Training data
- Test and validation data
- Cross-validation
- Limiting information leakage
- Limiting channel effects
- Ground truth
- ML algorithms, hyperparameters and parameters
- Evaluation environment
- Acceleration
- Appropriate baselines
- Putting performance in context

Informative Annexes

Annex A~D can help us better use TS 4213

Annex A

Multi-class classification performance illustration

Annex B

Illustration of ROC curve derived from classification results

Annex C

Summary information on ML classification benchmark tests

Annex D

Chance-corrected cause-specific mortality fraction

Thank you

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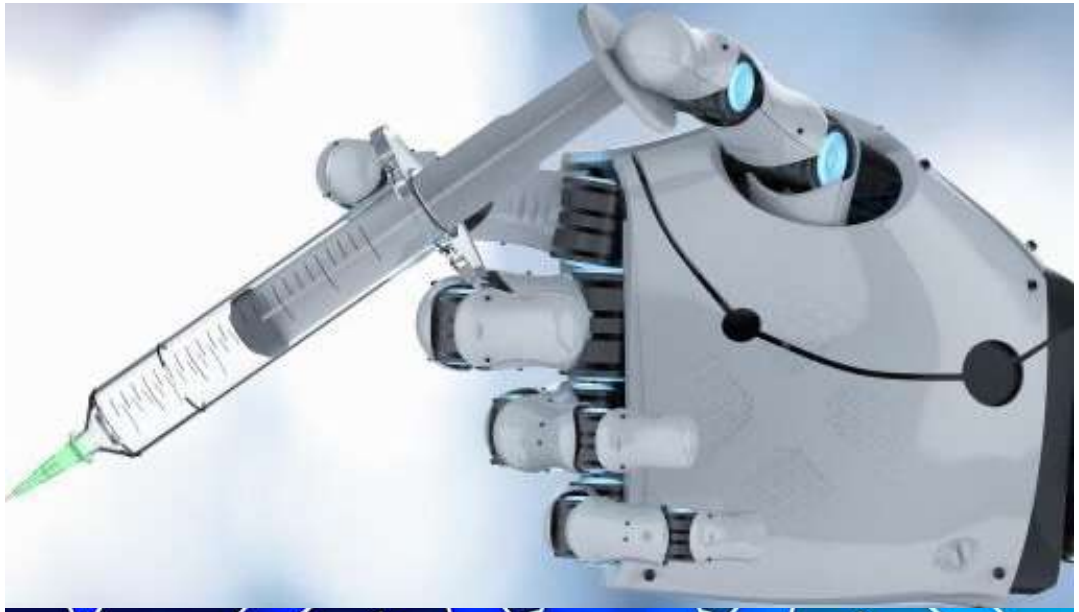

Introduction of Governance Implications of AI Systems

Yonosuke Harada,

SC42 JWG1 Convenor

Emeritus Prof. Institute of Information Security

ISO JTC1 IEC
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SC 42 – Artificial Intelligence

Introduction

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Topics

- Background
- ISO/IEC38507
- Why governance ?
- Where to start AI governance
- Models and policies

Background

AI is the opportunity and risk for the organization

Use of AI can bring:

- significant benefit to the organization strategically

- significant risk to the organization, with the potential for harm to its stakeholders;

- additional obligations (regulations, ethical behavior, etc) to the organization.

Background

Governance is common issues

- IT : Governance of IT
  - Impact of IT systems : Society, economy, safety
  - ISO/IEC 38500:2015 Governance of IT (SC40)
- IT security : Governance of Information Security
  - Information Security and Privacy is global issue
  - ISO/IEC 27014:2020 Governance of Information Security
- AI : Governance imprecation is necessary

Background

Governance is common issues

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- AI : Governance imprecation is necessary

Why Governance

definition from ISO31000 Risk Management

- Governance guides the course of the organization, its external and internal relationships, and the rules, processes and practices needed to achieve its purpose.
- Management structures translate governance direction into the strategy and associated objectives required to achieve desired levels of sustainable performance and long-term viability.

Why Governance

use of AI brings new source of risk ?

New reality by implication of AI

- use of AI brings new risks and responsibilities

- AI is not inherently ‘good’ or ‘evil’, ‘fair’ or ‘biased’, ‘ethical’ or ‘unethical’

(its use can be or can seem to be so)

- Governing Body implicate necessary actions identify new risks, mitigate potential risk with policies and controls

ISO/IEC 38507:2022

just published by joint effort by ISO/IEC JTC1 SC42 and SC40

- Provides guidelines for the governing body of the organization in introduction of AI.
- Provides basic idea to understand AI as the new technology and show pro and con for use of AI for the organization
- Provides reference to other standards for detail implementation by the management of the organization.

Overview of AI and AI systems (clause 5)

technical background (base line and not for technicians/engineers)

- Introduction AI for beginner
- How AI *systems* differ from other information technologies
- Decision automation
- Data-driven problem-solving
- Adaptive systems
- AI ecosystem
- Benefits of the use of AI
- Constraints on the use of AI

Use of AI

concept introduced in ISO/IEC38507

- Use of AI to fulfil objectives and create value for the organization
- Use of AI is defined in the broadest sense as developing or applying an AI system through any part of its life
  - includes relationships with any party providing or using such systems
  - excludes AI service provider
- Governance on Use of AI is focused.

when to apply

- governance of current and future uses of AI in the organization
- implications of use for the organization to fulfil purpose
- generate additional value for the organization and its stakeholders

Where to apply

AI is used every where (embedded in software)

- Governance should be implemented through any part of AI life cycle
- Governance “gating process” in each stage

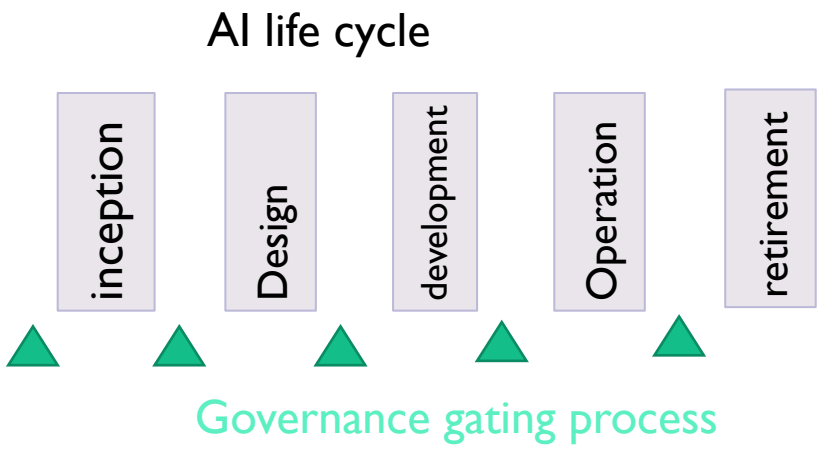


Figure is modified from original Figure 2 in ISO/IEC38507

potential user/reader

not only for Governing Bodies

Guidance to a wider community,

- executive managers;
- external businesses or technical specialists, such as legal or accounting specialists, retail or industrial associations, or professional bodies;
- public authorities and policymakers;
- internal and external service providers (including consultants);
- assessors and auditors

Where to start AI governance ? Set a goal

- set goals in traditional contexts extends to both financial objectives and non-financial outcomes including culture, values and ethical outcomes.
- Organizational and governance policies are generally created and enforced through a combination of controls, business plans, strategies, position descriptions, professional discipline accepted practice, regulation, training, key performance indicators and a variety of executive communications

Where to start AI governance ?

Responsibility and accountability of AI

- remains accountable for all activities (including AI) of an organization and this accountability cannot be delegated.
- ongoing responsibility to consider the implications on the organization of any new tool, technique or technology for AI being introduced.
- AI has the potential to enable new organizational objectives, and to fulfil or extend existing ones, and do so more effectively and more efficiently

ISO/IEC 38507:2022

helps governing body and the organization

- intended to help the governing body understand and adapt and revise policies for the use of AI.
- provides guidance operational aspects of the policies are implemented through management.
- refers to other standards for details on related topics including social responsibility, trustworthiness (such as risk management, management of bias, and quality) and compliance management.

Governing body and Management

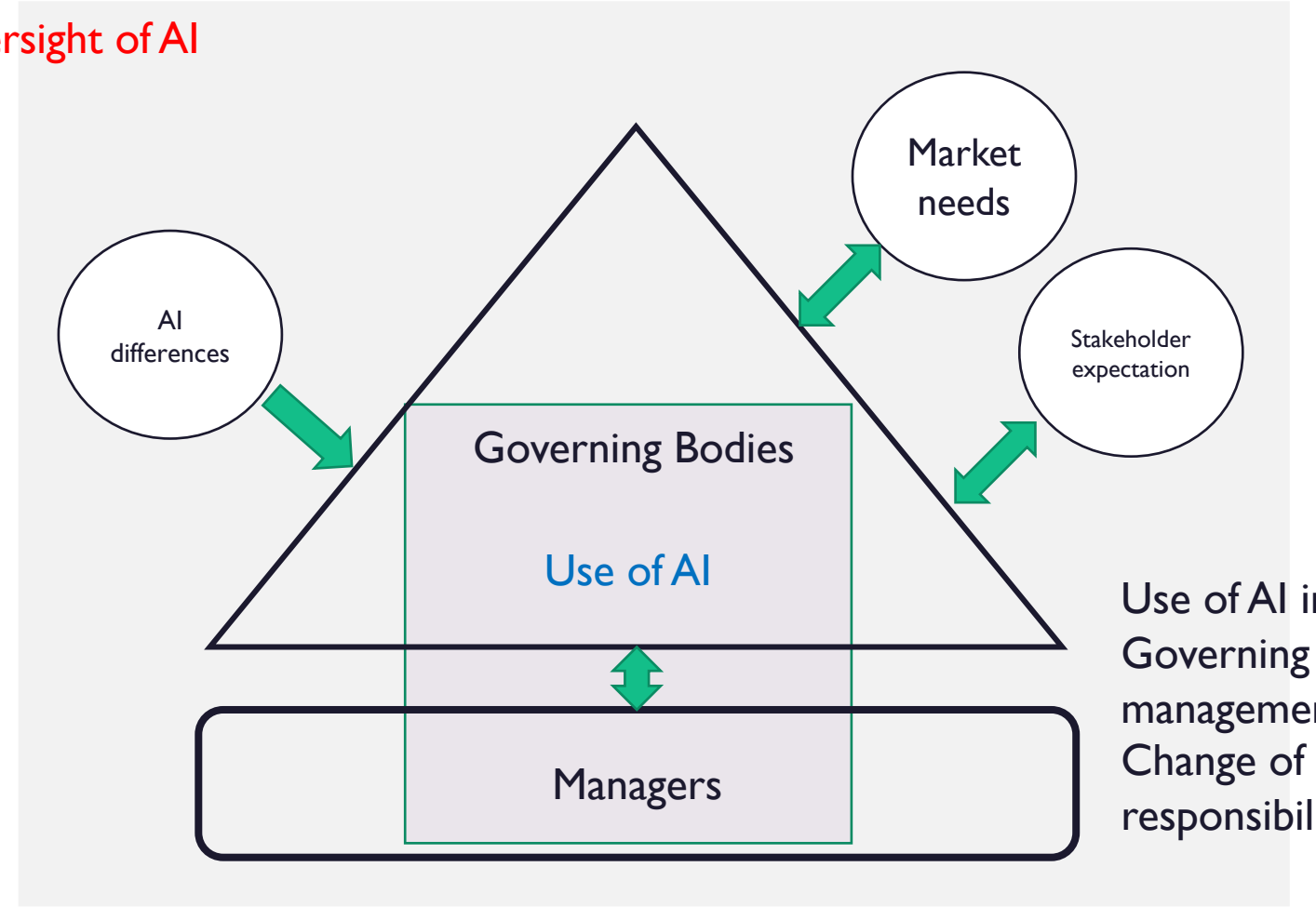
- managers are responsible for ensuring the achievement of the objectives of the organization within the strategies and policies established by the governing body.
- governance is accomplished in close cooperation between the governing body and managers.

Model of Use of AI implication for the organization

Use of AI will enhance customer satisfaction and communication

Use of AI will decrease cost

Use of AI for Organization by increasing completive advantage

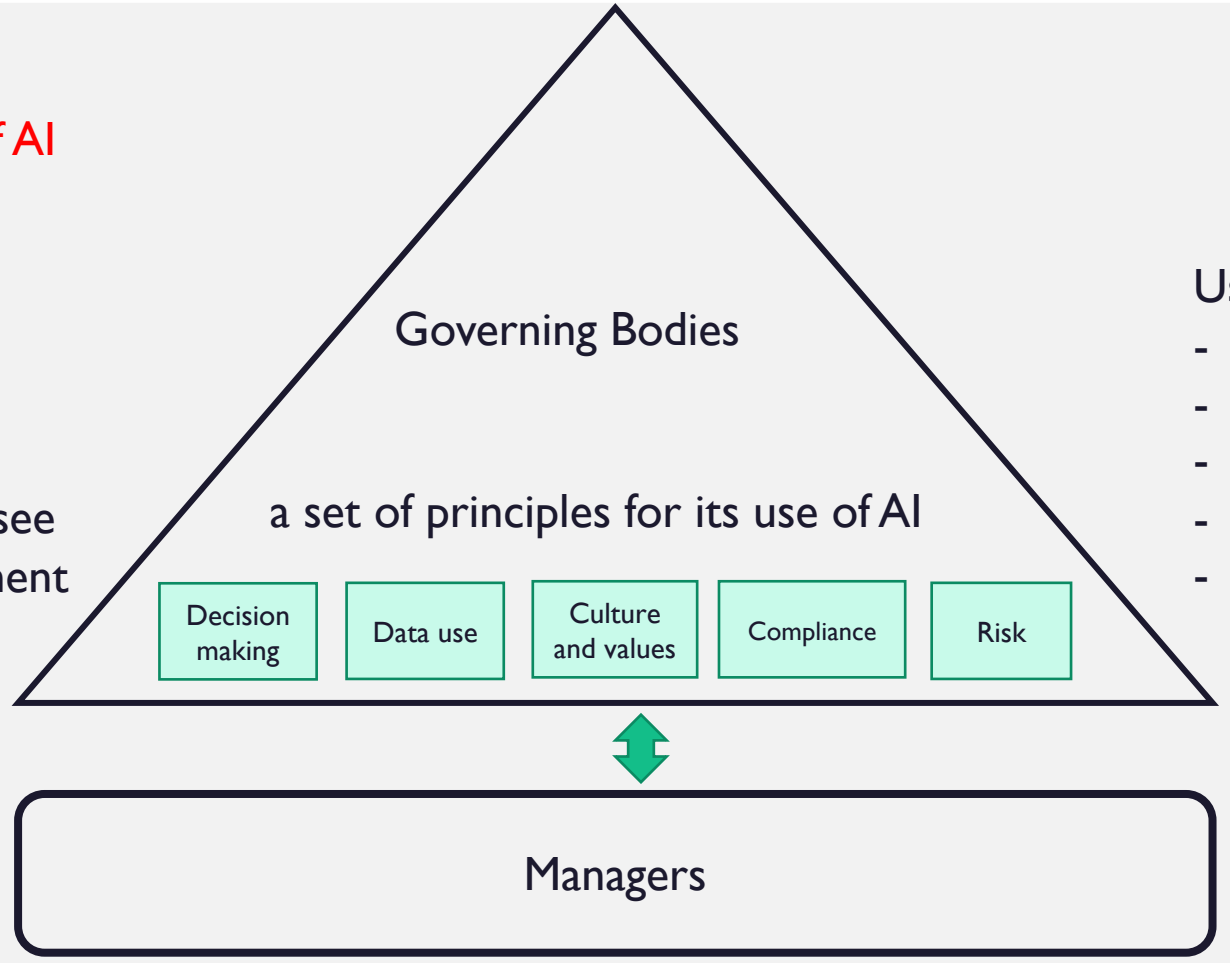


Use of AI impact both Governing body and management
Change of business style, responsibility etc

Figure is modified from original Figure 3 in ISO/IEC38507

Model of Use of AI implication for the organization

Oversight of AI



set and oversee the achievement of outcomes

Use of AI introduces new issues
- Decision making
- Data use
- Culture and values
- Compliance
- Risk

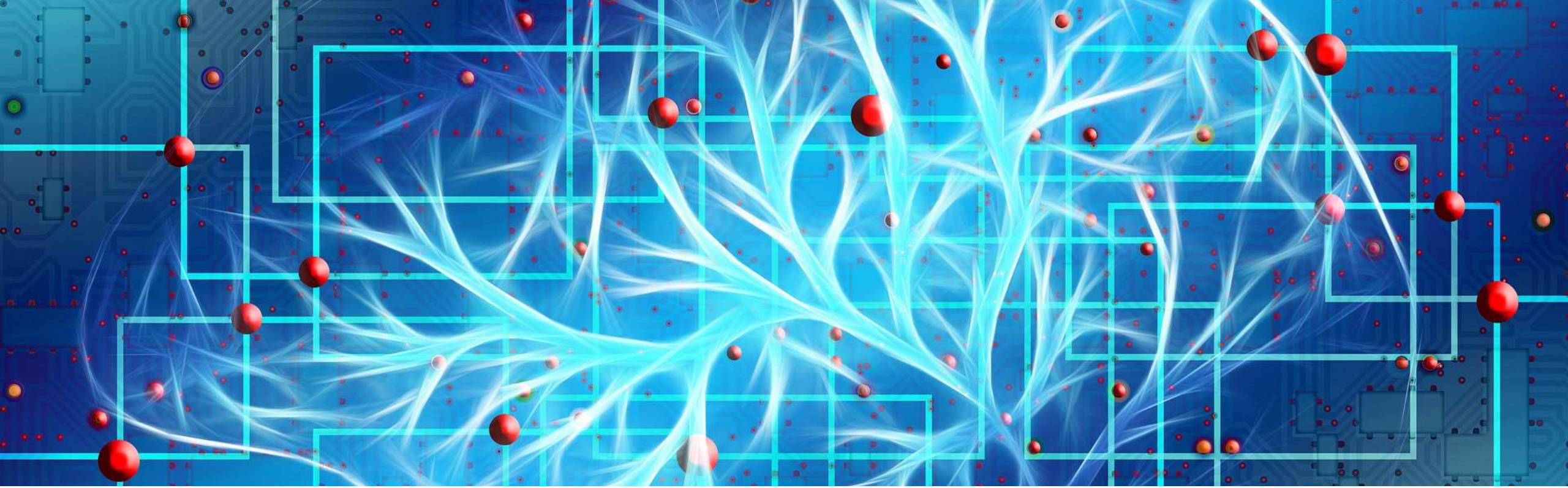
Figure is modified from original Figure 3 in ISO/IEC38507

Policies to address use of AI

- Governance oversight of AI
- Governance of decision-making
- Governance of data use
- Culture and values
- Compliance
- Compliance obligations
- Compliance management
- Risk

Risk management for use of AI

- Risk appetite
- Risk management
- Objectives
- Sources of risk
- Risk controls



Summary

AI provides a huge advantages and chances to the organization
However such opportunities may be accompanied by unforeseen risk and disadvantages Governing Bodies should understand whole issues together and pay attention to risks
38507 gives advices

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Thank you

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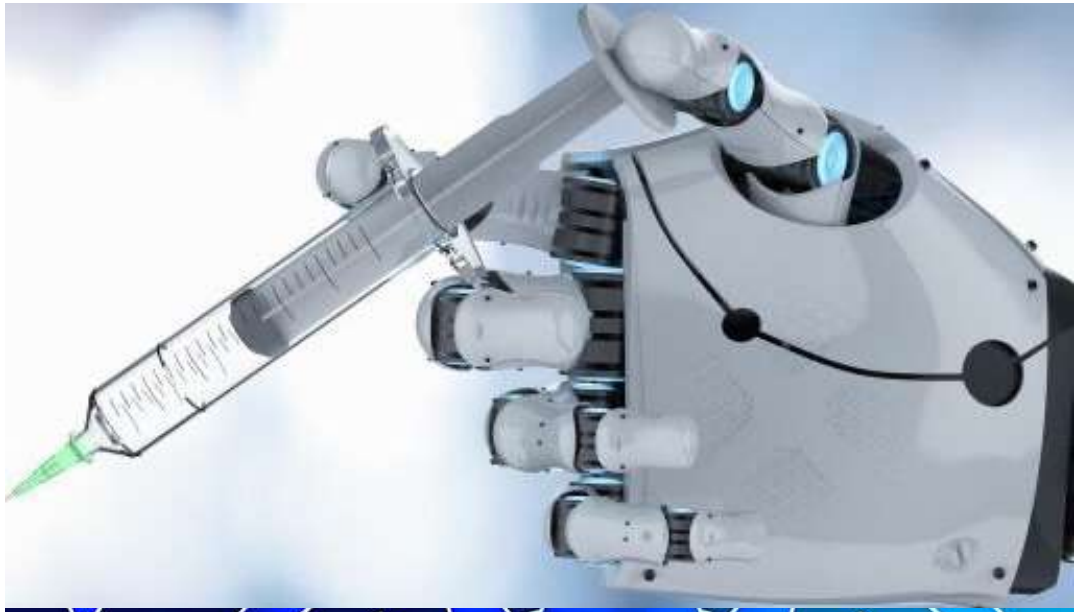


ISO JTC1 IEC
INFORMATION TECHNOLOGY STANDARDS
SC 42 – Artificial Intelligence

The foundational standards for AI

ISO/IEC 22989 and ISO/IEC 23053

Paul Cotton, Milan Patel, Wei Wei

ISO JTC1 IEC
INFORMATION TECHNOLOGY STANDARDS

SC 42 – Artificial Intelligence

Introduction

Foundational standards are the fundamental building blocks for other standards and applications. 22989 and 23053 are the first two foundational standards developed by JTC1 SC42 (AI) since it's creation in 2018. Both standards provide common terminologies and key concepts in AI and ML field. In May 2022, both AI foundational standards have been approved and will be published shortly.

ISO JTC1 IEC
INFORMATION TECHNOLOGY STANDARDS
SC 42 – Artificial Intelligence

ISO/IEC 22989 AI concept & terminology

- ✓ FDIS 22989 has been approved in May 2022, will be published shortly
- ✓ Standard terminology provides common language in AI world which helps people with different backgrounds to understand each other
  - ✓ 117 terms in 7 categories: AI general terms (e.g., AI system), data terms (e.g., test data, validation data), ML terms (e.g., model parameter), neural network terms (e.g., deep learning), trustworthiness terms (e.g., bias, explainability, transparency), NLP terms (e.g., machine translation), computer vision terms (e.g., image recognition).
- ✓ Key concept in AI world helps people to develop standards which are interoperable and coherent
  - ✓ basic concepts in AI, ML, data, trustworthiness as well as AI system life cycle, stakeholder roles, functional overview, eco system, application fields etc.

22989: AI system definition

Blind men and the elephant

A group of blind men heard that a strange animal, called an elephant, had been brought to the town, but none of them were aware of its shape and form. Out of curiosity, they said: "We must inspect and know it by touch, of which we are capable". So, they sought it out, and when they found it they groped about it. The first person, whose hand landed on the trunk, said, "This being is like a thick snake". For another one whose hand reached its ear, it seemed like a kind of fan. As for another person, whose hand was upon its leg, said, the elephant is a pillar like a tree-trunk. The blind man who placed his hand upon its side said the elephant, "is a wall". Another who felt its tail, described it as a rope. The last felt its tusk, stating the elephant is that which is hard, smooth and like a spear.

- ✓ The most challenging task that SC42 WG1 experts spent most time and effort in 22898
- ✓ Hard to reach consensus, because different people with different background has different view
- ✓ Many contributions from experts and NBs including definitions from internal/external sources such as OBP, EU AI HLEG, EU AI Act, OECD, Oxford etc
- ✓ Current approach contains two parts: main body describes what AI system does + note describes how AI system works

AI system

engineered system that generates outputs such as content, forecasts, recommendations or decisions for a given set of human-defined objectives

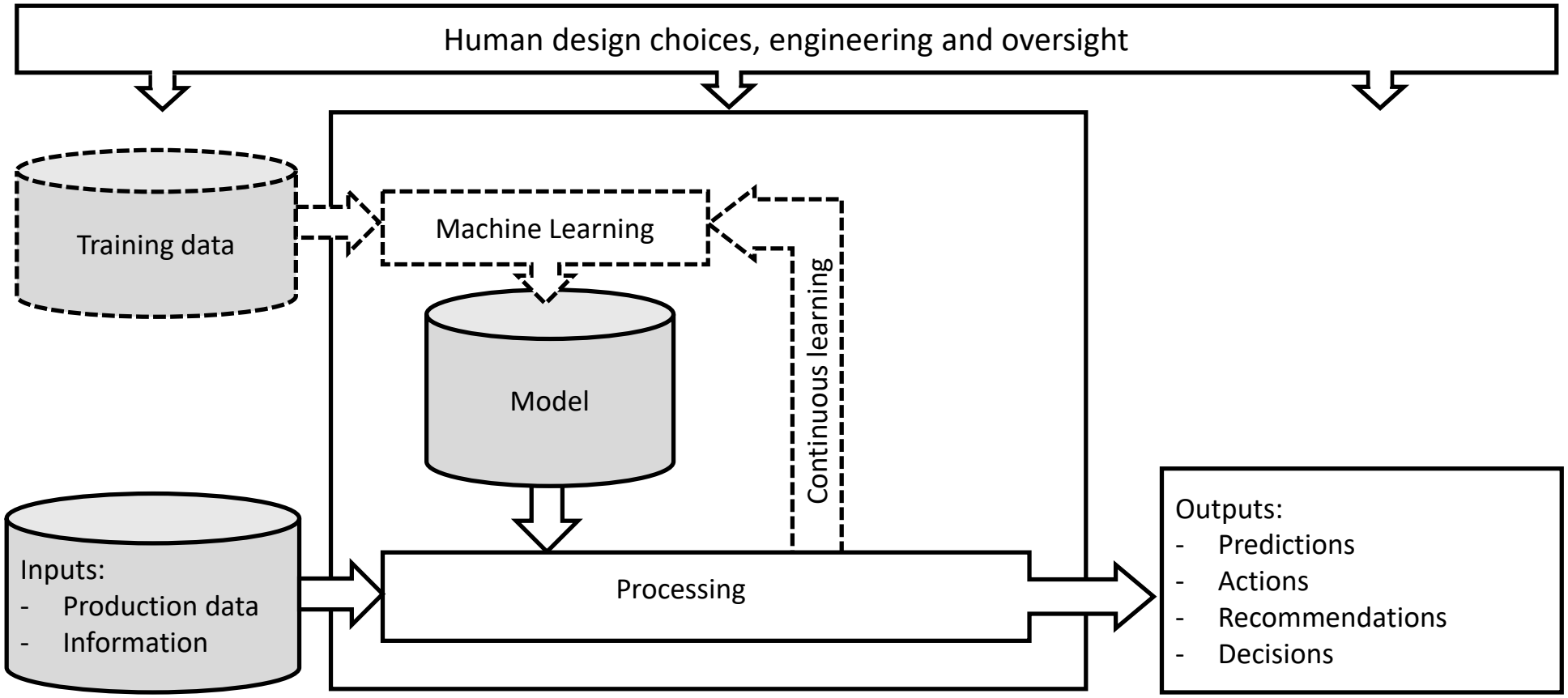
Note 1 to entry: The engineered system can use various techniques and approaches related to *artificial intelligence* (3.1.3) to develop a *model* (3.1.23) to represent data, *knowledge* (3.1.21), processes, etc. which can be used to conduct *tasks* (3.1.35).

Note 2 to entry: AI systems are designed to operate with varying levels of *automation* (3.1.7).

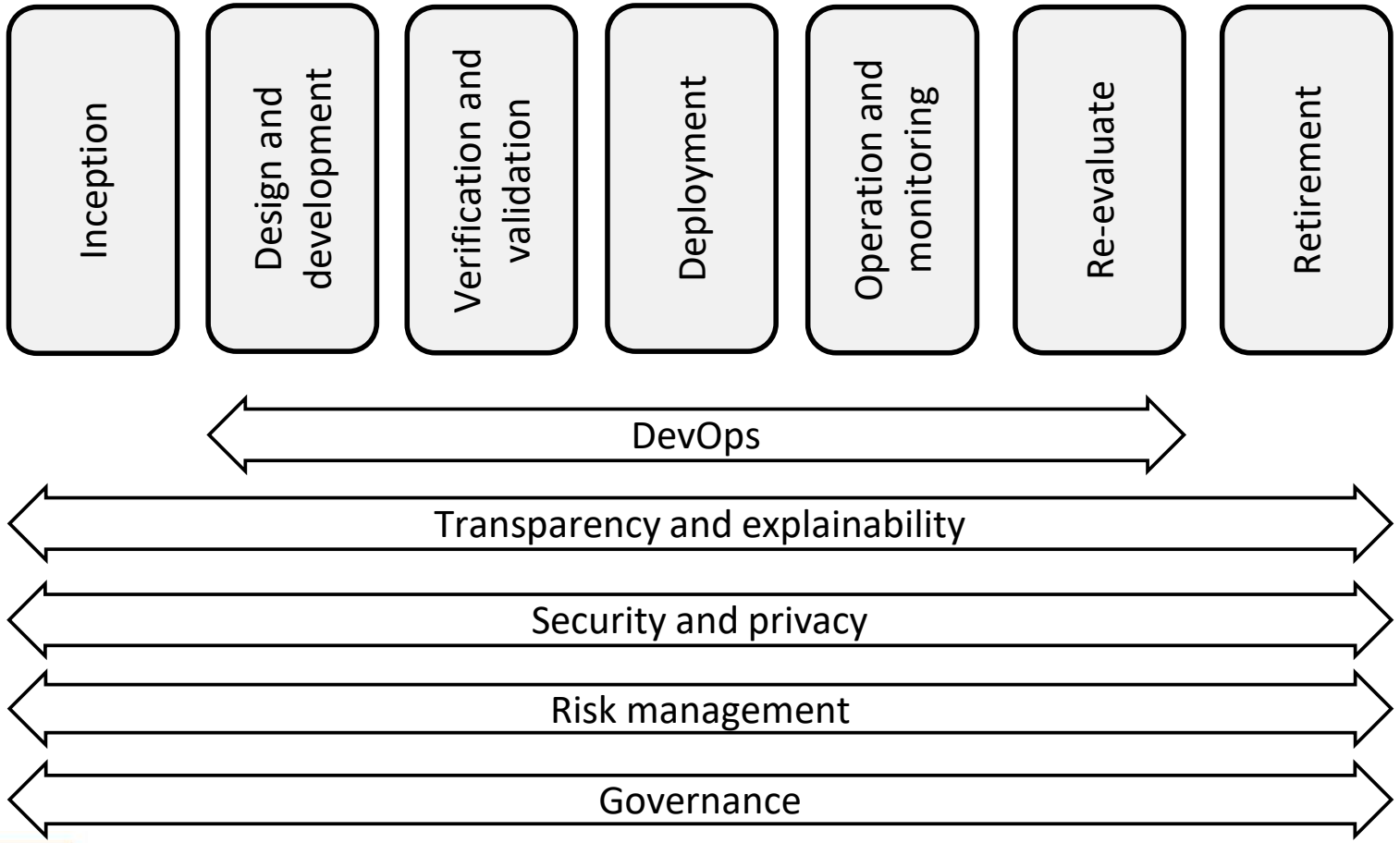
22989: Level of automations

		Level of automation	Comments
Automated system	Autonomous	6 - Autonomy	The system is capable of modifying its intended domain of use or its goals without external intervention, control or oversight.
	Heteronomous	5 - Full automation	The system is capable of performing its entire mission without external intervention
		4 - High automation	The system performs parts of its mission without external intervention
		3 - Conditional automation	Sustained and specific performance by a system, with an external agent being ready to take over when necessary
		2 - Partial automation	Some sub-functions of the system are fully automated while the system remains under the control of an external agent
		1 - Assistance	The system assists an operator
		0 - No automation	The operator fully controls the system

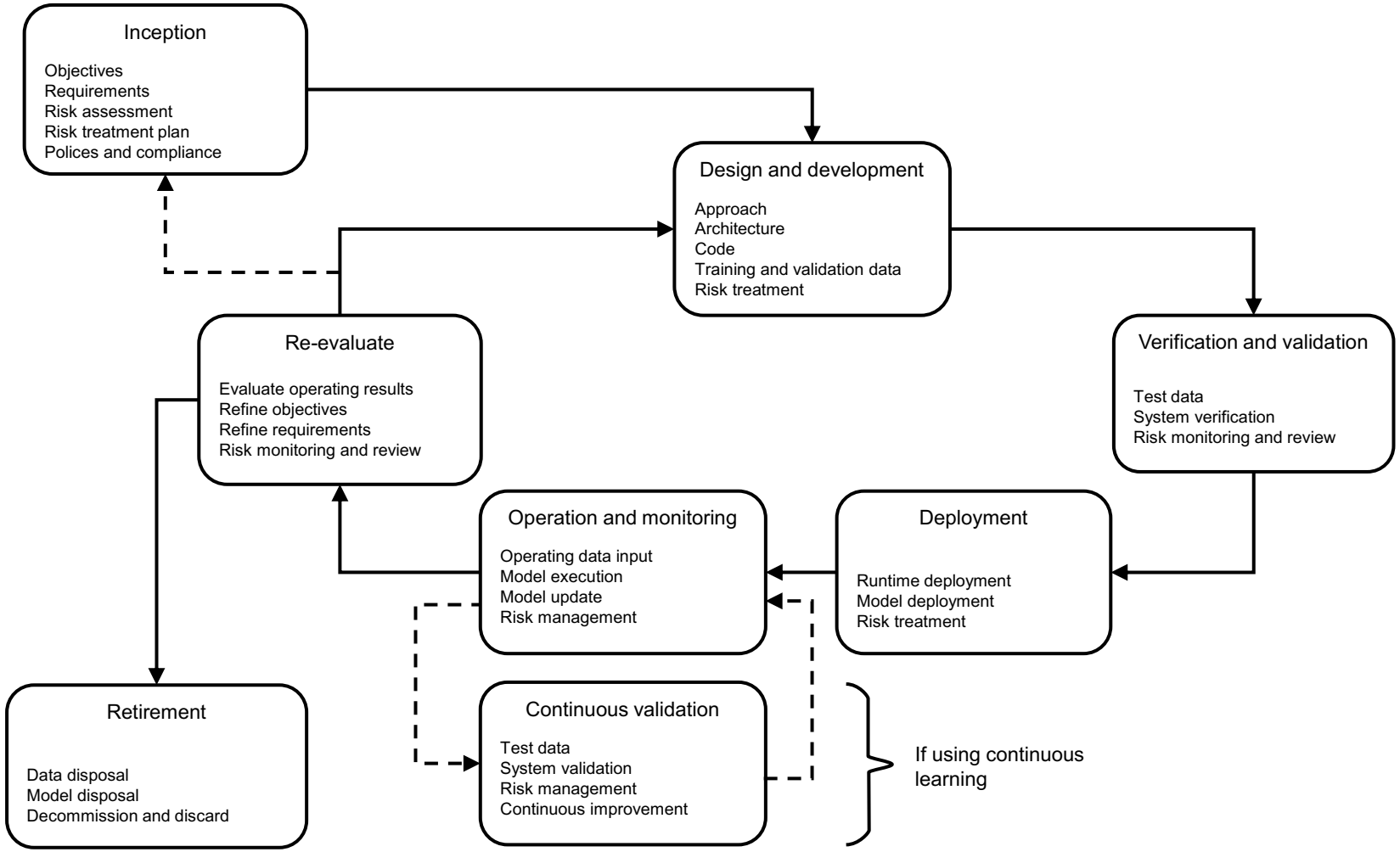
22989: AI functional overview



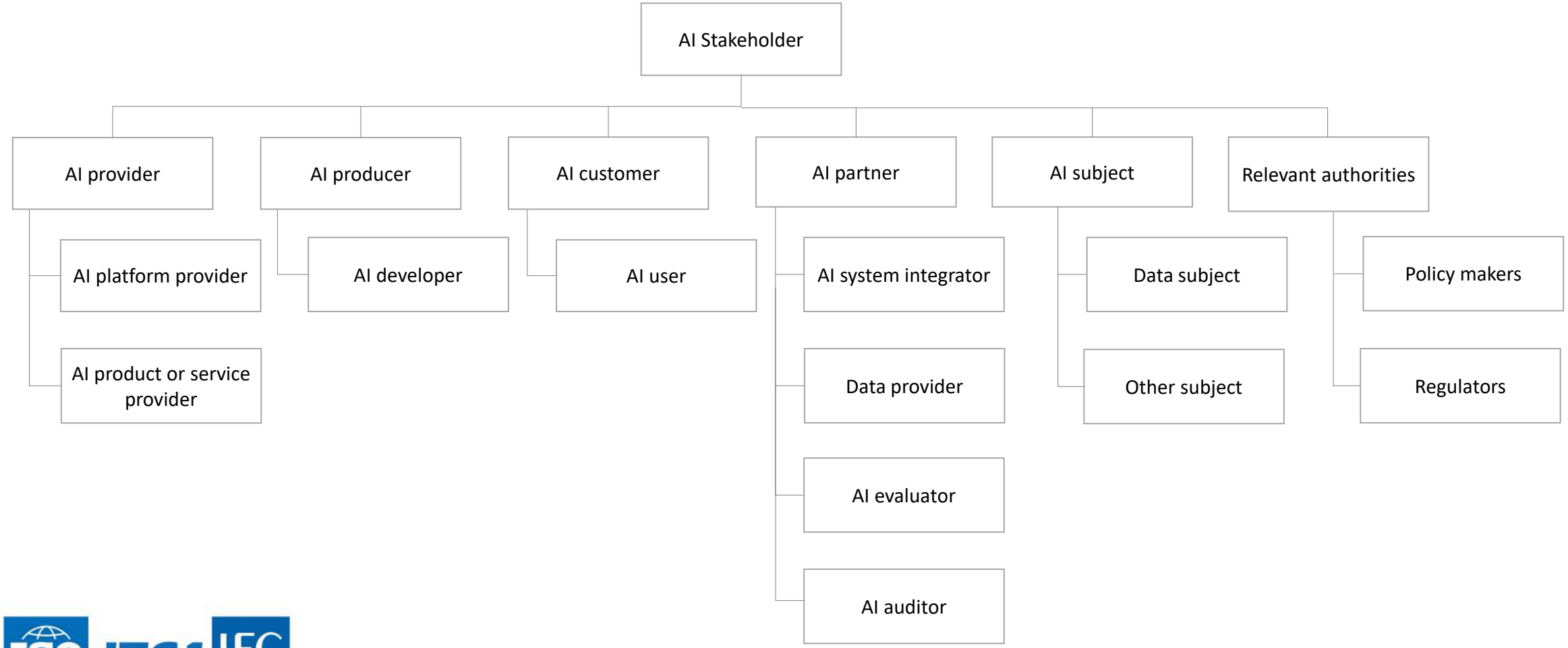
22989: AI system life cycle model



22989: AI system life cycle processes



22989: AI stakeholder roles



ISO/IEC 23053 Machine learning framework

Builds on ISO/IEC 22989

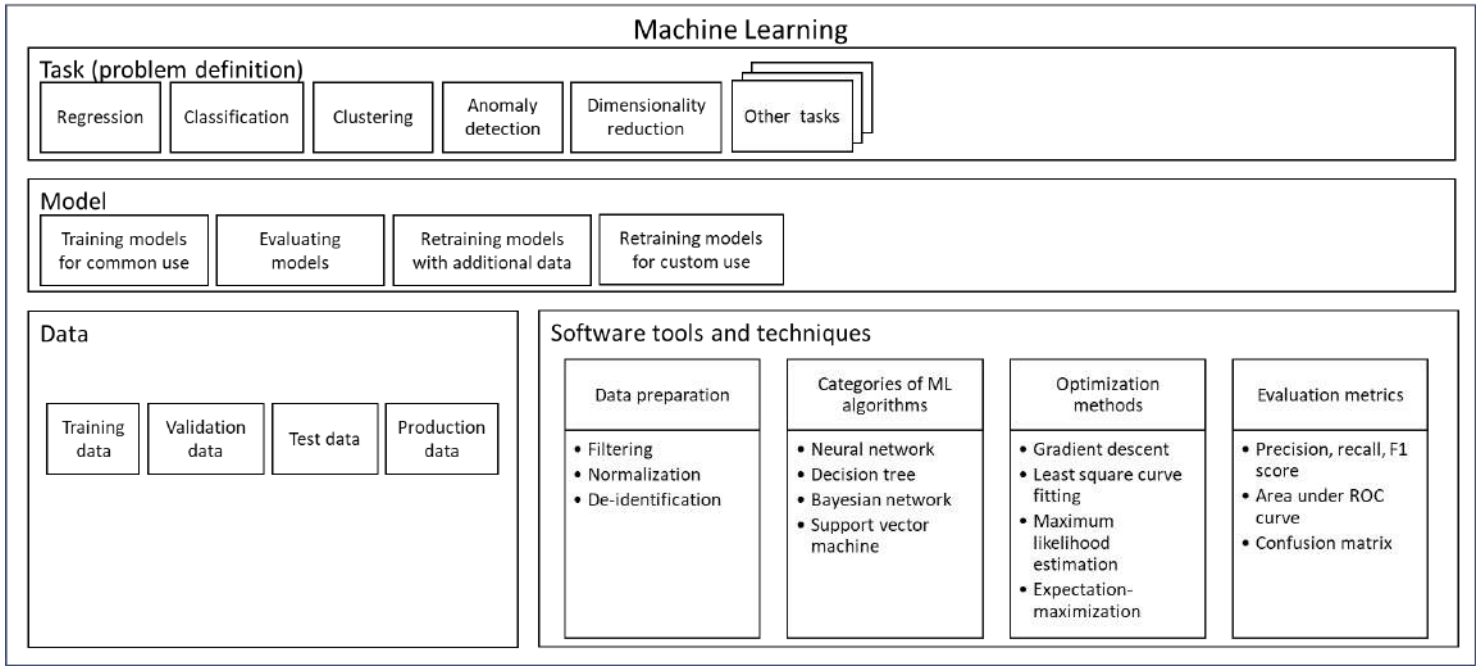
Deeper dive into concepts related to machine learning

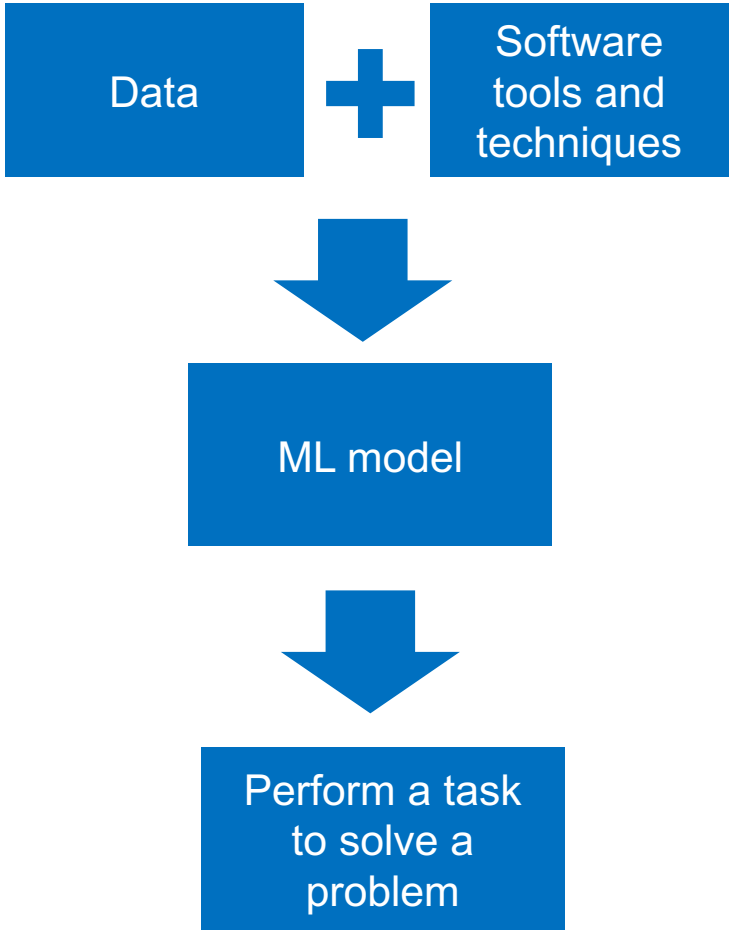
Arranging concepts into a framework to help clearly explain AI systems that use ML and how they are developed; includes descriptions of the data needed for the creation evaluation and use of an ML model

Aimed at a wide audience – experts and non-practitioners

machine learning:
process of optimizing model parameters through computational techniques, such that the model's behaviour reflects the data or experience

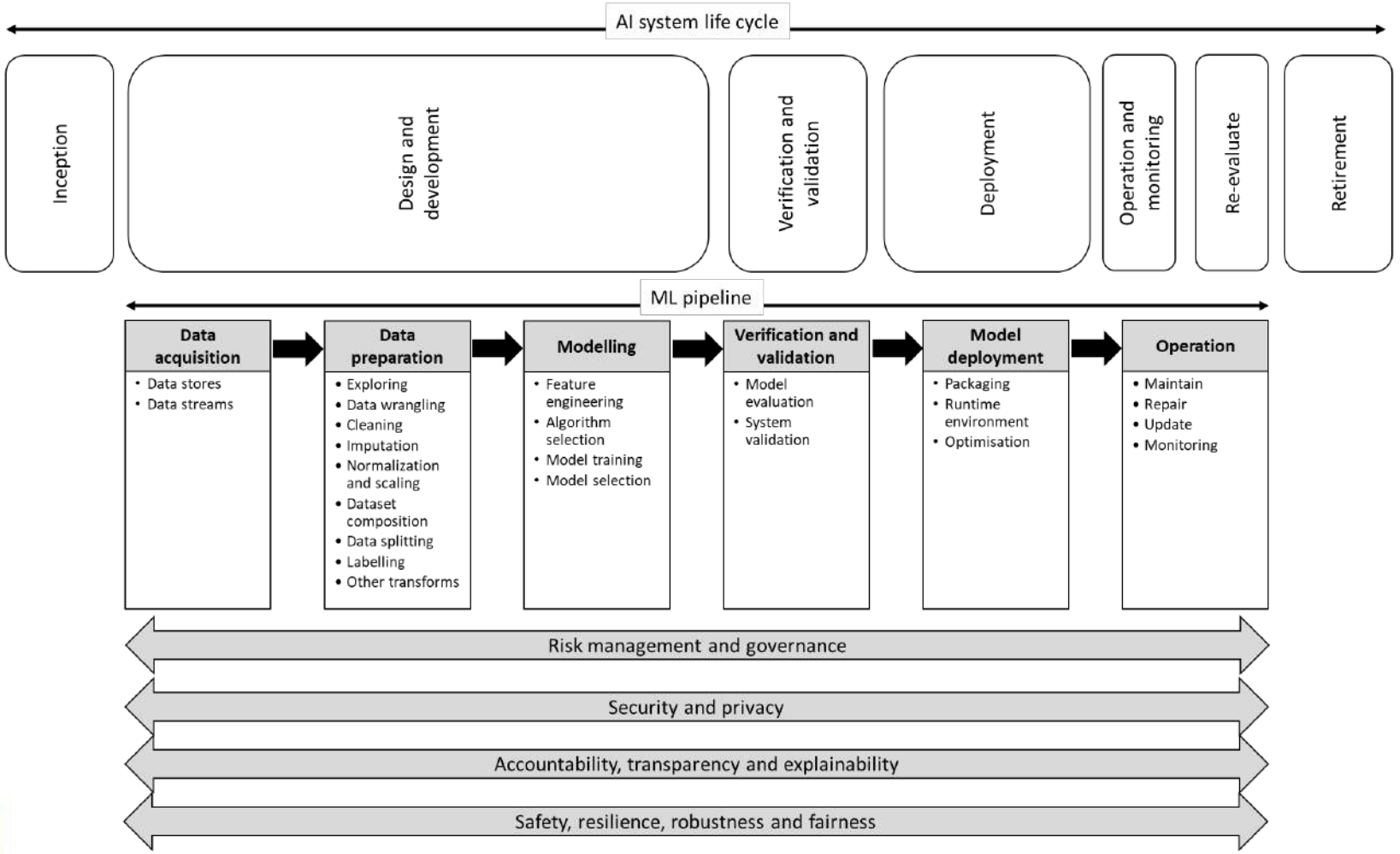
ISO/IEC 23053 Machine learning framework



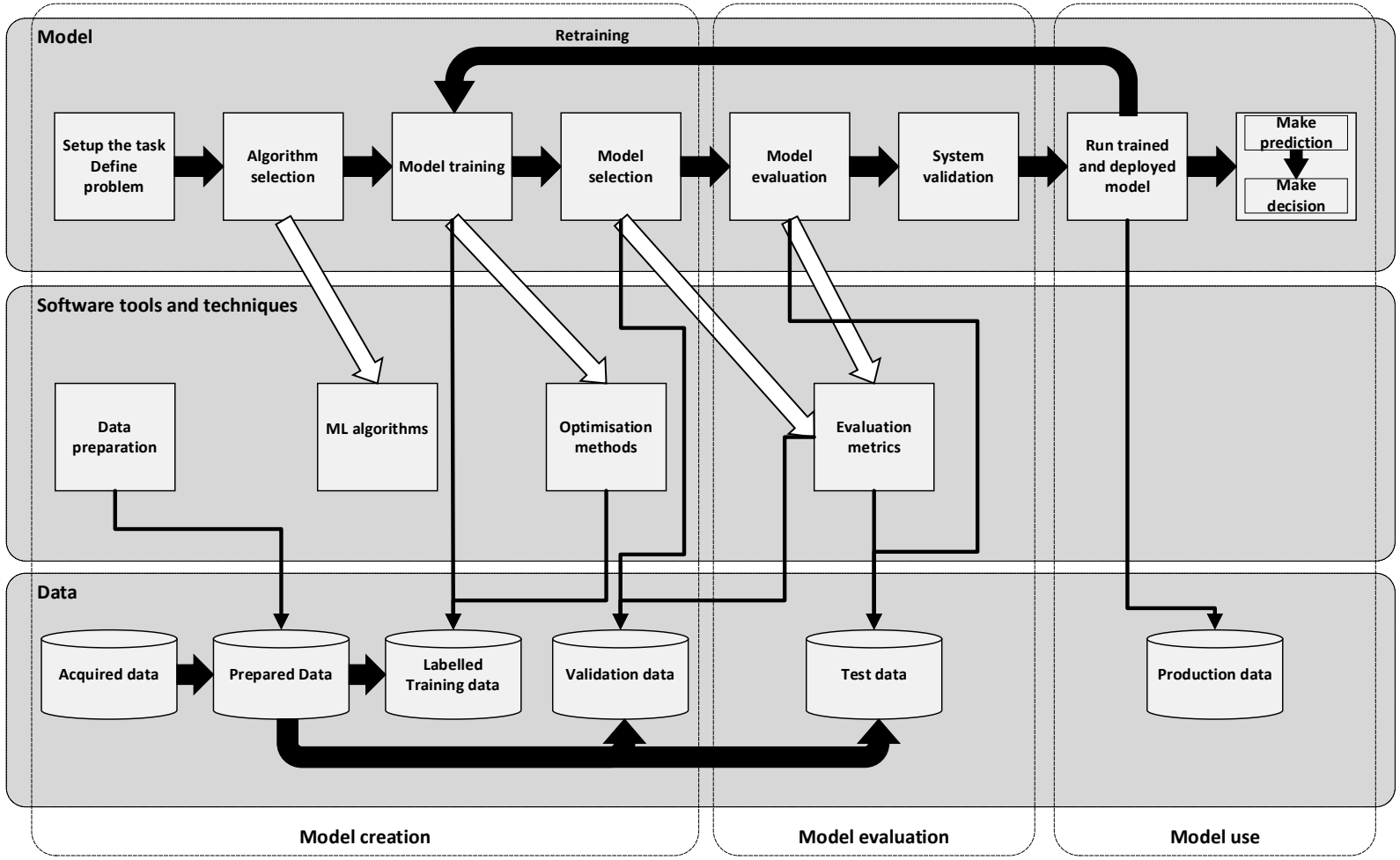


This framework is used for the structure of the document, but also to illustrate the machine learning process

Machine learning pipeline



Supervised machine learning process based on the ML pipeline



ISO/IEC 42001 AI management system

Requirements and guidance for establishing, implementing, maintaining and continually improving an AI management system.

Management processes to help an organization to develop or use AI systems responsibly in pursuing its objectives, help to meet regulatory requirements, obligations and expectations of interested parties.

Helps enable trust in the organization and the AI systems it develops or uses

ISO/IEC 42001 AI management system

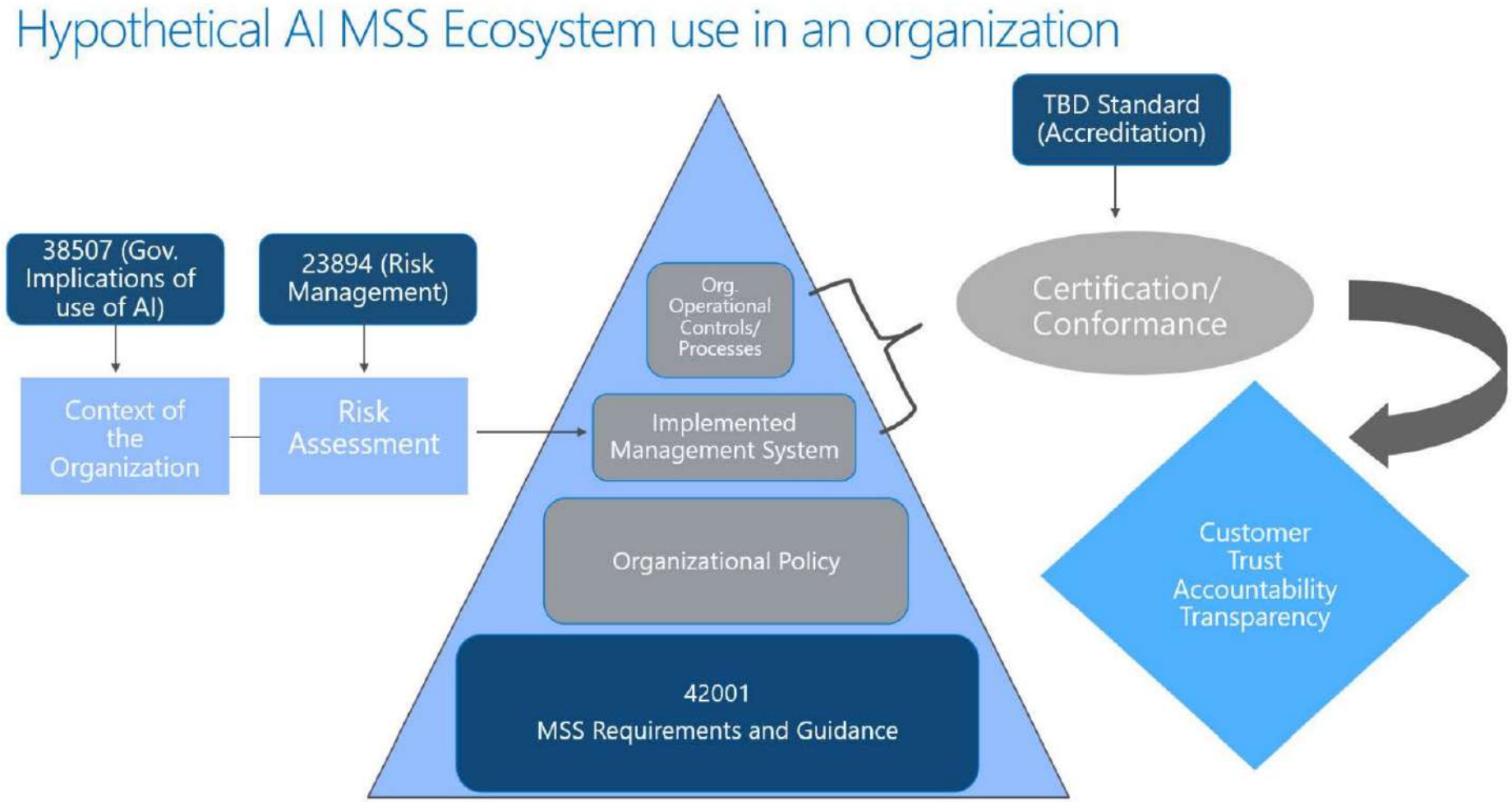
Risk based with controls and guidance to implement organizational and technical measures to mitigate risks

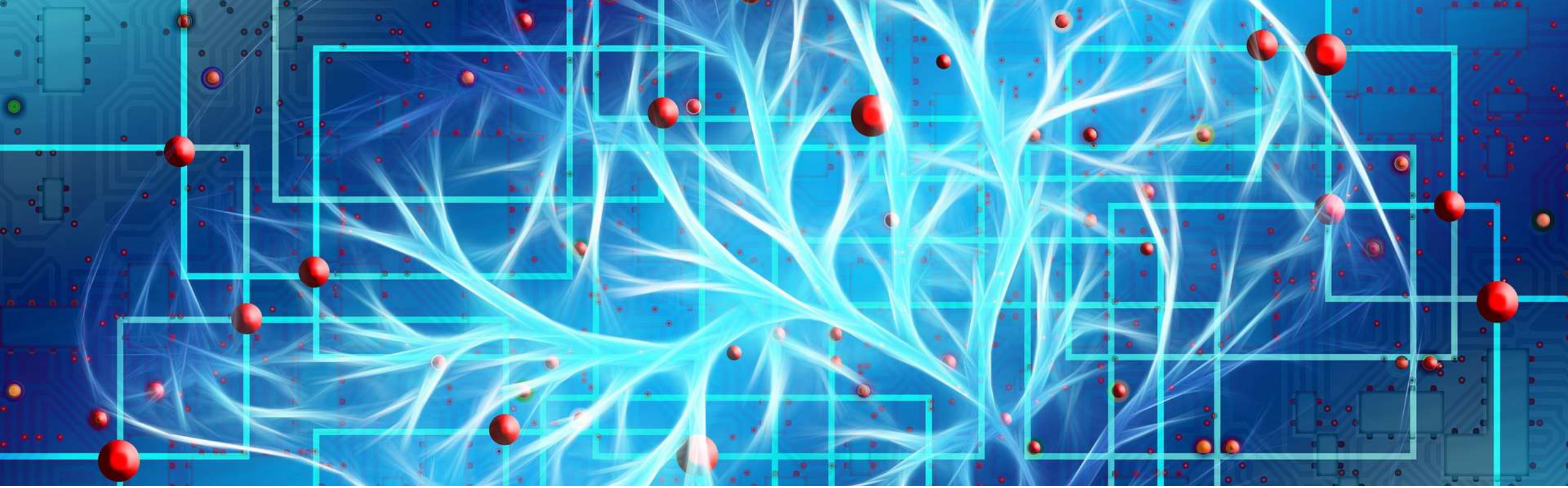
Incorporates the need for AI system impact assessments that can feed into organizational risk management processes

Can be integrated with existing management processes or other management system requirements

Can be used to underpin conformity assessment

Use of management system and related governance and risk standards





Summary

Foundational standards are the basis for development of other standards and applications in AI and its related field. For teaching and learning → it explains the fundamental part in AI. For communication → same terminology helps people with different background to understand each other better. For application → common concept and framework help people to develop interoperable and coherent applications or standards.

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SC 42 – Artificial Intelligence

Thank you

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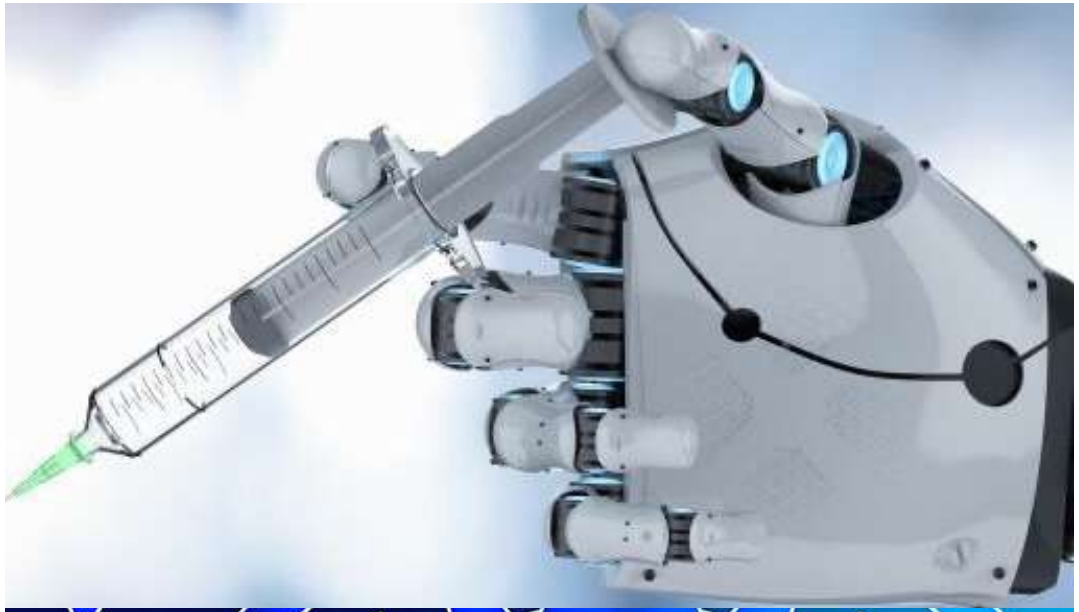


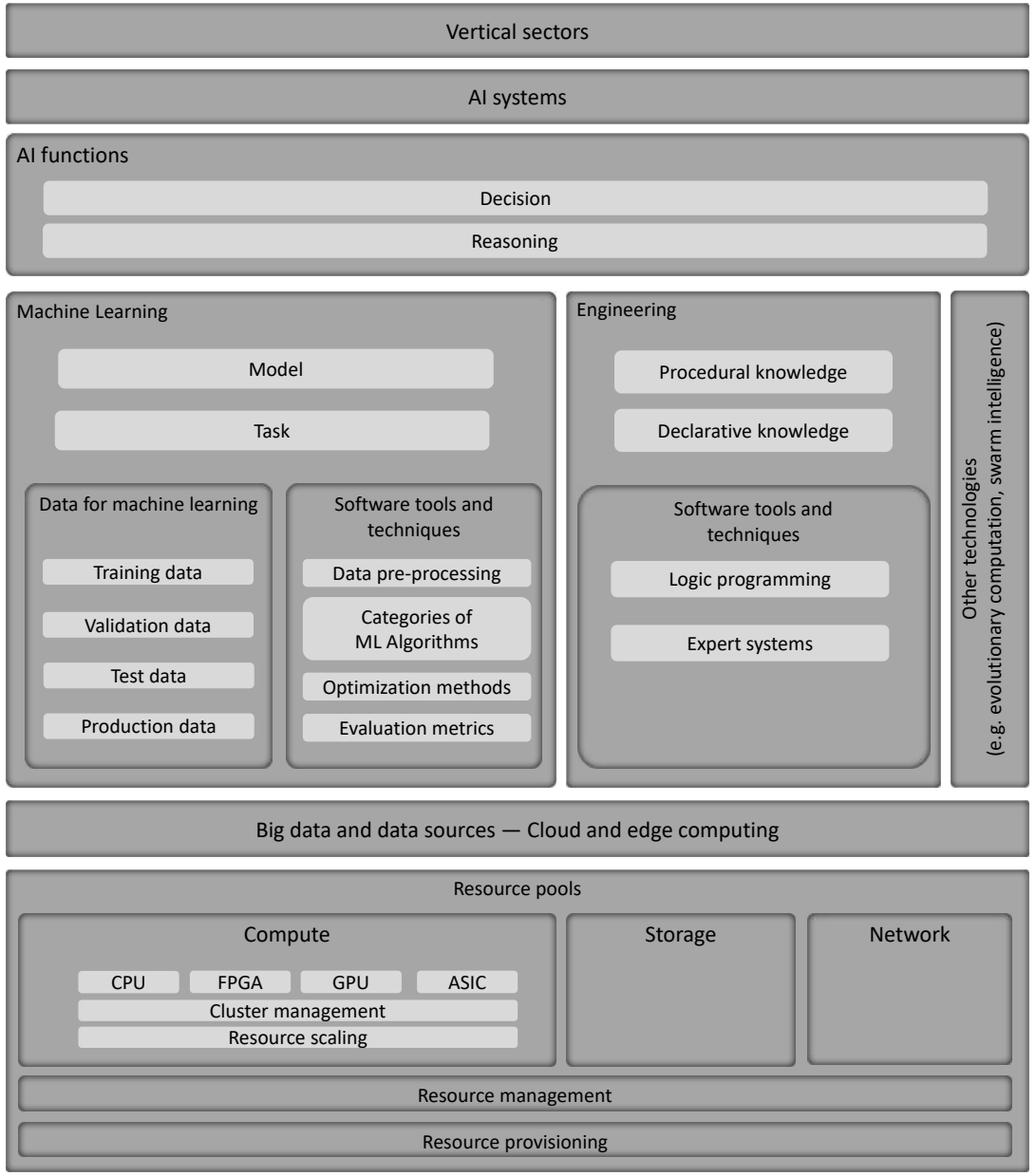
22989: Compare AI definition with EU AI Act

22989 AI System	AI system in EU AI Act
engineered system that generates outputs such as content, forecasts, recommendations or decisions for a given set of human-defined objectives Note 1 to entry: The engineered system can use various techniques and approaches related to artificial intelligence (3.1.3) to develop a model (3.1.23) to represent data, knowledge (3.1.21), processes, etc. which can be used to conduct tasks (3.1.35). Note 2 to entry: AI systems are designed to operate with varying levels of automation (3.1.7).	artificial intelligence system' (AI system) means software that is developed with one or more of the techniques and approaches listed in Annex I and can, for a given set of human-defined objectives, generate outputs such as content, predictions, recommendations, or decisions influencing the environments they interact with ANNEX I List (a) Machine learning approaches, including supervised, unsupervised and reinforcement learning, using a wide variety of methods including deep learning; (b) Logic- and knowledge-based approaches, including knowledge representation, inductive (logic) programming, knowledge bases, inference and deductive engines, (symbolic) reasoning and expert systems; (c) Statistical approaches, Bayesian estimation, search and optimization methods.

22989: Compare AI definition with OECD

22989 AI System	AI system in OECD
engineered system that generates outputs such as content, forecasts, recommendations or decisions for a given set of human-defined objectives Note 1 to entry: The engineered system can use various techniques and approaches related to artificial intelligence (3.1.3) to develop a model (3.1.23) to represent data, knowledge (3.1.21), processes, etc. which can be used to conduct tasks (3.1.35). Note 2 to entry: AI systems are designed to operate with varying levels of automation (3.1.7).	An AI system is a machine-based system that can, for a given set of human-defined objectives, make predictions, recommendations or decisions influencing real or virtual environments. It does so by using machine and/or human-based inputs to: i. perceive real and/or virtual environments; ii. abstract such perceptions into models through analysis in an automated manner (e.g. with ML, or manually); and iii. use model inference to formulate options for information or action. AI systems are designed to operate with varying levels of autonomy.

22989: AI eco system



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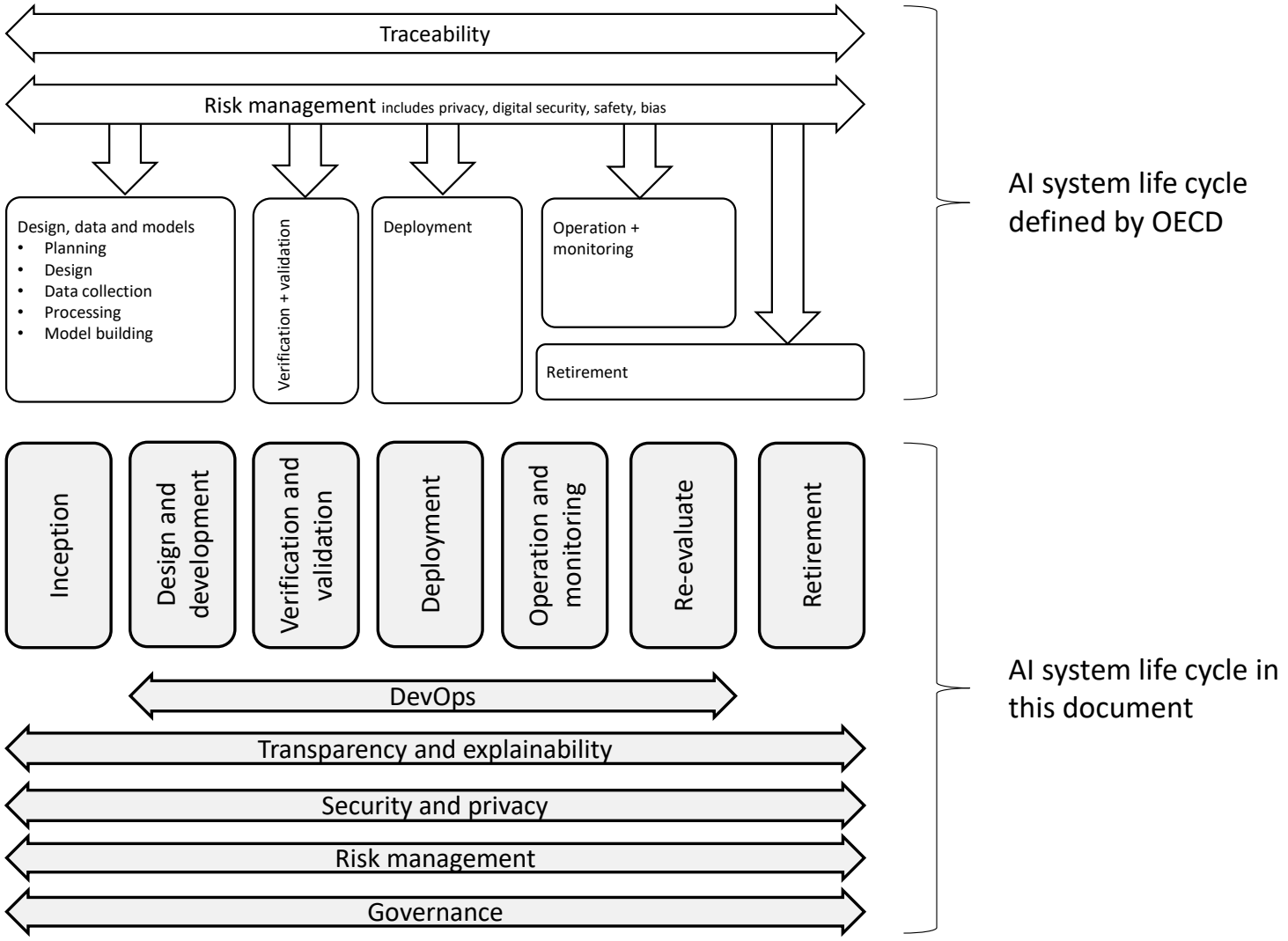
22989: Mapping with OECD AI life cycle



Artificial Intelligence

Overview of the AI Standards Program and Novel Ecosystem Approach

ISO/IEC Workshop Series, Inaugural Event, May 2022

Wael William Diab, Chair SC 42 (Artificial Intelligence)

ISO JTC 1 IEC
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SC 42 – Artificial Intelligence

Acknowledgement

Heather Benko (SC 42 Committee Manager)

Andy Dryden, Jose Alcorta (ISO TPMs)

ISO Communications Team (Clare, Vivienne, Liz, Catherine, Barnaby)

IEC Communications Team (Mike, Gabriella, Antoinette)

SC 42 Officers

Enabling the Digital Transformation

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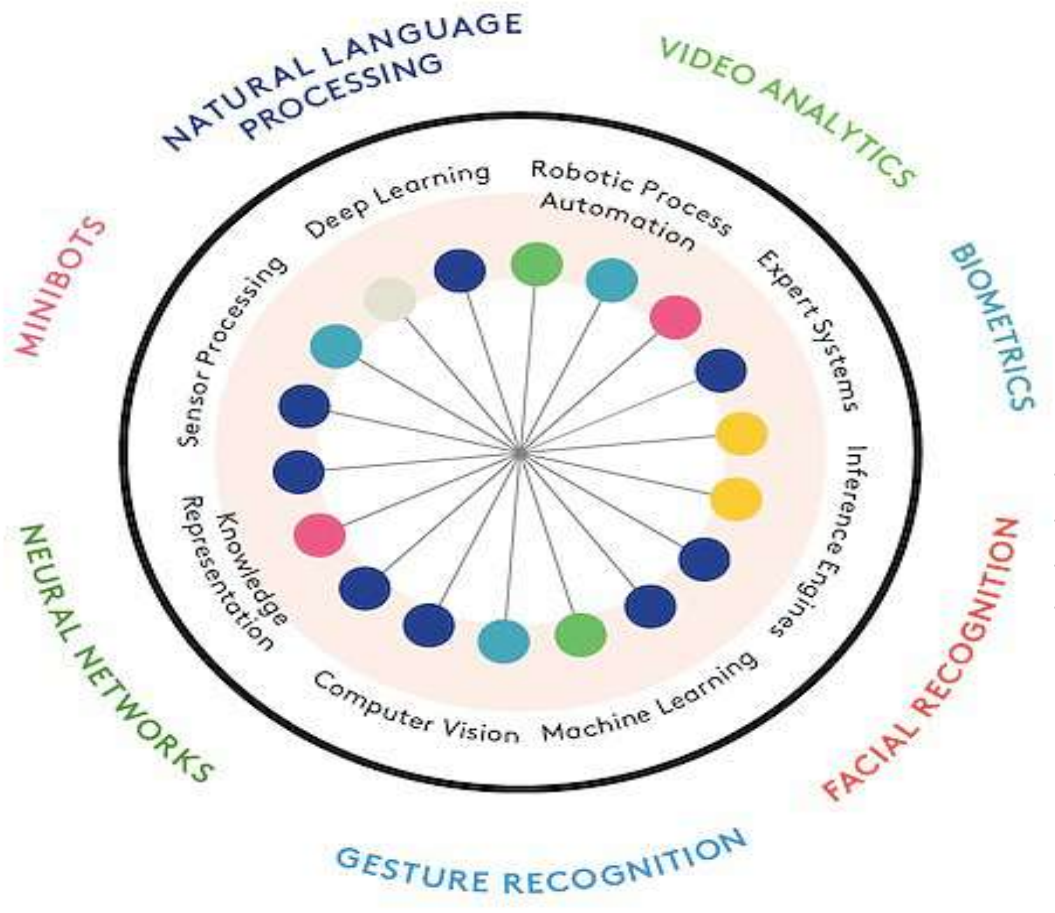

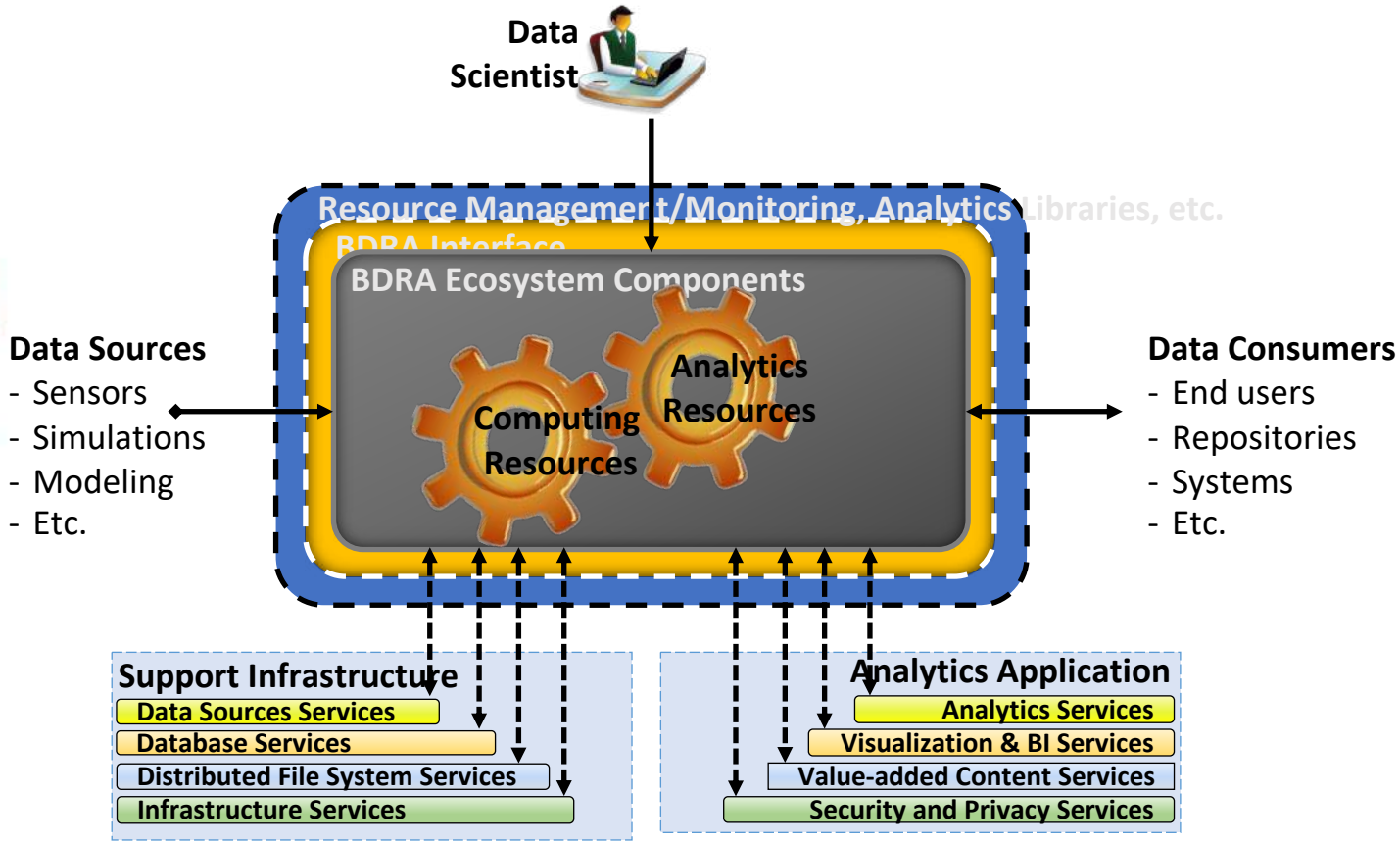

Artificial Intelligence
- not just one technology
- variety of SW / HW technologies applied in applications

Data Science and the Data Ecosystem
- **Big Data** ecosystem, **AI related data** and **analytics**
- includes BD reference architecture, data quality, AI data aspects

Changing how we live, work and paly…

AI Use Cases, Applicability and Growth

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Traditionally, AI had been focused on large scale problems that were either too hard and complex to solve with traditional compute methods or were in specialized emerging areas

This is no longer the case. Machine learning has widened the applicability of AI. Focus on the **digital transformation** has created a demand for services and more intelligent analytics. Examples:

- AI expert systems are helping **healthcare** professionals make better decisions for patients with proper trustworthiness measures designed into the system,
- AI deployment in the **smart manufacturing** sector where it is driving higher efficiencies by allowing robots to work alongside human workers with the proper safety measures designed into the system,
- AI deployment in the **financial ecosystem** where it is enabling applications that range from asset management that takes into account factors such as the clients risk to fraud detection that reduces false-positives

Emerging applications are numerous and diverse e.g. **consumer**, **retail**, **digital assistants**, **expert systems** such as smart grid, **marketing intelligence** tools, enterprise etc.

Thus, it is not surprising that IDC estimates **that 75% of enterprise applications will use AI.** The market is forecast to accelerate further in 2022 with 18.8% growth and remain on track to break the $500 billion mark by 2024.

Ecosystem is ripe for standardization

The Need for an Ecosystem Perspective

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Historically, IT systems and their governing standards were based on well understood environments

- Early approaches focused on performance for a specific problem definition
- As IT became ubiquitous, considerations such as cost, sustainability, security and privacy played a an increasingly important role in defining requirements

Digital transformation of industries has changed the landscape for IT standardization. For instance:

- Emerging non-technical requirements such as ethical and societal considerations and the ability to design trustworthy systems are key aspects
- Stakeholder diversity has increased considerably (eg. regulatory, social scientists etc.)
- Early engagement by the various stakeholders has become the norm
- The application domains and associated use cases have increased dramatically
- Understanding uses, proving business cases and developing standards are now concurrent
- The “data ecosystem” is as important as hardware, software and operational technologies
- Enabling certification, 3rd party audit and increasing end-user confidence increasingly important

SC 42 and the Holistic AI Ecosystem

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A new approach to standardization is needed that

- Takes into account the context of use of the technology by looking at both technology capability and non-technical requirements such as business requirements, regulatory and policy requirements, application domain needs, and ethical and societal concerns
- Translating the above into technical requirements
- Building foundational standards that allow communities to build upon such as terminology, use cases, application guidance and reference architectures
- Linking technology innovation communities such as proprietary implementations, research, SDOs and open-source communities

The result not only accelerates technology adoption but it also takes into account its context of use and builds an ecosystem

AI, Big Data and associated analytics are examples of this technology, it's use and IT's evolution

SC 42 has adopted this holistic ecosystem approach providing the glue between requirements and technical requirements through the horizontal deliverables the committee develops

Bridging the Gap – An Ecosystem Approach

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Example of Non-Technical Trends and Requirements

- **Application Domain Requirements**
- **Regulatory and Policy Requirements**
- **Emerging Societal Requirements**
- **Business Requirements / KPIs**

SC 42 Ecosystem Perspective

- **Assimilating Requirements for Context of Use of AI, Big Data and Analytics**

SC 42 Deliverables

- **Horizontal and Foundational Projects**
  Enabling and Accelerating Wide Adoption while Addressing Concerns
  - **Foundational Concepts**
  - **Data Stds**
  - **Reference Architectures**
  - **Use Cases**
  - **Application Guidelines**
  - **Frameworks**
  - **Guidance**
  - **Interop**
  - **MSS**

Ecosystem Deliverables & Implementations

- **Application Standards**
  Domain specific standards that build on SC 42 horizontal deliverables
- **Open Source Projects**
  OS projects including AI algorithms leveraging SC 42 ecosystem deliverables
- **Proprietary Solutions**
  Proprietary solutions leveraging SC 42 deliverables for requirements and gudance
- **Implementations Across Diverse Application Domains**
  E.g. AI-enabled Smart Manufacturing, Health Care, Financial Systems, Consumer Devices, ITS etc.

Introduction and Overview of SC 42

ISO JTC 1 IEC
INFORMATION TECHNOLOGY STANDARDS
SC 42 – Artificial Intelligence

Part of the **ISO** and **IEC** Family

- Committee on AI standardization under the joint initiative on Information Technology (JTC 1)
- IEC and ISO produce international standards and with participation by country – one country one vote
- Collaboration with long established sister ISO and IEC committees covering broad rage of app domains
- Works with JTC 1 committees producing horizontal stds in key areas such as security, cloud, IoT, governance

Scope

- Standardization in the area of Artificial Intelligence
  - Serve as the focus and proponent for JTC 1's standardization program on Artificial Intelligence
  - Provide guidance to JTC 1, IEC, and ISO committees developing Artificial Intelligence applications

Growing Program of Work and Stakeholders

- Projects: **28 active** (**10** added within last year). **11 published. 2 NP ballots.** New study items being discussed
- Participation: **50 nations** (35P/15O) with annual growth. New regions represented. **250+** delegates at plenaries
- SC 42 “customers” consuming our standards and participants are increasingly diverse e.g. from data scientists to regulators to application domain experts to social scientists

Extensive collaborations (internal and external) – over 45 liaisons including Cat A e.g. recently EUROCAE, IIOC

Structure of SC 42

WG 1 Foundational standards

WG 2 Data

WG 3 Trustworthiness

WG 4 Use cases and applications

WG 5 Computational approaches and computational characteristics of AI systems

JWG 2 (SC 42 – SC 7) Testing of AI-based system

AG 3 AI standardization roadmapping

AHG 4 Liaison with SC 27

Key Topics: Foundational Standards

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Overview and motivation

- AI has generated interest across a very diverse and growing set of stakeholders
- Introduce a **common language** that can be used across stakeholder groups
- **Building blocks** for other SC 42 projects and ISO/IEC TC application standards
- Addresses **unique AI requirements** to enable certification and audit via MSS

Current focus areas

- **AI Concepts and Terminology***
- **Framework for AI Systems Using Machine learning***
- **Management System Standard** (ISO/IEC 42001)
- NP ballot on new project related to **AI system impact assessment**
- Discussion on the concept of **risk** for input to ISO TMB/IEC SMB joint task force

* AI Standards Lifecycle contributions included in these projects

Key Topics: Data – AI, Big Data, Analytics

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Overview

- **Data ecosystem, characteristics, properties and quality** essential to **AI, Big Data and analytics** work
- **Big Data** deals with **extensive datasets** by considering **characteristics,** such as volume, variety, velocity, variability, which allows scalable technology to efficiently store, manipulate, manage and analyze these datasets
- **AI** systems acquire, process and apply **knowledge**, which relies on **data**, its **properties** and **quality**
- **Analytics** derives **insights** from data, which requires **data** acquisition, collection, validation and processing

History, motivation and current focus areas

- History
  - BD work initiated as JTC 1/WG 9 in 2015 and moved to SC 42 in 2018 creating SC 42/WG 2 (Big Data)
  - WG 2 **expanded** to data in context of AI, BD and analytics April 2020 focusing SC 42's data work in one WG
- Foundational Big Data work completed and published: ISO/IEC 20546 and ISO/IEC BDRA 20547 series
- Areas of current work
  - BD: **Process management framework for Big Data analytics** to leverage across the organization irrespective of industry
  - AI/Analytics:
    - Multipart series **AI – data quality for analytics and ML** – **5 parts** including newly added part 5 on data governance
    - New **AI – Data lifecycle framework**
- Areas of current study and project proposals under development
  - **Data ecosystem study areas** include AI Data AHG, Data Quality AHG and road-mapping

Key Topics: Trustworthiness

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Overview

- Looking at a wide range of issues related to trustworthiness, security and privacy within the context of AI

Motivation and current focus areas

- Hot topic due to regulatory landscape (e.g. European privacy laws; discussions about social media engines)
- Stakeholders view this as a necessary area for the success and broad market adoption of AI. Essential to AI application areas
- Published work: AI **trustworthiness** overview, overview of **robustness of neural networks** and **bias** in AI systems
- Areas of current work
  - **Formal methodologies** for the assessment of **neural networks**
  - **Risk management framework** for AI based on **ISO 31000**
  - Systems and SW Quality Requirements and Evaluation **(SQuaRE) -- Quality Model for AI systems**
    - Companion on **quality evaluation guidelines**
  - **Functional Safety and AI Systems** being developed in close collaboration **with IEC TC 65/SC 65A**
  - Objectives and approaches for **explainability** of ML models and AI systems
  - **Controllability** of automated artificial intelligence systems
  - Treatment of **unwanted bias** in classification and regression machine learning tasks
  - **Transparency taxonomy** of AI systems
- Comprehensive areas of study and road-mapping

COMMON AI-RELATED ETHICAL AND SOCIETAL ISSUES*

*Source: Accenture (Liongosari)

Key Topics: Societal Concerns and Ethics

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Overview

- Adoption of transformative technologies like AI have impacts that go beyond the technology
  - AI-specific trustworthiness issues e.g. reliability, privacy, security, explainability, controllability
  - Emerging issues related to the **context of use of the technology**
    - e.g. algorithmic bias, safety directives in industrial AI, eavesdropping
- AI ethical considerations not limited to SC 42 but extend to ISO/IEC TCs in their applications

Motivation and current focus areas

- Standards can mitigate ethical issues allowing for broad **responsible adoption**. Stakeholders include
  - industry, regulatory, technologists, interest groups, app domain, society at large
- Ethical considerations and societal concerns **considered across entire SC 42 program**
  - **Dedicated** projects
    - **Overview** of AI ethical and societal concerns with tie-in to trustworthiness and exemplary use cases
    - PWI on **AI best practice guidance for mitigating ethical and societal concerns**
  - **Integrated into and enabled by entire SC 42 deliverables portfolio**. For instance,
    - governance, MSS, use cases, application guidelines, (with IEC SC 65A) safety etc.
- SC 42 **collaborating** with other work programs e.g. PAI, OECD, UNESCO, EC, ISO SMCC, IEC ACOS

Key Topics: Use Cases and Applications

ISO JTC 1 IEC
INFORMATION TECHNOLOGY STANDARDS
SC 42 – Artificial Intelligence

Overview

- Identify AI application domains, context of AI use in those domains and develop guidance
- Collect representative use cases and analyze for derived requirements

Motivation and current focus areas

- Interest in AI continues to grow across application domains and use cases
- Use cases are the “currency” between SDO committees
  - By looking at different domains, ensures SC 42 deliverables are “broad enough to be horizontal”
  - Novel approach that includes trustworthiness, ethics and societal concerns
- Published areas of work
  - ISO/IEC 24030 with **over 130 use cases** including contributions from liaisons
- Current and new areas of work
  - **Guidelines for AI applications**
    - Application guidance **enables SDOs and OS communities** developing AI app projects **to leverage** SC 42’s work
    - **Macro-level** view of an application to facilitate its understanding, development and use amongst all stakeholders
    - “What are the characteristics and considerations of an AI application?
  - AI lifecycle for software developers – **AI system life cycle processes**
  - **Revision of ISO/IEC 24030:2021** for additional use cases
  - **AI Service Ecosystem** assigned to WG 4 and will be incorporated into the existing two projects above

Key Topics: Computational Methods

ISO JTC 1 IEC
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Overview

- Heart of AI looking at computational approaches and characteristics of AI systems

Motivation and current focus areas

- Published work
  - Overview project: **Overview of the state of the art of computational approaches for AI systems**, describing: a) main computational characteristics of AI systems; b) main algorithms and approaches used in AI systems, referencing use cases contained in ISO/IEC TR 24030
- Current work
  - Desire to have some key industry agreed tenants for classification performance of algorithms – currently no such internationally agreed upon tenants / norms
    - **Assessment of classification performance for machine learning models and algorithms**
  - **Reference architecture** of **knowledge engineering**
  - **Overview of machine learning computing devices**
- Areas of current study and road-mapping
  - NP ballot on new project related to **verification and validation analysis of AI systems**

Key Topics: Governance Implications of AI

ISO JTC 1 IEC
INFORMATION TECHNOLOGY STANDARDS
SC 42 – Artificial Intelligence

Overview

- Fueled by the digital transformation, AI technologies are being rapidly adopted across industries, cities, homes and infrastructures
- Thus, the need to address governance implications for the use of AI in organizations has become of paramount importance

Motivation and current focus areas

- The motivation is to help **organization boards and executives ask and answer key questions about AI technologies**
- By **combining the expertise of SC 42, which is looking at the entire AI ecosystem, with that of SC 40, which is looking at IT governance, a joint working group has been established** to develop an ISO/IEC standard on the governance implications of AI
- Project published April 2022!

Key Topics: Testing of AI-Based Systems

ISO JTC 1 IEC
INFORMATION TECHNOLOGY STANDARDS
SC 42 – Artificial Intelligence

Overview

- As adoption and deployment across industry sectors of AI continues, a need to address testing of AI-based systems is key

Motivation and current focus areas

- AI testing is similar to conventional software testing, but it also faces AI-specific challenges. These challenges are discussed and approaches to mitigate are introduced.
- Guidelines for the testing of AI systems across the AI system life cycle are provided. Moreover, guidelines related to AI testing useful for AI systems development in accordance with their specified functional and non-functional requirements.
- By **combining the expertise of SC 42, which is looking at the entire AI ecosystem, with that of SC 7, which is looking at software systems, a joint working group has been established** to develop the ISO/IEC standard
- Project in Working Draft

Key Topics: AI Standardization Roadmapping

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Overview, motivation and current focus areas

Driven by the

- rapid technology advancement
- broad adoption
- evolution of AI landscape
- context of use of AI and increasing diversity of stakeholders
- growing program of work

SC 42 has setup an advisory group to

- recommend new areas of work
- recommend further development of existing areas
- maintain a relationships document between the various projects

Examples discussion areas include conformity assessment, sustainable AI etc.

Key Topic: Management Systems Standard
ISO/IEC 42001

ISO JTC 1 IEC
INFORMATION TECHNOLOGY STANDARDS
SC 42 – Artificial Intelligence

Motivation

- AI technologies bring **AI-specific concerns** beyond those of traditional IT systems. For example
  - ML based AI system may provide different results depending on the training data used
    - The choice of training data when using an AI system is an additional process that an organization needs to perform to ensure the intended overall system performance
  - Consumers of AI products and services may lack trust in the AI supplier organization
    - Assurance that the organization considered for fairness, inclusiveness, accountability etc. of AI system

MSS Enables Assessment of **Conformance** and **Auditability** of the Process

- MSS designed with AI-specific process requirements
  - Allows organizations to check how well it meets their objectives in the use of an AI system
  - For trusted 3rd party performing a check or audit, a certificate of conformance can be issued

MSS Brings Benefits to the **Application Domains** Deploying AI Applications

- MSS **extendable to application domains**. Sector-specific implementations expand the applicability of the MSS, which in turn enable conformance/audit and broadens AI adoption

ISO/IEC 42001 **pulls together all** the SC 42 AI platform work from a management system perspective

Concluding Remarks

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INFORMATION TECHNOLOGY STANDARDS
SC 42 – Artificial Intelligence

SC 42 is the first of its kind international standards committee looking at the full AI ecosystem

- AI, Big Data and related analytics are **key technologies enabling the digital transformation**

SC 42 has a rapidly growing work program

- Strong **growth** and execution. 11 published projects and 28 active projects in 7 working groups. 2 NP ballots
- Robust **study** program for anticipated new work addressing AI ecosystem and system level concerns with AI

SC 42 engaging in extensive outreach and global collaboration

- Tremendous outreach via ISO, IEC and national bodies. Extensive and diverse liaison network

Part of the ISO, IEC and JTC 1 families

- Access to broad, diverse and numerous committees that range from horizontal to vertical areas
- System integration committee providing guidance to ISO, IEC and JTC 1 committees looking at AI applications

Opportunity for international standards to fuel AI market growth and accelerate adoption

Excellent opportunity to engage – if you are interested, please contact your national body


The First Meeting of ISO/IEC JTC 1/SC 42
Hosted by


ISO IEC
ARTIFICIAL INTELLIGENCE
OCTOBER 8-12, 2018
WELCOME DELEGATES
ANSI


ISO IEC


The First Meeting of ISO/IEC JTC 1/SC 42
Hosted by
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Coordinated by
China Electronics Standardization Institute


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Japan
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IEC 62 Members

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Japan


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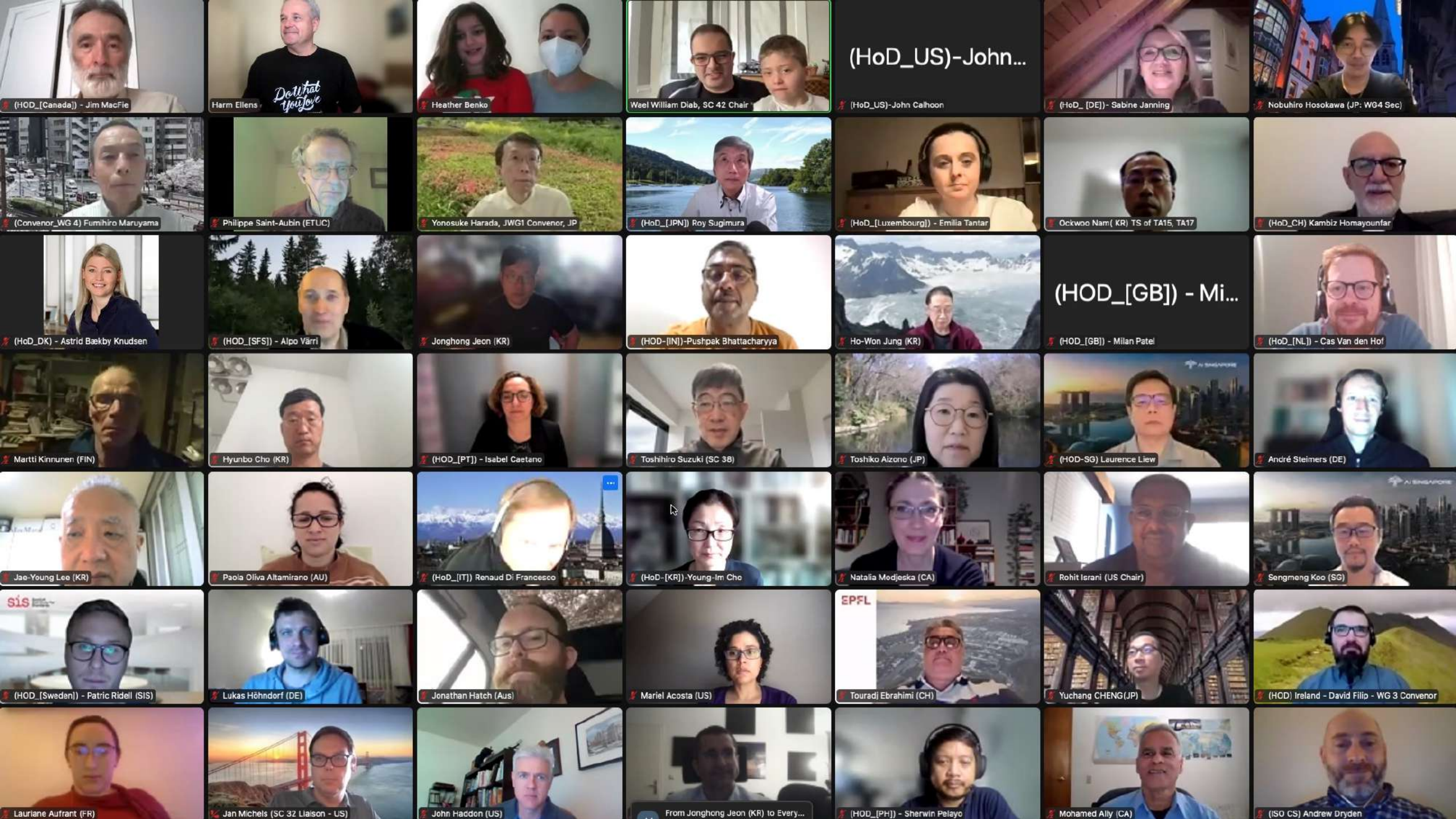
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Weel William Diab, SC 42 Chair
(HoD_US)-John...
(HoD_US)-John Calhoon
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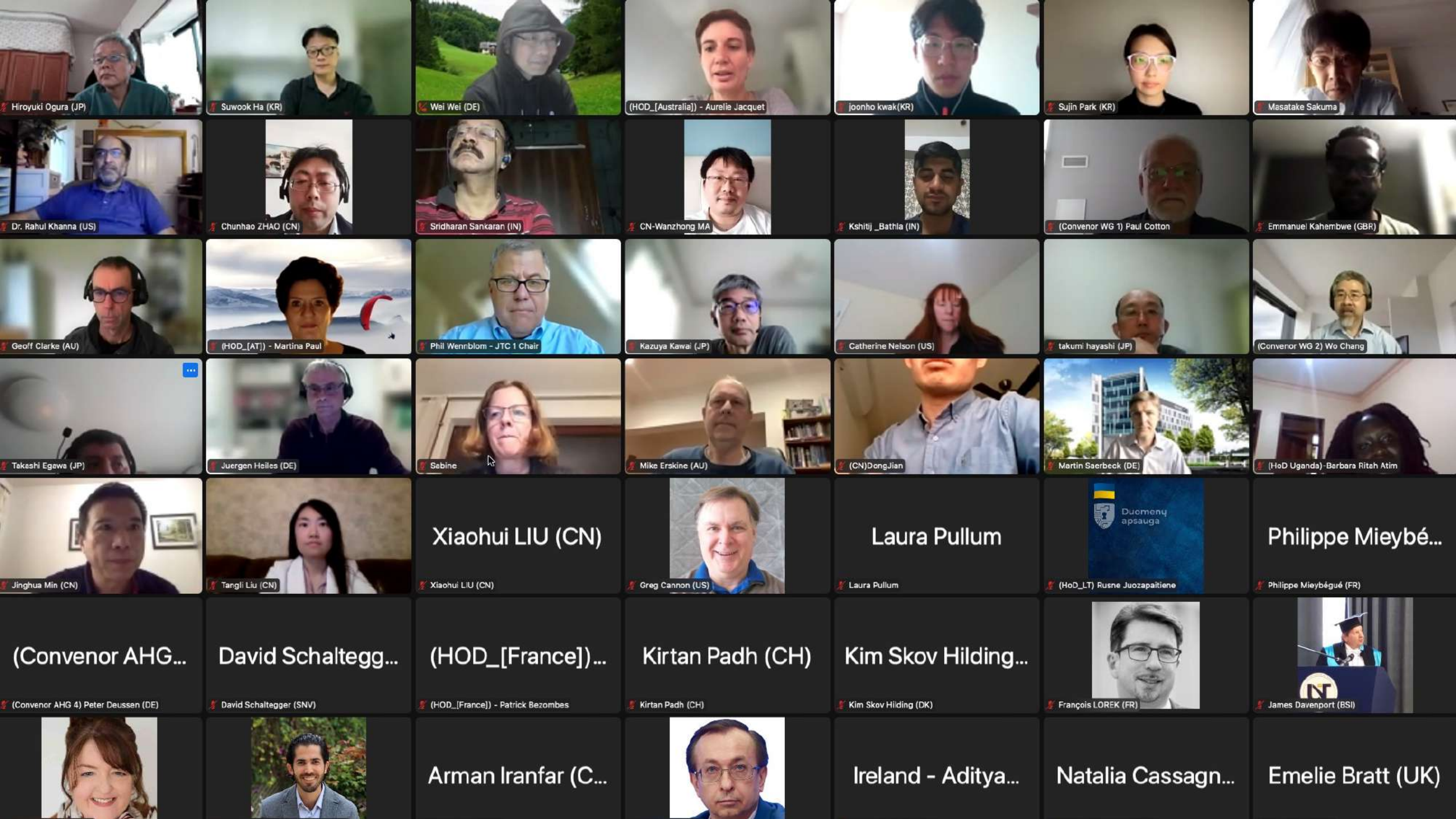
Yuchang CHENG(JP)
(HOD) Ireland - David Filip - WG 3 Convenor
Lauriane Aufrant (FR)
Jan Michels (SC 32 Liaison - US)
John Haddon (US)
From Jonghong Jeon (KR) to Every...
(HOD_[PH]) - Sherwin Pelayo
Mohamed Ally (CA)
(ISO CS) Andrew Dryden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Laura Pullum
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Kim Skov Hilding (DK)
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James Davenport (BSI)
Arman Iranfar (C...
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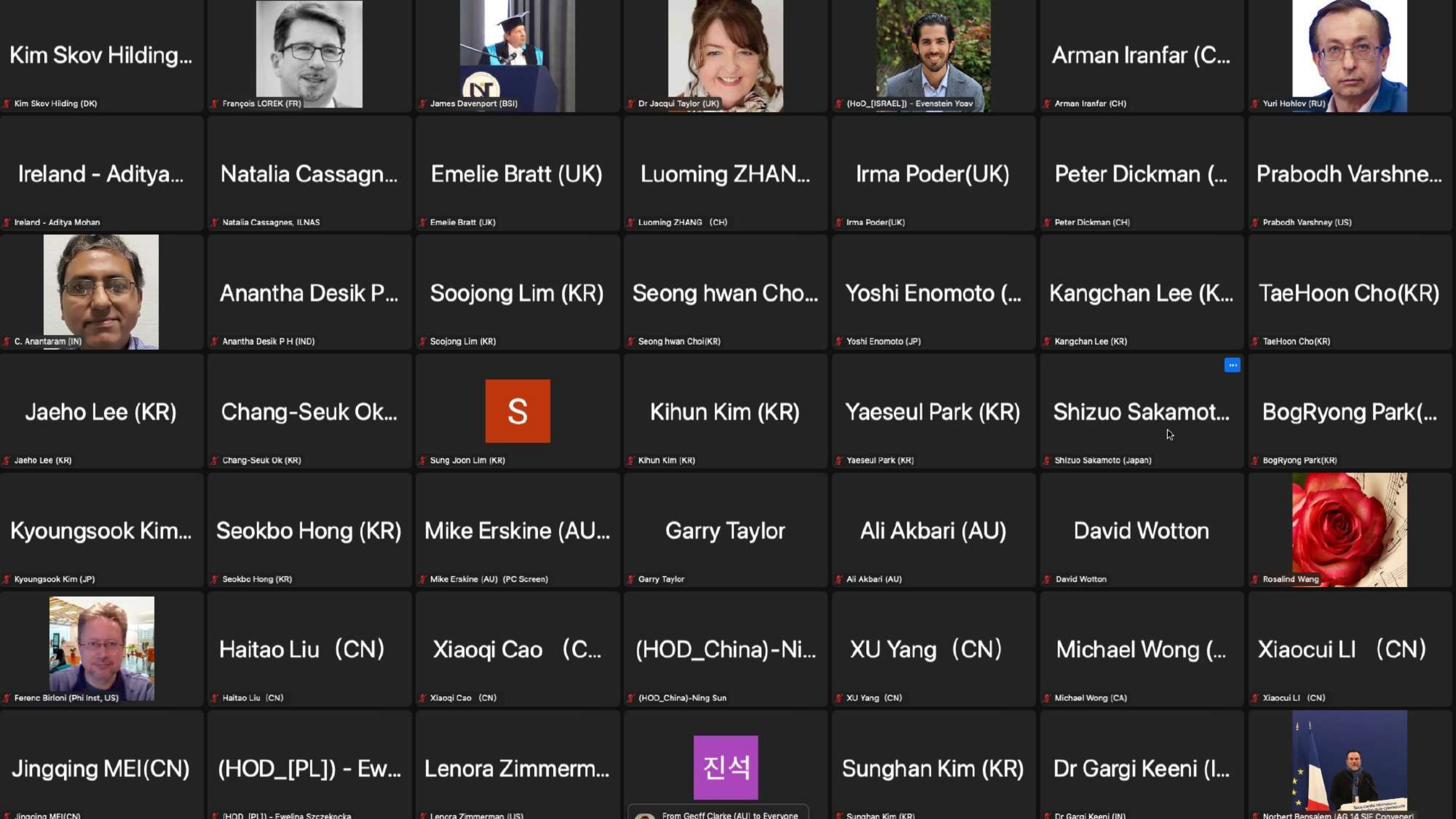
Natalia Cassagn...
Emelie Bratt (UK)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Arman Iranfar (CH)
Yuri Hohlov (RU)
Ireland - Aditya...
Ireland - Aditya Mohan
Natalia Cassagn...
Natalia Cassagnes, ILNAS
Emelie Bratt (UK)
Emelie Bratt (UK)
Luoming ZHAN...
Luoming ZHANG (CH)
Irma Poder(UK)
Irma Poder(UK)
Peter Dickman (...
Peter Dickman (CH)
Prabodh Varshne...
Prabodh Varshney (US)
C. Anantaram (IN)
Anantha Desik P...
Anantha Desik P H (IND)
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Seong hwan Cho...
Seong hwan Choi(KR)
Yoshi Enomoto (...
Yoshi Enomoto (JP)
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Chang-Seuk Ok...
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Sung Joon Lim (KR)
Kihun Kim (KR)
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Shizuo Sakamoto (Japan)
BogRyong Park(...
BogRyong Park(KR)
Kyoungsook Kim...
Kyoungsook Kim (JP)
Seokbo Hong (KR)
Seokbo Hong (KR)
Mike Erskine (AU...
Mike Erskine (AU) (PC Screen)
Garry Taylor
Garry Taylor
Ali Akbari (AU)
Ali Akbari (AU)
David Wotton
David Wotton
Rosalind Wang
Ferenc Birloni (Phi Inst, US)
Haitao Liu (CN)
Haitao Liu (CN)
Xiaoqi Cao (C...
Xiaoqi Cao (CN)
(HOD_China)-Ni...
(HOD_China)-Ning Sun
XU Yang (CN)
XU Yang (CN)
Michael Wong (...
Michael Wong (CA)
Xiaocui LI (CN)
Xiaocui LI (CN)
Jingqing MEI(CN)
Jingqing MEI(CN)
(HOD_[PL]) - Ew...
(HOD_[PL]) - Ewelina Szczekocka
Lenora Zimmerm...
Lenora Zimmerman (US)
진석
From Geoff Clarke (AU) to Everyone
Sunghan Kim (KR)
Sunghan Kim (KR)
Dr Gargi Keeni (I...
Dr Gargi Keeni (IN)
Norbert Bensalem (AG 14 SIF Convener)

Annex A

Additional Links and Information

Additional Links and Information

ISO JTC 1 IEC
INFORMATION TECHNOLOGY STANDARDS
SC 42 – Artificial Intelligence

- SC 42 Committee website
- Press Coverage Related to SC 42 Overview and Program of Work
  - IEC news A governance framework for organizations deploying AI systems (Apr 29th 2022)
  - IEC news New report focuses on convergence of AI and Industrial IoT (Mar 10th 2022)
  - ISO innovation article on Information technology growth and the role of AI and associated AI standards (Jan 2022)
  - IEC e-tech Computational approaches for AI systems (Jan 25th 2022)
  - ISO news Enabling An AI-Ready Culture - SC 42's Novel MSS Approach (Nov 2021)
  - IEC e-tech Standards help address bias in artificial intelligence technologies (Nov 8th 2021)
  - IEC news Growing AI standards committee concludes plenary (Oct 22nd 2021)
  - IEC news IEC and ISO artificial intelligence plenary begins (Oct 22nd 2021)
  - ISO publication White Paper on Smart Manufacturing (Oct 2021)
  - RAPS Article Enabling the digital transformation of industry: The roles of AI, big data, analytics, and related data ecosystem (June 1st 2021)
    - IEC news International standards instill confidence in artificial intelligence technologies (July 22nd 2021)
  - IEC news IEC and ISO artificial intelligence committee broadens standards work programme (May 17th 2021)
  - IEC e-tech IEC and ISO publish over 130 emerging AI use cases (May 17th 2021)
  - IEC news IEC/ISO standards committee for artificial intelligence begins spring plenary (Apr 30th 2021)
  - IEC e-tech New standard to enhance trustworthiness of artificial intelligence systems (March 15th 2021)
  - ISO news article on Getting Big on Data (Nov 5th 2020)
  - IEC e-tech article on International standards committee for AI ecosystem expands into new areas (Sep 15th 2020)

Additional Links and Information

SC 42 – Artificial Intelligence

- Press Coverage Related to SC 42 Overview and Program of Work
  - IEC e-tech article on IEC and ISO publish TR which provides overview of big data framework and reference architecture (Aug 24th 2020)
  - IEC e-tech article on Achieving trustworthy AI with standards (June 8th 2020)
  - ISO news SC 42 virtual plenary as an example of standards innovation during COVID-19 (May 15th, 2020)
  - IEC news announcing the key outcomes of the 5th plenary and added focus on data ecosystem (May 7th, 2020)
  - IEC e-tech article on SC 42's holistic ecosystem approach to AI standardization (Feb 2020)
  - IEC e-tech article on New IEC and ISO Standard will enable big data adoption across industry sectors (Feb 15th 2020)
  - IEC e-tech article on IEC and ISO AI committee (SC 42) expands programme of work (Jan 2020)
  - ISO focus Nov/Dec 2019 magazine on AI and the SC 42 program of work (November 2019)
    - ISO focus landing page for edition including links to download PDF (above in English) in various languages and individual articles
  - IEC news AI standards help accelerate digitalization of smart manufacturing (Dec 2019)
  - IEC news announcing the key outcomes of the 4th plenary (Nov 11th, 2019)
  - IEC e-tech article on Establishing trustworthiness is vital in our human-machine world (July 15th 2019)
  - IEC e-tech article on Artificial intelligence and big data: a paradigm shift in healthcare (May 15th 2019)
  - IEC news announcing the key outcomes of the 3rd plenary (April 23rd, 2019)
  - IEC news announcing the start of the 3rd plenary (April 9th 2019)
  - ISO news article (18th October 2018)
  - JTC 1 press committee article (30th May 2018)

Additional Links and Information

- Press Coverage Related to SC 42 Formation
  - IEC e-tech article (17th May 2018). Additional circulations
    - ISO retweeted the article (September 2018)
    - Published on ANSI (US National Body) website
    - Published on UNE (Spain National Body) website (September 2018)
    - Published on ILNAS (Luxemburg National Body) website (27th April 2018)
      - Note: not a direct reprint but used the photo
    - Published on Robotics Automation and News Magazine
  - ANSI news article on the formation of SC 42 (16th January 2018)
  - Introduction of SC 42 in the IEC MSB White Paper on Artificial Intelligence

Additional Links and Information

ISO JTC 1 IEC
INFORMATION TECHNOLOGY STANDARDS
SC 42 – Artificial Intelligence

- Press Coverage Related to SC 42 Participation at Key Industry and International Events
  - IEC Medium Publications
    - IEC news on How standardization can contribute to an international framework for AI (Oct 20th 2021)
    - IEC news Young Professionals learn about international standards for artificial intelligence (Oct 15th 2021)
    - IEC blog on Webinar on regulations and artificial intelligence technologies (Dec 10th 2020)
    - IEC blog on AI standards on the agenda at IOT Solutions World Congress (Dec 8th 2020)
    - IEC blog on IEC and ISO present AI standardization work during event by European Commission (Oct 28th 2020)
    - IEC blog on Trustworthiness is key to services and products using AI and IoT technologies (Mar 3rd, 2020)
    - IEC blog on AI standards on the agenda at IOT Solutions World Congress (Nov 21st 2019)
    - IEC blog on AI and IoT industry leaders to consider a digital trust framework at Berlin forum (May 15th 2019)
  - Global Standards Collaboration (GSC-22) 2019 Session on Artificial Intelligence
    - ISO news on Standards cooperation is key to making AI and smart cities a reality (April 4th 2019)
    - IEC blog on 22nd Global Standards Collaboration meeting discusses need for standards to accelerate AI technology innovation and adoption (April 3rd 2019)
  - JTC 1 Info
    - JTC 1 info article on IEC and ISO present on the AI Ecosystem Standardization Program at the European Commission Workshop (Oct 16th 2020)
  - Industrial Internet Consortium (IIC)
    - IIC blog on from IEC on Standards for AI on the Agenda at IoT Solutions World Congress
  - IoT Solutions World Congress (IoTSWC)
    - IoTSWC promotion of the IEC blog on AI standards on the agenda at IOT Solutions World Congress

Additional Links and Information

ISO JTC 1 IEC
INFORMATION TECHNOLOGY STANDARDS
SC 42 – Artificial Intelligence

- Other media coverage
  - Twitter
    - ISO (@isostandards)
      - Tweet Chat on standards on Artificial Intelligence with Chair of SC 42 (25th October). Hashtags: #ISOchat #Standards4AI
    - IEC (@IECStandards)
      - Article on New international standard will help organization boards and executive managers ask and answer key questions about AI technologies (12th February 2019)
      - Article on International standards play a key role in addressing the ethical, technical, safety and security aspects (6th February 2019)
      - Article and video on Standardization can help eliminate data bias in AI (4th February 2019)
      - Article and video on Chair of SC 42 explains the growing influence of AI in Smart Manufacturing (4th February 2019)
      - Article on Chair of SC 42 will lead a session at the CEN/CENELEC workshop on Trustworthy Artificial Intelligence (10th Aug 2018)
  - IEC Medium Publications
    - IEC blog on New IEC and ISO Standard will enable big data adoption across industry sectors (Mar 30th, 2020)
    - IEC blog on Important questions around AI technologies in smart manufacturing (Jan 8th, 2020)
    - IEC blog on New IEC and ISO Standard will enable big data adoption across industry sectors (Mar 30th, 2020)
    - IEC blog on Trustworthiness is key to services and products using AI and IoT technologies (Mar 3rd, 2020)
    - IEC blog on How standards help people trust AI (Jan 15th, 2020)
    - IEC blog on Important questions around AI technologies in smart manufacturing (Jan 8th, 2020)

Additional Links and Information

ISO JTC 1 IEC
INFORMATION TECHNOLOGY STANDARDS
SC 42 – Artificial Intelligence

- Other media coverage
  - IEC Medium Publications
    - IEC blog on Establishing trustworthiness is vital in our human-machine world (Sep 9th 2019)
    - IEC blog on The need for Big Data Standards (April 24th 2019)
    - IEC blog on New international standard will offer risk management framework for AI (March 18th 2019)
    - IEC blog on Helping organization boards and executives ask and answer key questions about AI technologies (Feb 12th 2019)
    - IEC e-tech article on AI in healthcare: keeping data safe and building trust (January 25th 2019)
    - IEC blog on Making AI safe (January 23rd 2019)
    - IEC e-tech article on Healthcare needs doctors and machines (December 10th, 2018)
    - IEC e-tech article on Eliminating data bias from machine learning systems (November 13th 2018)
    - IEC e-tech article on Smart homes are getting smarter (November 6th 2018)
    - IEC e-tech article on Machine learning is not a synonym for AI (October 17th 2018)
    - IEC e-tech article on Rethinking the healthcare ecosystem (reference to SC 42)
    - IEC e-tech article on Standards development organizations play key role in enabling remote daily life
  - Publications referencing SC 42 work
    - IEC e-tech on Luxembourg highlights role of technical standardization in adoption of artificial intelligence (Sep 21st 2021)
    - ILNAS white paper on AI and technical standardization
    - IEC e-tech article on How Standards Australia contributes to the global artificial intelligence ecosystem (Jan 20th 2021)

Additional Links and Information

ISO JTC 1 IEC
INFORMATION TECHNOLOGY STANDARDS
SC 42 – Artificial Intelligence

- Other media coverage
  - ISO Multimedia
    - ISO video interview with Chair of SC 42 on Standards and Artificial Intelligence (November 14th 2018)
      - Artificial Intelligence and the role of International Standards in the implementation of this technology
    - ISO video interview with Chair of SC 42 on Standards and Artificial Intelligence Continued (November 14th 2018)
      - Artificial Intelligence and easing the mind of end-users including AI trustworthiness, ethics and societal concerns
  - IEC Multimedia
    - IEC video interview with SC 42 Chair, SC 42/WG 3 Connvenor and ISO/IEC 24368 Editor on AI Ethics (Nov 2019)
    - IEC video interview with Chair of SC 42 on How can we ensure AI is safe for Healthcare? (April 6th 2019)
    - IEC video interview with Chair of SC 42 on Is it too early to use machine learning for cybersecurity? (April 5th 2019)
    - IEC video interview with Chair of SC 42 on To what extent is AI ready for standardization? (April 5th 2019)
    - IEC video interview with Chair of SC 42 on What are some of the challenges you see with AI? (March 26th 2019)
    - IEC video interview with Chair of SC 42 on How to Define Artificial Intelligence (March 26th 2019)
    - IEC video interview with Chair of SC 42 on Why do we need standards for AI? (March 26th 2019)
    - IEC video interview with Chair of SC 42 on Artificial Intelligence (February 4th 2019)
      - The growing influence of AI in Smart Manufacturing and the important role of standards
    - IEC video interview with Chair of SC 42 on Artificial Intelligence (February 4th 2019)
      - Standardization can help eliminate data bias in AI

Annex B

Details of Publications, SC 42 WGs, Liaisons and Program of Work

Published Standards – AI – 2022

ISO JTC 1 IEC
INFORMATION TECHNOLOGY STANDARDS
SC 42 – Artificial Intelligence

ISO/IEC 38507 -- Information technology -- Governance of IT -- Governance implications of the use of artificial intelligence by organizations

- Publication date: 2022-04

This document provides guidance for members of the governing body of an organization to enable and govern the use of Artificial Intelligence (AI), in order to ensure its effective, efficient and acceptable use within the organization.

This document also provides guidance to a wider community, including:

— executive managers;

— external businesses or technical specialists, such as legal or accounting specialists, retail or industrial associations, or professional bodies;

— public authorities and policymakers;

— internal and external service providers (including consultants);

— assessors and auditors.

This document is applicable to the governance of current and future uses of AI as well as the implications of such use for the organization itself.

This document is applicable to any organization, including public and private companies, government entities and not-for-profit organizations. This document is applicable to an organization of any size irrespective of their dependence on data or information technologies.

Published Standards – AI – 2021

ISO JTC 1 IEC
INFORMATION TECHNOLOGY STANDARDS
SC 42 – Artificial Intelligence

ISO/IEC TR 24029-1:2021 Artificial Intelligence -- Assessment of the robustness of neural networks -- Part 1: Overview

- Publication date: 2021-03

This document provides background about existing methods to assess the robustness of neural networks.

ISO/IEC TR 24030:2021 Information technology -- Artificial Intelligence -- Use cases

- Publication date: 2021-05

This document provides a collection of representative use cases of AI applications in a variety of domains.

ISO/IEC TR 24027:2021 Information technology -- Artificial Intelligence -- Bias in AI systems and AI aided decision making

- Publication date: 2021-11

This document addresses bias in relation to AI systems, especially with regards to AI-aided decision-making. Measurement techniques and methods for assessing bias are described, with the aim to address and treat bias-related vulnerabilities. All AI system lifecycle phases are in scope, including but not limited to data collection, training, continual learning, design, testing, evaluation and use.

ISO/IEC TR 24372:2021 Information technology -- Artificial Intelligence -- Overview of computational approaches for AI systems

- Publication date: 2021-12

This document provides an overview of the state of the art of computational approaches for AI systems, by describing: a) main computational characteristics of AI systems; b) main algorithms and approaches used in AI systems, referencing use cases contained in ISO/IEC TR 24030.

Published Standards – AI – 2020

ISO JTC 1 IEC
INFORMATION TECHNOLOGY STANDARDS
SC 42 – Artificial Intelligence

ISO/IEC TR 24028:2020 Information technology -- Artificial Intelligence -- Overview of trustworthiness in artificial intelligence

- Publication date: 2020-05

This document surveys topics related to trustworthiness in AI systems, including the following:

— approaches to establish trust in AI systems through transparency, explainability, controllability, etc.;

— engineering pitfalls and typical associated threats and risks to AI systems, along with possible mitigation techniques and methods; and

— approaches to assess and achieve availability, resiliency, reliability, accuracy, safety, security and privacy of AI systems.

The specification of levels of trustworthiness for AI systems is out of the scope of this document.

Published Standards – Big Data – 2020

ISO JTC 1 IEC
INFORMATION TECHNOLOGY STANDARDS
SC 42 – Artificial Intelligence

ISO/IEC 20547-1:2020 Information technology -- Big data reference architecture -- Part 3: Framework and application process

- Publication date: 2020-08

The ISO/IEC 20547 series is intended to provide users with a standardized approach to developing and implementing big data architectures and provide references for approaches.

This document describes the framework of the big data reference architecture and the process for how a user of the document can apply it to their particular problem domain.

ISO/IEC 20547-3:2020 Information technology -- Big data reference architecture -- Part 3: Reference architecture

- Publication date: 2020-03

The ISO/IEC 20547 series is intended to provide users with a standardized approach to developing and implementing big data architectures and provide references for approaches.

This document describes the reference architecture in terms of User and Functional views.

The reference architecture presented in this document provides an architecture framework for describing the big data components, processes, and systems to establish a common language for the various stakeholders named as big data reference architecture (BDRA).

Published Standards – Big Data – 2018, 2019

ISO JTC 1 IEC
INFORMATION TECHNOLOGY STANDARDS
SC 42 – Artificial Intelligence

ISO/IEC TR 20547-2:2018 Information technology -- Big data reference architecture -- Part 2: Use cases and derived requirements

- Publication date: 2018-01

ISO/IEC TR 20547-2:2018 provides examples of big data use cases with application domains and technical considerations derived from the contributed use cases.

ISO/IEC TR 20547-5:2018 Information technology -- Big data reference architecture -- Part 5: Standards roadmap

- Publication date: 2018-02

ISO/IEC TR 20547-5:2018 describes big data relevant standards, both in existence and under development, along with priorities for future big data standards development based on gap analysis.

ISO/IEC 20546:2019 Information technology -- Big Data -- Overview and Vocabulary

- Publication date: 2019-02

This document provides a set of terms and definitions needed to promote improved communication and understanding of this area. It provides a terminological foundation for big data-related standards.

This document provides a conceptual overview of the field of big data, its relationship to other technical areas and standards efforts, and the concepts ascribed to big data that are not new to big data.

SC 42 Projects, Status and Leadership

SC 42/WG 1 Foundational standards

- Terms of reference: Development of foundational standards for Artificial Intelligence
- Convenor: Paul Cotton (Canada)
- ISO/IEC 22989: Artificial Intelligence Concepts and Terminology
  - Editor: Wei Wei (Germany)
  - Status: Publication
- ISO/IEC 23053: Framework for Artificial Intelligence Systems Using Machine Learning
  - Editor: Milan Patel (United Kingdom)
  - Status: Publication
- ISO/IEC 42001: Information technology -- Artificial Intelligence -- Management System
  - Editor: Marta Janczarski (Canada)
  - Status: CD Ballot

SC 42 Projects, Status and Leadership

ISO JTC 1 IEC
INFORMATION TECHNOLOGY STANDARDS
SC 42 – Artificial Intelligence

SC 42/WG 2 Data

- Terms of reference: Standardization in relation to data in the context of artificial intelligence, big data, and data analytics
- Convenor: Wo Chang (United States)
- ISO/IEC 5259-1: Data quality for analytics and ML -- Part 1: Overview, terminology, and examples
  - Editor: Suwook Ha (Korea)
  - Status: Working draft
- ISO/IEC 5259-2: Data quality for analytics and ML -- Part 2: Data quality measures
  - Editor: Kyoung-Sook Kim (Japan)
  - Status: Working draft
- ISO/IEC 5259-3: Data quality for analytics and ML -- Part 3: Data quality management requirements and guidelines
  - Editor: Matthis Eicher (Germany)
  - Status: Working draft
- ISO/IEC 5259-4: Data quality for analytics and ML -- Part 4: Data quality process framework
  - Editor: Wanzhong Ma (China)
  - Status: Working draft

SC 42 Projects, Status and Leadership

ISO JTC 1 IEC
INFORMATION TECHNOLOGY STANDARDS
SC 42 – Artificial Intelligence

SC 42/WG 2 Data

- ISO/IEC 5259-5: Data quality for analytics and ML -- Part 5: Data quality governance
  - Editor: Gyeung-Min Kim (Korea)
  - Status: Working draft
- ISO/IEC 8183 Information technology -- Artificial intelligence -- Data life cycle framework
  - Editor: Colin Crone (United Kingdom)
  - Status: CD Ballot Comment Resolution
- ISO/IEC 24668: Information technology -- Artificial Intelligence -- Process management framework for Big data analytics
  - Editor: Gautam Banerjee (India)
  - Status: FDIS

SC 42 Projects, Status and Leadership

ISO JTC 1 IEC
INFORMATION TECHNOLOGY STANDARDS
SC 42 – Artificial Intelligence

SC 42/WG 3 Trustworthiness

- Terms of reference: Standardization in the area of AI Trustworthiness
- Convenor: David Filip (Ireland)
- Secretariat: Aditya Mohan (Ireland)
- ISO/IEC 24029-2: Artificial Intelligence (AI) -- Assessment of the robustness of neural networks -- Part 2: Formal methods methodology
  - Editor: Arnault Ioualalen (France)
  - Status: CD Ballot
- ISO/IEC 23894 -- Information technology -- Artificial intelligence -- Risk management
  - Editor: Peter Deussen (Germany)
  - Status: DIS Ballot
- ISO/IEC TR 24368: Information technology -- Artificial Intelligence (AI) -- Overview of Ethical and Societal Concerns
  - Editor: Viveka Bonde (Sweden)
  - Status: Publication

SC 42 Projects, Status and Leadership

ISO JTC 1 IEC
INFORMATION TECHNOLOGY STANDARDS
SC 42 – Artificial Intelligence

SC 42/WG 3 Trustworthiness

- ISO/IEC TR 5469: Artificial Intelligence (AI) -- Functional Safety
  - Editor: Takashi Egawa (Japan), Riccardo Mariani (Italy)
  - Status: CIB for comments from SC 42 and IEC TC 65/SC 65A
- ISO/IEC 25059 -- Software engineering -- Systems and software Quality Requirements and Evaluation (SQuaRE) -- Quality Model for AI-based systems
  - Editor: Adam Leon Smith (United Kingdom)
  - Status: CD Ballot
- ISO/IEC TS 6254 -- Information technology -- Artificial intelligence -- Objectives and approaches for explainability of ML models and AI systems
  - Editor: Jaeho Lee (Korea)
  - Status: Working Draft
- ISO/IEC TS 5471 -- Artificial intelligence -- Quality evaluation guidelines for AI systems
  - Editor: Olivier Blais (France)
  - Status: Working Draft

SC 42 Projects, Status and Leadership

ISO JTC 1 IEC
INFORMATION TECHNOLOGY STANDARDS
SC 42 – Artificial Intelligence

SC 42/WG 3 Trustworthiness

- ISO/IEC TS 8200 -- Artificial intelligence -- Controllability of automated artificial intelligence systems
  - Editor: Xiaoqi Cao (China)
  - Status: Working Draft
- ISO/IEC 12791: Information technology -- Artificial Intelligence (AI) -- Treatment of unwanted bias in classification and regression machine learning tasks
  - Editor: Adam Leon Smith (United Kingdom)
  - Status: Working Draft
- ISO/IEC TS 12792: Information technology -- Artificial Intelligence (AI) -- Transparency taxonomy of AI systems
  - Editor: Rania Wazir (Austria)
  - Status: Working Draft
- Information technology -- Artificial Intelligence (AI) -- Best practice guidance for mitigating ethical and societal concerns
  - Editor: Viveka Bonde (Sweden)
  - Status: PWI

SC 42 Projects, Status and Leadership

ISO JTC 1 IEC
INFORMATION TECHNOLOGY STANDARDS
SC 42 – Artificial Intelligence

SC 42/WG 4 Use cases and applications

- Terms of reference: Use cases and applications for AI standardization
- Convenor: Fumihiro Maruyama (Japan)
- Secretariat: Nobuhiro Hosokawa (Japan)
- ISO/IEC 5338: Information technology -- Artificial Intelligence (AI) -- AI system lifecycle processes
  - Editor: Yuchang Cheng (Japan)
  - Status: CD Ballot
- ISO/IEC 5339: Information technology -- Artificial Intelligence (AI) -- Guidelines for AI applications
  - Editor: Shrikant Bhat (India)
  - Status: Working draft
- ISO/IEC TR 24030:2021 Revision: Information technology -- Artificial Intelligence (AI) – Use cases
  - Editor: Yuchang Cheng (Japan)
  - Status: Working Draft

SC 42 Projects, Status and Leadership

ISO JTC 1 IEC
INFORMATION TECHNOLOGY STANDARDS
SC 42 – Artificial Intelligence

SC 42/WG 5 Computational approaches and computational characteristics of AI systems

- Terms of reference: Standardization in the area of computational approaches and computational characteristics of AI systems
- Convenor: Ning Sun (China)
- Past Convenor: Tangli Liu (China) until April 29th 2022
- ISO/IEC TS 4213: Assessment of classification performance for machine learning models
  - Editor: Michael Theime (United States) and Lingzhong Meng (China)
  - Status: Publication
- ISO/IEC 5392: Information technology -- Artificial Intelligence (AI) -- Reference architecture of knowledge engineering
  - Editor: Ruiqi Li (China)
  - Status: CD Ballot
- ISO/IEC TR : Information technology -- Artificial intelligence -- Overview of machine learning computing devices
  - Editor: Xiaoqi Cao (China)
  - Status: Working Draft

SC 42 Projects, Status and Leadership

ISO JTC 1 IEC
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SC 42 – Artificial Intelligence

SC 42/JWG 1 Governance implications of AI (Completed)

[Joint WG with SC 40. Administered by SC 42]

- Convenor: Yonosuke Harada (Japan)
- Co-Convenor: Gyeung-Min Kim (Republic of Korea)
- ISO/IEC 38507 -- Information technology -- Governance of IT -- Governance implications of the use of artificial intelligence by organizations
  - Editor: Peter Brown (United Kingdom)
  - Status: Published!

SC 42/JWG 2 Testing of AI Systems

[Joint WG with SC 7. Administered by SC 42]

- Convenor: Adam Leon Smith (United Kingdom)
- Co-Convenor: Stuart Reid (United Kingdom)
- ISO/IEC 29119-11 -- Information technology -- Artificial intelligence -- Testing for AI systems -- Part 11
  - Editor: Jonghong Jeon (Korea), Stuart Reid (United Kingdom)
  - Status: Working Draft

SC 42 Projects, Status and Leadership

ISO JTC 1 IEC
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SC 42 – Artificial Intelligence

SC 42 Active AGs/AHGs on Specific Topics

- AHG 4 on Liaison with JTC 1/SC 27 – Convenor: Peter Duessen (Germany)
- AG 3 on AI standardization roadmap – Convenor: Patrick Bezombes (France)

SC 42 Completed AGs on Specific Topics

- AG 1 on AI Management Systems Standard – Convenor: Jim McFie (Canada)
- AG 2 on AI Systems engineering – Convenor: Luigi Troiano (Italy)

SC 42 Completed AHGs

- AHG 1 on Dissemination and outreach – Convenor: Wael William Diab (SC 42 Chair), Secretariat: Heather Benko (SC 42 Committee Manager)
- AHG 2 on Liaison with JTC 1/SC 38 – Convenor: Peter Duessen (Germany)
- AHG 3 on Intelligent systems engineering – Convenor: Luigi Troiano (Italy)
- AHG 5 on AI standardization landscape and roadmap – Convenor: Patrick Bezombes (France)
- Societal concerns
- Study groups terms of reference
- Business plan review 2018, 2019, 2020 and 2021
- Ethical and sustainable AI proposal

SC 42 Projects, Status and Leadership

ISO JTC 1 IEC
INFORMATION TECHNOLOGY STANDARDS
SC 42 – Artificial Intelligence

SC 42 Completed Study Groups

- SC 42/SG 1 Computational approaches and characteristics of artificial intelligence systems
  - Convenor: Tangli Liu (China)
  - Secretariat: Qun Zhang (China)
  - Status
    - SG report to be submitted by the SG leadership team to SC 42 by May 31st for consideration
    - NWIPs under discussion in the SG have been assigned to WG 5 to continue discussion and consideration
- SC 42/SG 2: Trustworthiness
  - Convenor: David Filip (Ireland)
  - Secretariat: Barry Smith (Ireland)
  - Status
    - Study group report on robustness completed and accepted by SC 42
    - Remaining items of study from terms of reference assigned as tasks to SC 42/WG 3
- SC 42/SG 3: Use cases and applications
  - Convener: Fumihiro Maruyama (Japan)
  - Secretariat: Nobuhiro Hosokawa (Japan)
  - Status: Remaining items of study from terms of reference assigned as tasks to SC 42/WG 4

SC 42 Liaisons

ISO JTC 1 IEC
INFORMATION TECHNOLOGY STANDARDS
SC 42 – Artificial Intelligence

SC 42 has established an extensive and comprehensive set of liaisons for collaboration

- SC 42 provides guidance to ISO, IEC and JTC 1 committees on AI applications
- Reflects strong internal and external interest in the AI standardization program of work

Approved Category A External Liaisons

- EC – European Commission
  - SC 42 liaison officer: Ray Walshe
- ETUC – European Trade Union Confederation
- EUROCAE – The European Organization for Civil Aviation Equipment
- euRobotics AISBL
- Big Data Value Association (BDVA)
  - SC 42 liaison officers: Abdellatif Touimi, Ray Walshe
  - BDVA liaison officers: Ana Garcia Robles, Abdellatif Touimi
- Partnership on AI (PAI)
  - SC 42 liaison officer: Tarek Besold
  - PAI liaison officers: Terah Lyons, Peter Eckersley, Steven Adler

Approved Category A External Liaisons

- OECD – Organisation for Economic Co-operation and Development
  - OECD liaison officers: Karine Perset, Luis Aranda
  - SC 42 liaison officer: Rohit Israni
- Consumers International
- Small Business Standards (SBS)
- Open Geospatial Consortium (OGC)
  - OGC liaison officers: George Percivall, Ingo Simonis
- Independent International Organization for Certification (IIOC)
- IEEE
- ITU
  - SC 42 liaison officer: Yoav Evenstein
  - ITU liaison officers: Reinhard Scholl, Bilel Jamoussi

SC 42 Liaisons

ISO JTC 1 IEC
INFORMATION TECHNOLOGY STANDARDS

SC 42 – Artificial Intelligence

Approved Internal Liaisons to SC 42

- JTC 1/SC 7 – Software and systems engineering
  - Officers: Stuart Reid and Shuji Kinoshita
- JTC 1/SC 24 – Computer graphics, image processing and environmental data representation
- JTC 1/SC 27 – Information security, cybersecurity and privacy protection
- JTC 1/SC 29 – Coding of audio, picture, multimedia and hypermedia information
- JTC 1/SC 32 – Data management and interchange
- JTC 1/SC 34 – Document description and processing languages
- JTC 1/SC 36 – Information technology for learning, education and training
  - Officer: Jon Mason
- JTC 1/SC 37 – Biometrics
  - Officer: Markku Metsämäki (Finland)
- JTC 1/SC 38 – Cloud computing and distributed platforms
  - Officer: Toshiro Suzuki (Japan)
- JTC 1/SC 40 – IT Service Management and IT Governance
  - Officer: Terry Landers (Ireland)
- JTC 1/SC 41 – Internet of things and related technologies
  - Officers: Osten Franberg (Sweden) Luke Fay (United States)

Approved Internal Liaisons to SC 42

- JTC 1 (WG 11) – Smart Cities
  - Officer: Howard Choe
- ISO/CASCO
- ISO/PC 317 – Consumer protection: privacy by design for consumer goods and services
- ISO/TC 20 – Aircraft and space vehicles
- ISO/TC 20/SC 16 – Unmanned aircraft
- ISO/TC 37 – Language and terminology
- ISO/TC 37/SC 3 – Management of terminology resources
- ISO/TC 42 – Photography
  - Officer: Scott Foshee (United States)
- ISO/TC 69 – Applications of statistical methods
  - Officer: Radouane Oudrhiri (United Kingdom)
- ISO/TC 211 – Geographic information/Geomatics
- ISO/TC 215 – Health infomatics
- ISO/TC 262 – Risk management
- ISO/TC 268 – Sustainable cities and communities
- ISO/TC 269 – Railway applications

SC 42 Liaisons

SC 42 – Artificial Intelligence

Approved Internal Liaisons to SC 42

- ISO/TC 307 – Blockchain and distributed ledger technologies
  - Officer: Janna Lingenfelder (Germany)
- ISO/TC 309 – Governance of organizations
  - Officer: Michael Kayser
- IEC/SyC AAL
  - Officer: Ulrike Haltrich
- IEC/SyC SM
  - Officer: Alexander McMillan
- IEC/TC 62 – Electrical equipment in medical practice
- IEC/SC 62C – Equipment for radiotherapy, nuclear medicine and radiation dosimetry
- IEC/TC 65 – Industrial – Process measurement, control and automation
  - Officers: Rudy Belliardi (TC 65 Secretary) and Wael William Diab (SC 42 Chair)
- IEC/SC 65A – System aspects
- IEC/TC 100 – Audio, video and multimedia systems and equipment

SC 42 Liaisons

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INFORMATION TECHNOLOGY STANDARDS

SC 42 – Artificial Intelligence

Approved Internal Liaisons from SC 42

- IEC/SyC AAL – Active Assisted Living
  - SC 42 Officer: David Martin (United States)
- IEC/SyC Smart Cities
  - SC 42 Officer: Tangli Liu (China)
- IEC/SyC SM – Smart Manufacturing
  - SC 42 Officer: Wael William Diab (SC 42 Chair)
- IEC/TC 62 – Electrical equipment in medical practice
- IEC/TC 65 – Industrial – Process measurement, control and automation
  - SC 42 Officers: Wei Wei (Germany), Rudy Belliardi (TC 65 Secretary) and Wael William Diab (SC 42 Chair)
- IEC/TC 65/SC 65A – System Aspects
  - SC 42 Officer: Takashi Egawa (Japan)
- JTC 1/SC 7 – Software and systems engineering
  - SC 42 Officers: Yuchang Cheng (Japan) and Adam Leon Smith (UK)
- JTC 1/SC 27 – IT security techniques
  - SC 42 Officers: Peter Deussen (Germany), Sun Yan (China)
- JTC 1/SC 29 – Coding of audio, picture, multimedia and hypermedia information
  - SC 42 Officers: Wo Chang (United States) and Abdellatif Benjelloun Touimi (UK)

Approved Internal Liaisons from SC 42

- JTC 1/SC 32 – Data management and interchange
  - SC 42 Officers: Wo Chang (US) and Guang Liang (China)
- JTC 1/SC 34 – Document description and processing languages
  - SC 42 Officers: Jaeho Lee (Korea)
- JTC 1/SC 36 – Information technology for learning, education and training
  - SC 42 Officer: Bruce Peoples (United States)
- JTC 1/SC 37 – Biometrics
  - SC 42 Officers: Brianna Brownell (Canada), Frank Rudzicz (Canada)
- JTC 1/SC 38 – Cloud computing and distributed platforms
  - SC 42 Officers: Peter Deussen (Germany), David Filip (Ireland)
- JTC 1/SC 39 – Sustainability for and by Information Technology
  - SC 42 Officer: Yoav Evenstein (Israel)
- JTC 1/SC 40 – IT Service Management and IT Governance
  - SC 42 Officer: Geoff Clarke (Australia)
- JTC 1/SC 41 – Internet of things and related technologies
  - SC 42 Officer: Wei Wei (Germany)
- JTC 1 (WG 11) – Smart cities
  - SC 42 Officer: Tangli Liu (China)
- ISO CASCO

SC 42 Liaisons

Approved Internal Liaisons from SC 42

- ISO/TC 22/SC 32 – Electrical and electronic components and general system aspects
- ISO/TC 37 – Language and terminology
  - SC 42 Officer: David Filip (Ireland)
- ISO/TC 37/SC 3 – Management of terminology resources
  - SC 42 Officer: David Filip (Ireland)
- ISO/TC 69 – Applications of statistical methods
  - SC 42 Officer: Radouane Oudrhiri (UK)
- ISO/TC 204 – Intelligent Transport Systems
  - SC 42 Officer: Wael William Diab (Chair)
- ISO/TC 215 – Health informatics
  - SC 42 Officer: Paolo Alcini (Italy)
- ISO/TC 262 – Risk management
  - SC 42 Officer: Pat Baird (United States)
- ISO/TC 299 – Robotics
  - SC 42 Officer: David Dubois (Canada)
- ISO/TC 307 – Blockchain and distributed ledger technologies
  - SC 42 Officers: Li Bin (China) and Dapeng Zhang (China)

Approved Internal Liaisons from SC 42

- ISO/TC 309 – Governance of organizations
  - SC 42 Officer: Victoria Hailey (Canada)
- IEC/TC 100 – Audio, video and multimedia systems and equipment
- ISO/TC 268 – Sustainable cities and communities

Annex C

Additional Information on SC 42 Meeting Schedule

Upcoming Meetings

ISO JTC 1 IEC
INFORMATION TECHNOLOGY STANDARDS
SC 42 – Artificial Intelligence

10th Plenary meeting

- October, 2022
- Sydney, Australia
- Confirmed

11th Plenary meeting

- April, 2023
- Tel Aviv, Israel
- Confirmed

12th Plenary meeting

- October, 2023
- Vienna, Austria
- Confirmed

13th Plenary meeting

- April, 2024
- Seoul, South Korea
- Confirmed

14th Plenary meeting

- October, 2024
- France
- Confirmed

15th Plenary meeting

16th Plenary meeting

- October, 2025
- Berlin, Germany
- Confirmed

17th Plenary meeting

- April, 2026
- Salerno, Italy
- Tentative

Past Meetings

ISO JTC 1 IEC
INFORMATION TECHNOLOGY STANDARDS
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9th Plenary meeting

- April 18th to 29th, 2022
- Virtual

8th Plenary meeting

- October 18th to 29th, 2021
- Virtual

7th Plenary meeting

- April 26th – May 7th, 2021
- Virtual

6th Plenary meeting

- October 19th – 30th, 2020
- Virtual

5th Plenary meeting

- April 6th – 20th, 2020
- Virtual

4th Plenary meeting

- October 7th – 11th, 2019
- Tokyo, Japan

3rd Plenary meeting

- April 8th – 12th, 2019
- Dublin, Ireland

2nd Plenary meeting

- October 18th – 20th, 2018
- Sunnyvale, CA, USA

1st Plenary meeting

- April 18th – 20th, 2018
- Beijing, China

Annex D

SC 42 Member National Bodies

SC 42 Member National Bodies

ISO JTC 1 IEC
INFORMATION TECHNOLOGY STANDARDS
SC 42 – Artificial Intelligence

The following national bodies are participating members of SC 42 (P-members)

- Australia (SA), Austria (ASI), Belgium (NBN), Canada (SCC), China (SAC), Congo, The Democratic Republic of the (OCC), Cyprus (CYS), Denmark (DS), Finland (SFS), France (AFNOR), Germany (DIN), India (BIS), Ireland (NSAI), Israel (SII), Italy (UNI), Japan (JISC), Kazakhstan (KAZMEMST), Kenya (KEBS), Korea, Republic of (KATS), Luxembourg (ILNAS), Malta (MCCAA), Netherlands (NEN), Norway (SN), Portugal (IPQ), Russian Federation (GOST R), Saudi Arabia (SASO), Singapore (SSC), Spain (UNE), Sweden (SIS), Switzerland (SNV), Uganda (UNBS), United Arab Emirates (MoIAT-STR), United Kingdom (BSI), United States (ANSI)

The following national bodies are observing members of SC 42 (O-members)

- Argentina (IRAM), Benin (ANM), Brazil (ABNT), Côte d'Ivoire (CODINORM), Hong Kong (ITCHKSAR), Hungary (MSZT), Indonesia (BSN), Lithuania (LST), Mexico (DGN), New Zealand (NZSO), North Macedonia (ISRSM), Philippines (BPS), Poland (PKN), Romania (ASRO), South Africa (SABS), Ukraine (DSTU)

ISO JTC 1 IEC
INFORMATION TECHNOLOGY STANDARDS

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Annex E

Overview of Guidelines for AI Applications (ISO/IEC 5339)

ISO/IEC 5339 Guidelines for AI Applications

ISO JTC 1 IEC
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- Macro-level view
  - The document provides a macro-level view of an AI application to facilitate its understanding, development and use amongst all stakeholders
- Document includes
  - motivation and objectives;
  - an approach to identifying an AI application's stakeholders, context, functional characteristics and non-functional characteristics;
  - an AI application framework that can be used to answer the question: "What are the characteristics and considerations of an AI application?";
  - guidelines for AI applications based on the make, use and impact perspectives
- Progress
  - submitted for an eight-week CD ballot starting May 2nd, 2022

Annex F

Big Data Trends and Emerging Projects

Key Topics: Big Data Background

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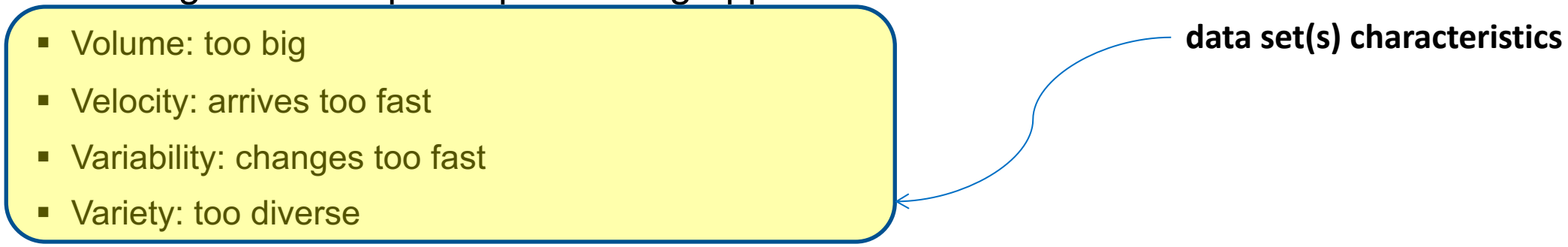
SC 42 – Artificial Intelligence

Overview

- Big Data is extensive datasets — primarily in the data characteristics of volume, variety, velocity, and/or variability — that require a scalable technology for efficient storage, manipulation, management, and analysis. Note: Big data is commonly used in many different ways, for example as the name of the scalable used to handle big data extensive datasets.
- Big Data deals with ***characteristics*** that for an application domain ***cannot be efficiently processed*** using ***traditional technologies*** and techniques in order to ***extract value***

Key Drivers of Big Data

- Key drivers in understanding the Big Data paradigm – how this is different from traditional data storage and compute / processing applications



- The applications ***generating*** this data or requiring its ***analysis*** may have one more of the above aspects present

Emerging applications are creating a **paradigm shift** and enabling predictive analytics

Big Data Analysis and Predictions

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Tremendous market growth and job creation

Strong support that Big Data adoption is happening, cross-cutting and has significant implications and potential

Paradigm shift and predictive analytics

IDC – Predictions from the IDC FutureScape for Big Data and Analytics

1. Visual data discovery tools will be growing 2.5 times faster than rest of the business intelligence (BI) market. By 2018, investing in this enabler of end-user self service will become a requirement for all enterprises.
2. Over the next five years spending on cloud-based Big Data and analytics (BDA) solutions will grow three times faster than spending for on-premise solutions. Hybrid on/off premise deployments will become a requirement.
3. Shortage of skilled staff will persist. In the U.S. alone there will be 181,000 deep analytics roles in 2018 and five times that many positions requiring related skills in data management and interpretation.
4. By 2017 unified data platform architecture will become the foundation of BDA strategy. The unification will occur across information management, analysis, and search technology.
5. Growth in applications incorporating advanced and predictive analytics, including machine learning, will accelerate in 2015. These apps will grow 65% faster than apps without predictive functionality.
6. 70% of large organizations already purchase external data and 100% will do so by 2019. In parallel more organizations will begin to monetize their data by selling them or providing value-added content.

Big Data Analysis and Predictions

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Emerging Applications and Trends for BD

IDC – Predictions from the IDC FutureScape for Big Data and Analytics

7. Adoption of technology to continuously analyze streams of events will accelerate in 2015 as it is applied to Internet of Things (IoT) analytics, which is expected to grow at a five-year compound annual growth rate (CAGR) of 30%.
8. Decision management platforms will expand at a CAGR of 60% through 2019 in response to the need for greater consistency in decision making and decision making process knowledge retention.
9. Rich media (video, audio, image) analytics will at least triple in 2015 and emerge as the key driver for BDA technology investment.
10. By 2018 half of all consumers will interact with services based on cognitive computing on a regular basis.

Gartner

Bid Data Motivators within ICT Space

- On weather or not “Big data hype or substance?”
  - Beyond all the discussions, adoption of big data is simply inevitable
- Within key IT trends
  - Identifies Big Data expertise as essential
  - Identifies Big Data expertise as needed within Web-scale I, IoT and others
- Benefits of big data are not limited solely to better decision making
  - fewer than half of big data projects focus on direct decision making
  - most big data projects are geared to generating deeper business insights and optimizing, automating or even designing new processes

Process Management Framework – Big Data Analytics

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The proposed standard provides a framework for developing processes to effectively leverage big data analytics across the organization irrespective of the industries/sectors. It specifies process management for big data analytics with the five process categories as listed below with help of Process Reference Model, Measurement Framework and Assessment Model:

Process Reference Model

Context
Purpose
Outcomes

Process Measurement Framework

Attributes
Attribute Outcomes
Rating Scale

Process Assessment Model

Process Capability by processes from Process groups

Progress Categories & Processes

Organization Stakeholder processes:

OSP1: Business analytics policy
OSP2: Stakeholders decision rights and accountabilities
OSP3: Alignment with organizational objectives
OSP4: Change management
OSP5: Data driven culture

Competency Development processes:

CDP1: Workforce planning
CDP2: Capability development
CDP3: Functional knowledge
CDP4: Capability renewal

Data Management processes:

DMP1: Data identification
DMP2: Data normalization
DMP3: Data governance
DMP4: Big data infrastructure

Analytics Development processes:

ADP1: Analytics activity definition
ADP2: Analytics practices
ADP3: Success criteria definition
ADP4: Risk identification

Technology Intergration processes:

TIP1: Enterprise data mart
TIP2: System integration

Annex G

Overview of JTC 1

Part of the ISO, IEC and JTC 1 Family

ISO JTC 1 IEC
INFORMATION TECHNOLOGY STANDARDS
SC 42 – Artificial Intelligence

JTC 1

- Jointly established under ISO and IEC covering the field of Information Technology
  - ICT building blocks for global markets
  - Standards for business and consumer applications
- 33 P-members and 62 O-members
- About 5000 active participants developing 580+ standards; over 3000 published
- Technical areas within JTC 1 include
  - Coded character sets – Telecommunications and information exchange between systems – Software and systems engineering – Cards and security devices for personal identification – Programming languages – Digitally recorded media – Computer graphics, image processing – IT security techniques – Office equipment (printing) – Coding of audio, picture, multimedia (JPEG, MPEG) – Automatic ID and data capture (RFID) – Data management – Document description, processing – User interfaces, IT for learning, education, training – Biometrics – Cloud computing – IT Sustainability – IT governance – Internet of Things – Artificial Intelligence – Smart cities – 3D printing and scanning – Quantum Computing
- Strategic topics covered within JTC 1 include
  - Digital transformation
    - Increased cooperation with other ISO and IEC TCs
    - Working with policy makers: standards and regulations
  - Systems integration
  - Cooperation with consortia
  - Trustworthiness
  - Emerging technologies
  - Open source

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INFORMATION TECHNOLOGY STANDARDS

SC 42 – Artificial Intelligence

Annex H

ISO/IEC AI Workshop Series

ISO/IEC AI Workshop Series

Inaugural Workshop on 24th and 25th May 2022 (Online)

ISO JTC1 IEC
INFORMATION TECHNOLOGY STANDARDS
SC 42 – Artificial Intelligence

4 Content Tracks

AI Applications

This track will look at emerging AI applications, public projects, use cases and case studies with the goal of identifying insights relating to AI application requirements, providing an overview of supporting horizontal standardization work and discuss roadmaps of application domain verticals

Emerging AI Technology Trends

AI technology and capability is evolving at a rapid pace. This track will look at emerging AI technology areas and trends with the goal of discussing new areas and looking at the interplay of research, industry activity and standardization

Novel AI Standardization Approaches

In addition to building on well established information and operational technologies, standards and open-source efforts, AI introduces technology-specific challenges through its learning nature. This track will look at such challenges and discuss the innovative standards approaches to address them

Emerging AI Requirements

Viewed as a digital transformation enabler or through its potential to deliver transformative insights for the betterment of society, AI is expected to become a ubiquitous technology. Thus, requirements to ensure responsible adoption continue to emerge from a diverse set of perspectives. This track will look at the context of use (e.g. ethics) and emerging requirements highlighting the role standards can play to complement other efforts such as industry, regulatory etc.

Benefits

Innovation

workshop will focus on state of the art, priorities and requirements

Market Intelligence

identify emerging trends, requirements, insights and opportunities

Thought Leadership

participating in this interactive event will help to position your organization as an industry leader

Enhanced

Enhanced networking opportunities

Stakeholders

Attract new stakeholders to join standardization activities

Information

Gain insight into alternative POVs and needs through Q&A and panel discussion

ISO/IEC AI Workshop Sessions

ISO JTC1 IEC
INFORMATION TECHNOLOGY STANDARDS
SC 42 – Artificial Intelligence

24th 1300 – 1600 UTC

Opening Remarks

AI Applications A

Novel AI Standardization A

Session registration

25th 0500 – 0800 UTC

Emerging AI Requirements

Emerging Tech Trends

Session registration

25th 2200 – 26th 0100 UTC

AI Applications B

Novel AI Standardization B

Closing Remarks

Session registration

Workshop Website

Contacts:

Wael William Diab, Chair SC 42 (Artificial Intelligence): wael.diab@gmail.com

Heather Benko, Committee Manager SC 42 (Artificial Intelligence): hbenko@ansi.org

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