Temporary Working Group on Artificial Intelligence

OPCW
Organisation for the Prohibition of Chemical Weapons

Peter Hotchkiss
Secretary to the SAB

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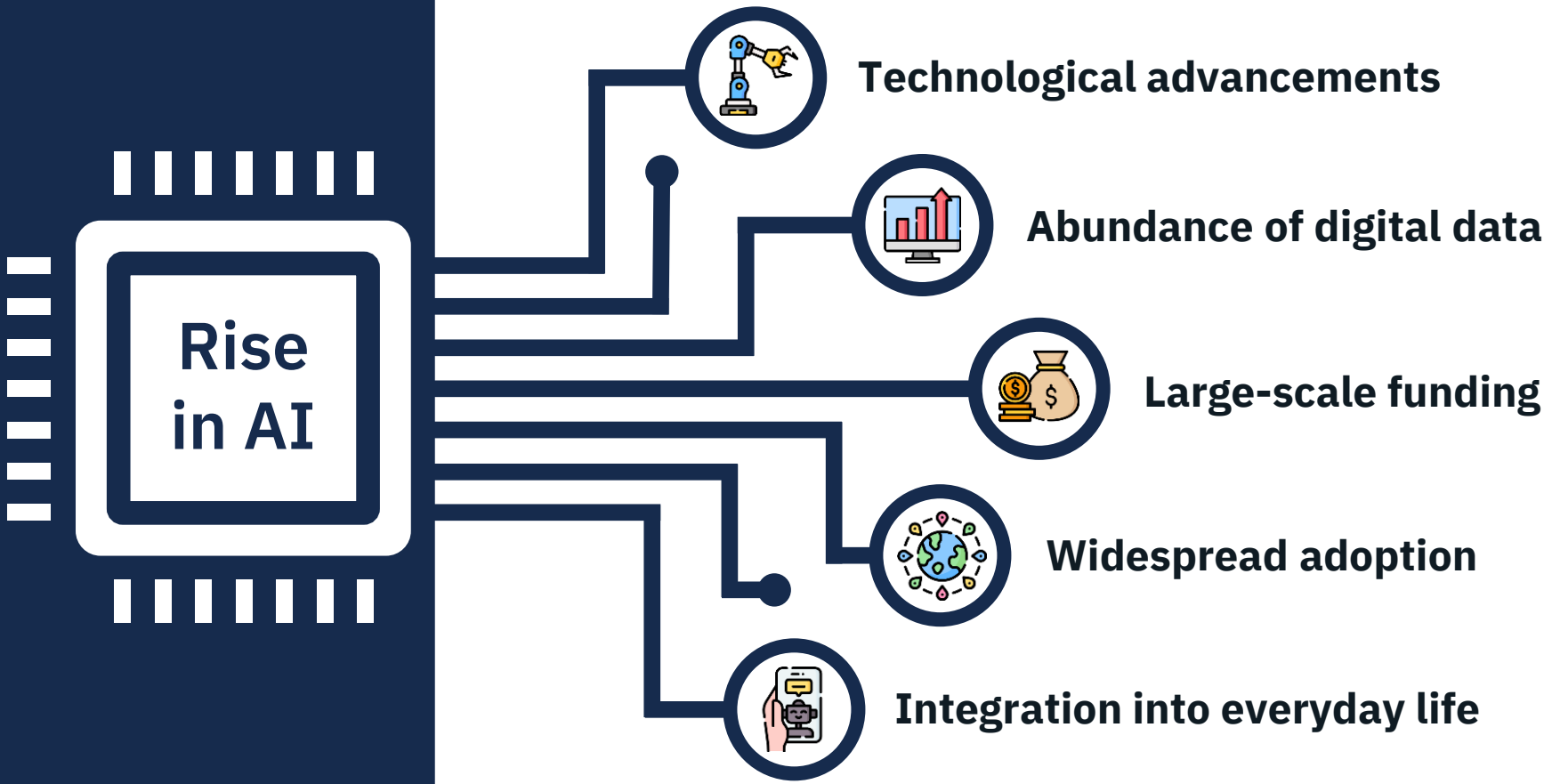

Rise in AI
Technological advancements
Abundance of digital data
Large-scale funding
Widespread adoption
Integration into everyday life

Artificial Intelligence

Term first used in **1956**

Machines or systems that mimic human intelligence

- Visual perception
- Speech recognition
- Problem solving
- Decision making

Data is the foundation of AI

Artificial Intelligence

Narrow (weak) AI

AI systems designed to perform a specific task

General (strong) AI

AI systems with human-like intelligence

Super AI

AI systems with greater-than-human intelligence

AI at the OPCW

SAB recognises data growth

October 2012

July 2017

SAB workshop on innovative technologies

SAB report to 4th Review Conference

April 2018

June 2022

OPCW and IUPAC Workshop on AI-assisted chemistry

SAB report to 5th Review Conference

February 2023

AI at the OPCW

April 2024

Director-General convenes AI expert meeting

June 2024

Keynote address at AI and WMD Conference

July 2024

Decision to establish TWG on AI

October 2024

Global Conference on AI and the Convention

December 2024

Establishment of the TWG on AI

The TWG on AI

Objectives

- Understand the impact of AI technology on the Convention
- Identify risks and opportunities for its implementation

Mandate for **1 year**

Composition of the TWG

12 External experts

3 SAB members

From academia, industry, and the armed forces

Terms of Reference

Technical focus areas


Synthesis and retrosynthesis prediction


Automated and remote synthesis and production of chemicals


Data curation, protection, and reliability


Property, spectral, and data prediction and generation


Data/sensor fusion for augmented detection and analysis


Simulation and training

Terms of Reference

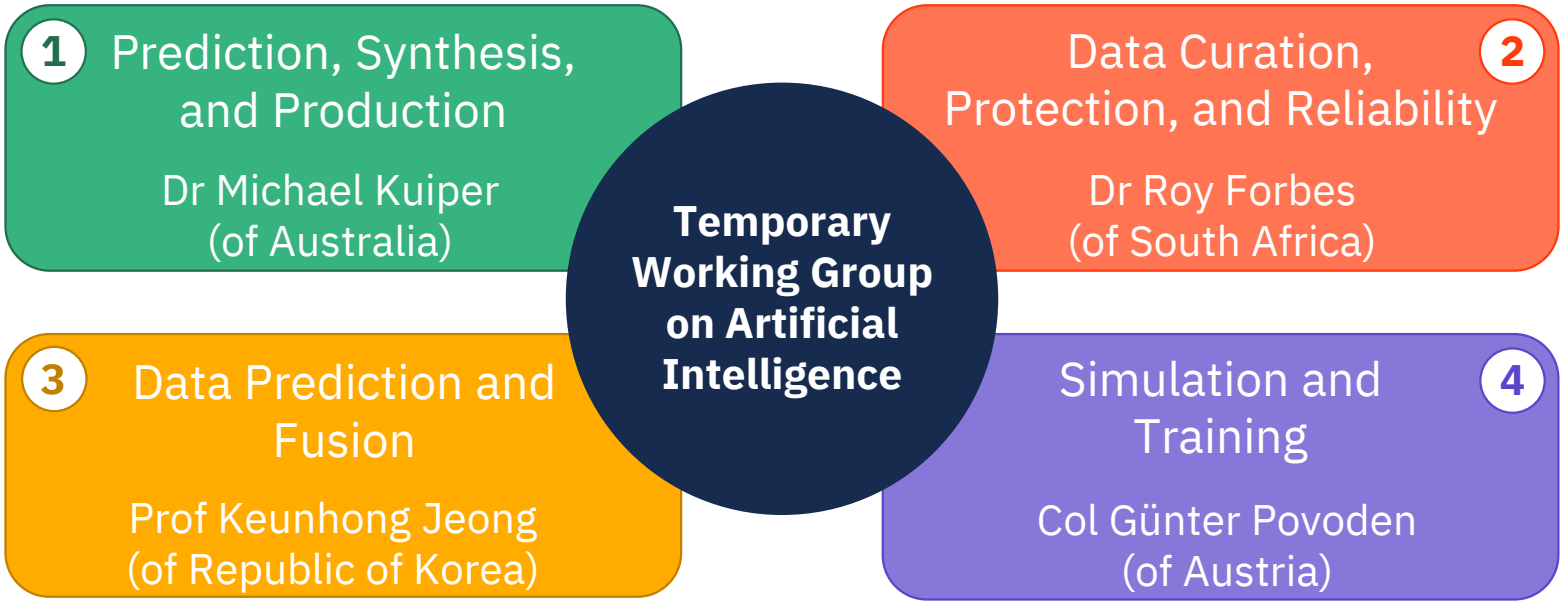
Key considerations for the implementation of **the Convention**

1. Capabilities, limitations, and challenges
2. Opportunities for the OPCW
3. Tools to augment OPCW capabilities
4. Risks and indicators of misuse
5. Governance and responsible use

The TWG assessed additional key questions

E.g. What new capabilities are being enabled, that is, what can be done now that was not possible before? Consider both opportunities and risks

Subgroups and topics

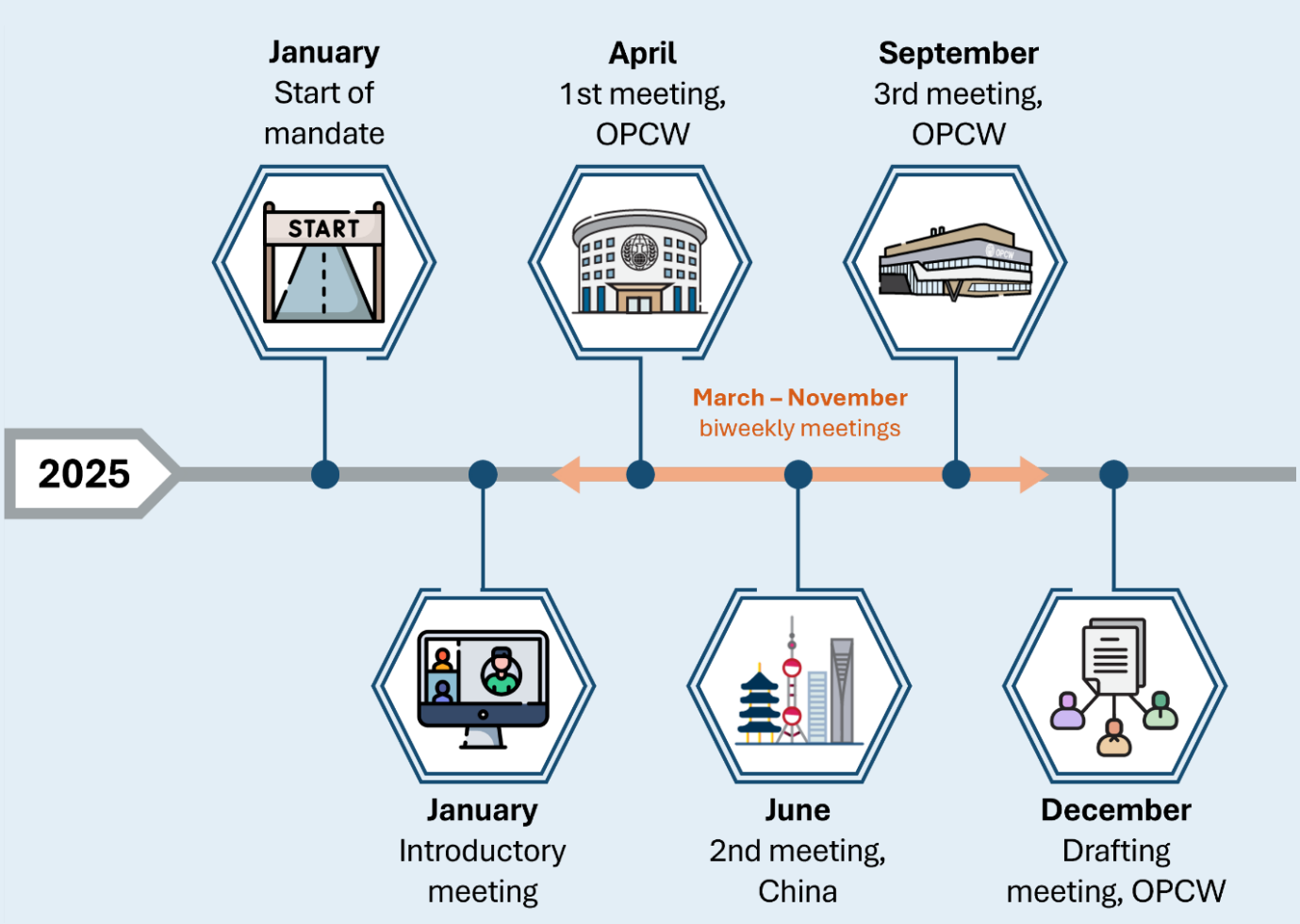


Meetings

1st meeting report

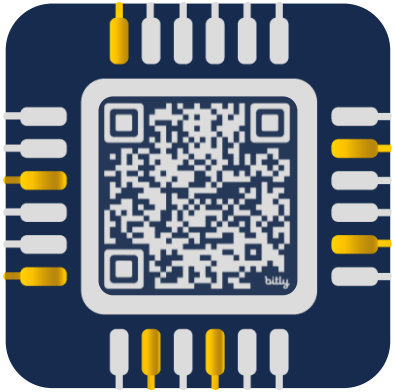
2nd meeting report

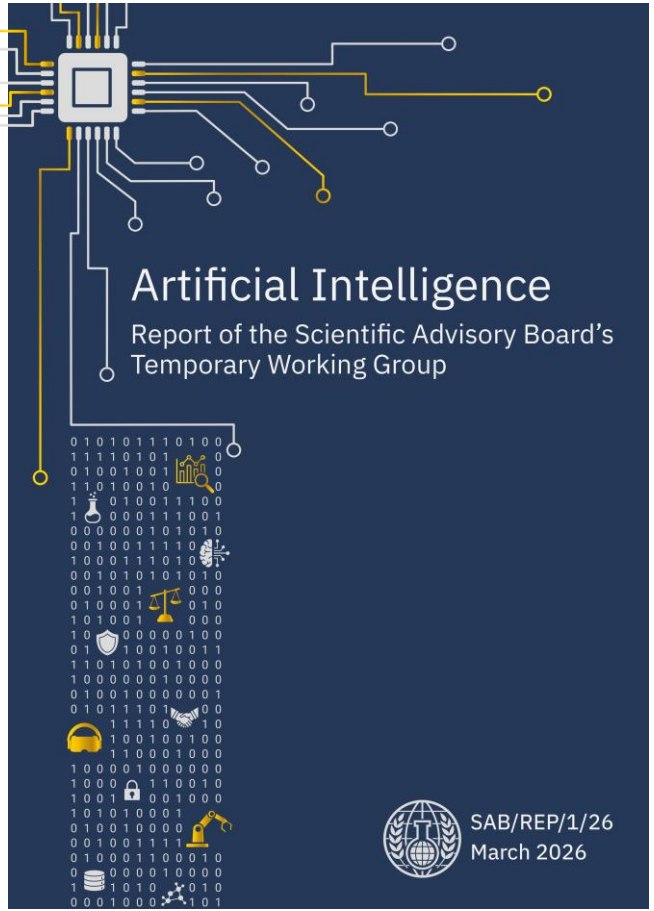
3rd meeting report



End-of-Mandate Report

Detailed findings supporting the advice and recommendations in the report





End-of-Mandate Report

Scientific impact

AI reshaping core areas of Convention-relevant chemistry

Verification enhancement

Opportunities to augment verification activities

Governance & readiness

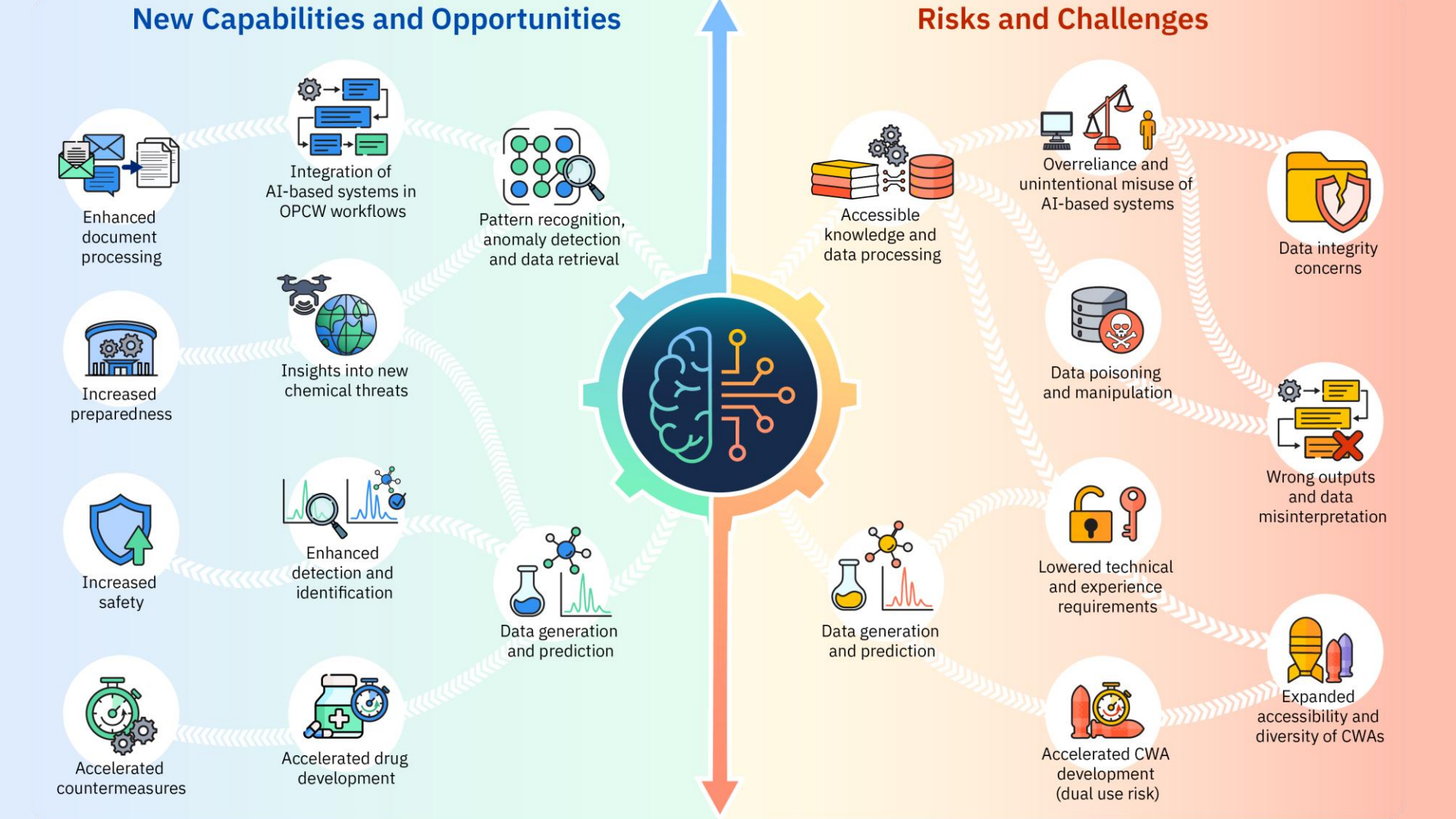
Responsible adoption requires infrastructure, expertise, and governance

Automation shift

Automation and AI-enabled laboratories may alter traditional indicators

Preparedness

Continuous monitoring and capacity-building are essential


New Capabilities and Opportunities
Risks and Challenges
Enhanced document processing
Integration of AI-based systems in OPCW workflows
Pattern recognition, anomaly detection and data retrieval
Increased preparedness
Insights into new chemical threats
Increased safety
Enhanced detection and identification
Data generation and prediction
Accelerated countermeasures
Accelerated drug development
Accessible knowledge and data processing
Overreliance and unintentional misuse of AI-based systems
Data integrity concerns
Data poisoning and manipulation
Wrong outputs and data misinterpretation
Data generation and prediction
Lowered technical and experience requirements
Expanded accessibility and diversity of CWAs
Accelerated CWA development (dual use risk)

Overview of Recommendation Core Areas

Continued monitoring

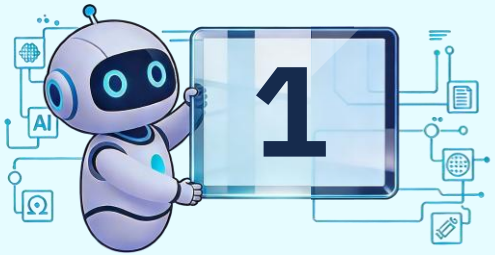
Outreach and engagement

OPCW verification activities

Organisational readiness and training

Capacity building

Continued monitoring



Establish continuous AI monitoring and foresight

- Actively track AI advances and industry trends
- Assess Convention-related risks and opportunities
- Convene expert meetings and SAB focus groups
- Conduct periodic assessments

Monitor advances in automated laboratories

- Track commercialisation of automated labs
- Engage academic and industrial developers
- Conduct assessments and exercises to review real-use cases
- Explore governance for responsible innovation

Outreach and engagement

Strengthen external engagement

- Develop links with UN and other multilateral organisations
- Strengthen cooperation with States Parties
- Engage AI ethics and safety frameworks
- Stay informed through active participation

Map and engage AI synthesis planning platform vendors

- Maintain AI synthesis planning platform vendor inventory
- Prioritise platforms with no verification process
- Raise awareness of Convention-related risks
- Promote responsible governance

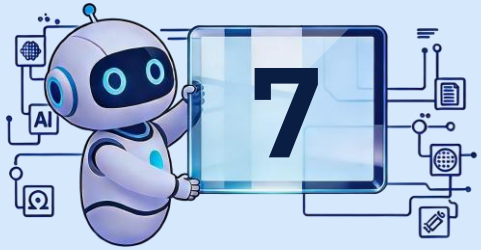
Build strategic partnerships across AI and chemistry

- Partner with AI and chemistry communities
- Engage leading publishers and journals
- Facilitate dialogue across disciplines
- Raise awareness of AI-related risks

Develop early warning indicators for AI misuse

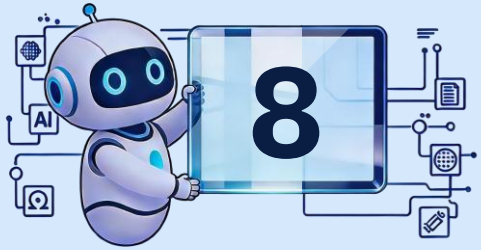
- Define misuse patterns
- Identify suspicious query behaviours
- Detect anomalous synthesis activity
- Convene workshops with State Party experts

OPCW verification activities



Modernise declarations with human-centred AI

- Digitise and translate all submissions
- Extract and structure key data
- Enable expert validation and review
- Secure, traceable, searchable database



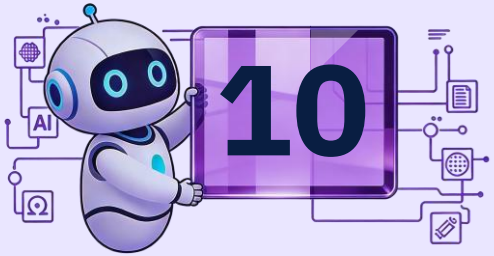
Enhance verification activities through AI integration

- Identify specific verification areas for enhancement
- Detect anomalies in declarations
- Enhance remote sensing
- Leverage open-source data mining

Augment chemical detection and identification with AI

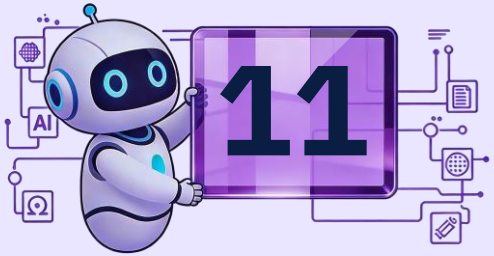
- Identify and implement suitable models
- Apply to spectral data analysis and multi-sensor fusion
- Leverage OPCW AI Research Challenge outcomes
- Collaborate with Designated Laboratories

Organisational readiness and training



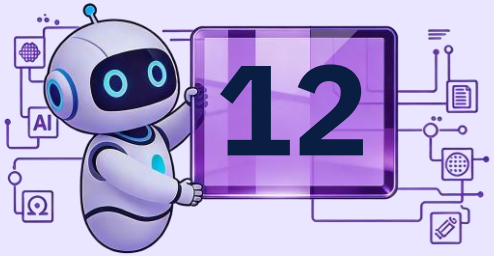
Strengthen organisational readiness through AI talent

- Recruit AI specialists
- Build internal capacity
- Reduce external dependency
- Harness AI to benefit the OPCW



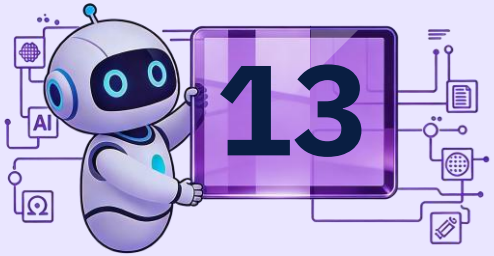
Deploy AI-enhanced extended reality training

- Develop AI-supported XR training for operational staff
- Create realistic, dynamic, equipment-integrated scenarios
- Enable instructor oversight and AI-driven evaluation
- Ensure secure, future-ready, user-configurable systems



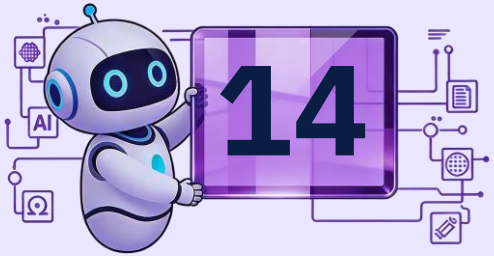
Use AI simulation for training

- Simulate chemical facilities and production process equipment
- Model incident scenarios for training relevant staff
- Leverage multimodal models for embodied intelligence systems
- Enable realistic, context-aware multimodal interactions



Deploy a secure AI assistant

- Develop a secure, air-gapped AI chatbot system
- Assist with administrative and programmatic functions
- Provide inspectors rapid access to technical information
- Ensure AI-compatible IT procurement and staff training



Use AI to explore emerging chemical threat pathways

- Explore AI-supported tools to map chemical threat space
- Use AI-driven retrosynthesis and synthesis to identify novel pathways
- Assess risks from uncontrolled or non-scheduled precursor chemicals
- Apply predictive models for spectral information and key risk properties

Capacity building

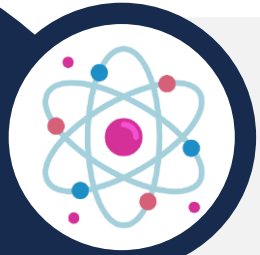
Develop an AI capacity-building programme

- Provide information on the latest AI capabilities
- Enable recognition of malicious and accidental AI misuse
- Strengthen data governance and management capabilities
- Promote safe, responsible AI use in chemical production and research

Strengthen responsible AI through strategic twinning

- Develop and establish an AI twinning initiative
- Facilitate partnerships between AI-leading and developing States Parties
- Support capacity building through training and technical assistance
- Promote shared understanding of responsible AI use and risks

Key takeaways



Science-driven, policy-neutral analysis
The TWG assessed AI from a purely scientific and technical perspective—political considerations rest with the Director-General and States Parties

Human control must remain central
AI should augment expertise, not replace it. Human-in-the-loop oversight is essential

Significant opportunity, with managed risk
AI offers clear opportunities. With the TWG's foundational assessment, the OPCW is well-positioned to harness benefits while mitigating risks

Questions?