Strategic Framework for

Artificial Intelligence at CERN

A Core Capability

2026-2030

Table of Contents

1. Purpose and Strategic Context

CERN's mission to remain a world leader in particle physics has historically driven leadership across multiple enabling technology and engineering domains, including for example cryogenics, vacuum systems, RF technologies, magnet design, superconductivity, and advanced data analysis. This document positions Artificial Intelligence (AI) within this tradition, as a capability that both supports and extends CERN's technological leadership portfolio.

This document sets out CERN's strategic approach to AI as a core organisational capability for the period 2026–2030, with relevance extending to the full lifetime of the HL-LHC and the preparation of future facilities such as the FCC. The purpose of this document is to frame AI technology within the wider scientific and organisational CERN strategy. This allows CERN to develop and use AI to safeguard and extend its scientific leadership, ensure sustainable and reliable operations, and remain an attractive and effective organisation under increasing technical, financial, and human constraints. It provides CERN management with a clear framework for prioritisation, investment, governance, and accountability.

CERN's AI Strategy is developed within the broader context of high-energy physics activities worldwide. Experiments, laboratories, and collaborations (such as EuCAIF[1] and Artifact[2]) across the HEP community are advancing the use of AI in scientific analysis, detector systems, computing, and operations. While this Strategy addresses CERN's institutional priorities and responsibilities, it is informed by, and seeks coherence with, these wider developments where they intersect with CERN's mission and infrastructure. It does not replace or subsume community-driven strategic processes but provides the organisational framework through which CERN contributes to, supports, and helps scale AI capabilities within the global HEP ecosystem and beyond.

The Strategy also recognises community-driven work on AI at CERN and prior internal coordination efforts. It consolidates long-standing work into a coherent, organisation-wide view that will guide CERN-wide action in support of priorities for 2026–2030, focusing on a limited number of critical objectives. The Strategy will focus existing sector-level AI initiatives and define cross-cutting capabilities, shared investments, and governance mechanisms required to ensure coherence, scalability, prioritisation, and long-term value from AI across the organization. The Strategy is complemented by a separate implementation roadmap and resource plan, which translate this strategic direction into sequenced actions, milestones, and resourcing proposals.

[1] https://eucaif.org/
[2] https://artifact-network.org/

2. CERN Mission Challenges and the Role of AI

CERN faces a convergence of structural challenges[3] that cannot be addressed by incremental scaling of existing approaches.

- The Organization must operate the HL-LHC at unprecedented levels of complexity, data volume, and reliability while simultaneously designing and preparing future facilities whose scale, cost, and operational demands exceed those of previous generations. The traditional model of manual-intensive operation, supervision, and optimisation does not scale to this regime.
- The scientific ambitions of current and future research programmes increasingly depend on the ability to extract rare signals from vast and complex datasets, to explore high-dimensional design spaces for detectors and accelerators, and to integrate theory, simulation, and data analysis more tightly than before. Beyond addressing scale and complexity, AI has the potential to enable qualitatively new modes of scientific discovery at CERN. By allowing exploration of high-dimensional parameter spaces, complex correlations, and emergent phenomena that are inaccessible to traditional methods, AI can open new discovery pathways and expand the range of physics questions that can be meaningfully addressed by current and future facilities.
- CERN must deliver these objectives under growing constraints on energy consumption, financial resources, and available specialised personnel. Workforce pressure, skills scarcity, and sustainability requirements are now limiting factors for scientific and technical performance.

With a systematic and coordinated approach to AI, CERN can unlock the full potential of AI-enabled science, extend its scientific reach, improve operational efficiency, and strengthen the robustness of its infrastructure.

AI-related activities at CERN have already emerged across sectors and projects in response to local needs and opportunities. While these efforts have delivered valuable results, they do not scale effectively in the absence of a coherent CERN-wide framework, and they risk duplication and fragmentation. They have also limited the coherence and visibility of CERN's contributions to external initiatives, including European AI-for-science collaborations[4] like RAISE. This Strategy addresses these limitations by providing a central framework for coordination, prioritisation, resource allocation, and shared capability development.

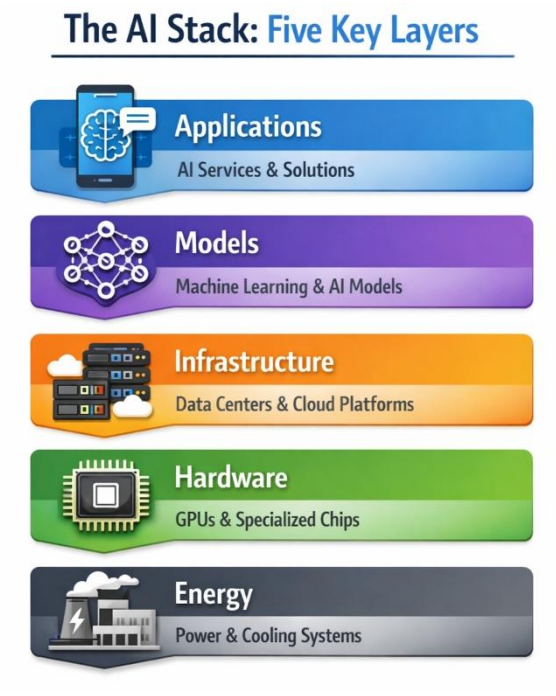
The importance of AI for particle physics has also been recognised within the European Strategy for Particle Physics (ESPP), particularly in areas such as data analysis, simulation, detector optimisation, and computing in support of the HL-LHC and future facilities. The recommendations of the European Strategy Group (ESG) on the 2026 Update of the European Strategy for Particle Physics[5] explicitly recognise AI as one of the foundational technologies

[3] The CERN Mission and Management Structure for the period 2026-2030 is summarised here: https://home.cern/news/opinion/cern/cern-management-structure-2026-2030
[4] Collaborations like RAISE follow from the European Commission's publication of their 'European AI in Science' Strategy. See: https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:52025DC0724
[5] https://cds.cern.ch/record/2950671

required for the future of particle physics, equal in importance to accelerators, detectors, and computing infrastructure. The ESG highlights AI's transformative impact today and its even greater role in future flagship projects such as the FCC-ee. The recommendations of the ESG are directly supported by this Strategy and provide an important scientific context for CERN's AI activities. The present Strategy, however, adopts a broader organisational perspective, extending beyond the scientific and technical scope addressed in the ESPP.

3. Strategic Vision and Principles for AI at CERN

CERN's vision is to establish AI as a trusted, transparent and integrated capability that not only underpins scientific discovery and operational excellence but actively enables new classes of scientific insight and breakthrough discovery at the frontiers of particle physics and large-scale research.



AI systems are often described using a layered model, sometimes referred to as a five-layer stack: energy, computing hardware, infrastructure, AI models, and applications. This Strategy explicitly recognises this model as a useful analytical framework. CERN's strategic focus lies primarily on the upper three layers of this stack: AI applications, AI models and methods, and the infrastructure required to develop and operate them at scale for CERN's mission. This includes federated use of on-premises, cloud-based, and partner computing resources, where appropriate, to support AI development and operation at scale. Where advanced computing hardware or specialised infrastructure services are not available in-house, CERN will rely on service procurement and on partnerships with external high-performance computing centres and EU initiatives, including EuroHPC, to access such capabilities in support of its mission, while selecting and operating such resources with explicit awareness of energy consumption and sustainability considerations.

In this context, sustainability refers to the environmental and operational footprint of AI systems within CERN's sphere of responsibility. This includes the energy consumption of computing workloads, optimisation of infrastructure utilisation, lifecycle management of digital assets, and the responsible selection and use of computing architectures and external resources. The lower layers of the model (hardware and energy) are critical dependencies and are addressed through procurement and partnerships, rather than in-house development.

This focus reflects CERN's role as a research infrastructure and ensures that strategic investment is concentrated where CERN creates unique scientific and operational value. In this context,

CERN both uses and develops AI. Internal development is focused on cases where CERN's scientific, technical, or operational environment requires approaches that are not readily available elsewhere and have clear differentiating value.

This implies that CERN's distinctive value in AI does not primarily lie in individual technologies, but in the scale, complexity, and integration of its scientific and operational environment. CERN operates frontier facilities that combine extreme data volumes, real-time operational constraints, long lifecycle infrastructures, and globally distributed scientific collaboration. This creates a unique setting in which AI must function simultaneously as a scientific, technical, and organisational capability. CERN can therefore make a differentiated contribution by shaping how AI is deployed, validated, governed, and scaled in large research infrastructures, and by demonstrating how AI can operate reliably in mission-critical scientific environments over multi-decade programmes.

AI deployment at CERN must demonstrably support measurable value creation and improve physics reach, operational reliability, sustainability, or organisational efficiency. AI adoption will be driven by measurable outcomes rather than technological opportunity or visibility. The Strategy is guided by the following principles:

- **AI as a core capability**. AI is treated on the same strategic level as computing, data, and engineering, not as an auxiliary or purely exploratory activity. In some cases, the development of AI methods at CERN is directly driven by scientific questions and experimental constraints, and forms part of the scientific work required to address them, rather than being limited to downstream application or tooling.
- **Innovation, long-term vision**. AI has potential to change the way scientific research is done. CERN and the high-energy physics community work on programmes often spanning periods of decades. A balance between short-term optimisation and long-term potential for breakthroughs and value creation is required to support this vision.
- **Responsibility and trust**. AI systems must be safe, scientifically reliable and explainable where required, and aligned with CERN's values, legal obligations, and reputation as a neutral scientific organisation.
- **Openness and collaboration**. CERN will favour Open Science and open-source dissemination of software and datasets in line with its established open-source governance and policies, and collaborate with Member States, European initiatives and partners, while protecting critical assets and data. CERN will support and favour initiatives and partnerships that increase return on investment for its Member States and further develop their scientific and technological competitiveness and sovereignty.
- **Selective development**. CERN will adopt and adapt mature external solutions where appropriate and concentrate internal development on areas where its scientific mission and infrastructure provide unique value.
- **Sustainability by design**. AI development and deployment must account for energy use, lifecycle cost and long-term maintainability, including the responsible selection and operation of computing architectures and hardware environments.

4. Strategic Objectives

The strategic objectives set out in this document are aligned with CERN management priorities for the 2026–2030 period and define a limited set of priority outcomes against which progress and value creation will be assessed at the level of CERN management. The strategic objectives are:

1. **Strengthen scientific discovery** through AI-enabled analysis, data processing, simulation, and design, enabling both measurable gains in physics reach, sensitivity, and time-to-result, and the exploration of new discovery regimes and scientific questions that are otherwise inaccessible with traditional methods. AI can also support theoretical work by enabling new forms of model exploration, interpretation, and hypothesis testing, complementing traditional analytical and computational approaches.

2. **Increase operational reliability, efficiency, and sustainability** by embedding AI in accelerator, detector, and infrastructure operations as well as administrative processes, thus reducing unplanned downtime, energy consumption, and manual intervention.

3. **Establish a coherent CERN-wide AI capability**, including shared infrastructure, tools, data readiness, technical competences and governance, reducing duplication and enabling scale.

4. **Build and retain critical AI-related skills** across CERN, ensuring ubiquitous access for all personnel so that they can effectively and responsibly use AI in scientific, technical, and administrative roles. This requires proactive talent acquisition and retention, and strengthening CERN's role as an environment that attracts, develops, and inspires future generations of scientists, engineers, and innovators aligned with its mission. It also includes the ability to understand the limitations, risks, and appropriate use of AI systems in different contexts, and to maintain trust in their application across the Organisation.

5. **Position CERN as a credible and effective partner in the European AI-for-science landscape**, enabling access to shared infrastructures, funding, and expertise while contributing to societal and industrial impact. This includes contributing knowledge, reference use cases, and expertise that support wider scientific, societal, and industrial benefit, consistent with CERN's role and mandate.

These objectives define what success looks like for CERN. They are not additive ambitions: progress in AI is expected to replace, simplify, or retire existing approaches where appropriate, rather than increasing overall workload or organisational complexity. AI adoption is also expected to progressively reshape roles, workflows, and organisational processes. While some repetitive or routine expert tasks may diminish, new responsibilities will emerge in oversight, validation, exception handling, and system governance. This evolution requires proactive workforce planning, role evaluation, and change management to ensure that CERN's organisational capabilities evolve in step with technological adoption. Subsequent sections describe how these objectives will be enabled, governed, and delivered.

5. AI as a Scientific Enabler

AI-enabled scientific activity at CERN is explicitly prioritised according to CERN's overarching scientific programme. Support for the delivery and full exploitation of the HL-LHC takes precedence, followed by AI contributions that enable and accelerate the feasibility of future facilities and research objectives. AI also has the potential to reshape how scientific work is conducted, augmenting researchers' capabilities and supporting new modes of inquiry and experimentation. Exploratory scientific AI work therefore remains essential, as some of the most significant scientific advances enabled by AI are expected to emerge from sustained exploration of approaches whose impact cannot be fully predicted in advance.

For current and future experiments, AI enables a step change in how data is processed, interpreted, and exploited. HL-LHC and successor facilities generate data volumes and complexity beyond traditional analysis and simulation approaches. AI will allow CERN to extract rare signals from large backgrounds, accelerate simulation and reconstruction chains, and integrate theory, data, and experiment more tightly. These capabilities directly translate into increased physics reach, faster turnaround from data to results, and more effective use of experimental running time.

Beyond data analysis, AI is increasingly central to the design of detectors and accelerators. Design spaces are high-dimensional, non-linear, and constrained by competing performance, cost, and operational criteria. AI-assisted optimisation and surrogate modelling (Digital Twins) enable exploration of design options that are inaccessible through manual or purely simulation-based approaches. Embedding these methods early in the design cycle reduces development time, improves performance margins, and creates a direct link between design assumptions and operational behaviour.

AI must therefore be institutionalised as a scientific capability, comparable in importance to detector and accelerator R&D, computing, and theoretical modelling. This institutionalisation is critical not only for efficiency and scale, but to ensure that AI can be systematically used as a driver of scientific breakthroughs. This does not imply uniform solutions or centralised control of detailed research directions. It requires that CERN provides shared infrastructure, common frameworks, and long-term support so that scientific teams can deploy AI methods reliably, reproducibly, and at scale.

Scientific use of AI must also meet CERN's standards of scientific integrity. Models must be validated, uncertainty must be understood, and results must be interpretable where required. In high-stakes contexts, explainability and physics-informed approaches are essential to ensure trust, reproducibility, and acceptance by the scientific community. In practical terms, CERN's role is to:

- Enable AI-based analysis, simulation, and modelling that demonstrably improves physics sensitivity or reduces time-to-result.
- Support AI-driven design and optimisation of detectors and accelerators for current upgrades and future facilities.

- Provide shared scientific AI infrastructure and services that avoid duplication and lower the barrier to entry for experiments and theory groups.
- Ensure that AI methods used in science are validated, reproducible, and aligned with CERN's standards of openness and scientific rigour.

Success in this area is measured not by the number of AI projects, but by their impact on scientific output, design efficiency, and CERN's ability to deliver its physics programme under increasing complexity.

6. AI as an Operational and Organisational Enabler

Operational AI initiatives are prioritised by balancing near-term operational needs with mid- to long-term strategic investment, in the acknowledgement that AI will initially compete for resources and personnel but will generate measurable efficiency, performance, and organisational benefits over time especially as part of a conscious process optimisation strategy.

Accelerator and detector systems are growing in complexity, infrastructure is ageing while being pushed to higher performance, and operational expectations are rising in parallel with constraints on sustainability, budget, and specialised personnel. AI enables CERN to maintain reliability, efficiency, and safety without unsustainable growth in operational effort. It allows a shift from reactive and manual-intensive operations towards predictive, assisted, and increasingly autonomous modes of operation. Representative approaches may include predictive models, system-level simulations, and digital representations of complex assets, without prescribing specific methods or technologies. This directly reduces unplanned downtime, improves asset utilisation, and increases the robustness of CERN's facilities.

A central aim is to embed AI into operations in a way that scales across the Organization. CERN must prioritise shared operational AI capabilities, including common data readiness, interoperable systems, and centrally supported platforms, while allowing local teams to adapt them responsibly to specific contexts. AI also has a critical role in improving organisational efficiency beyond technical systems. Engineering, administrative and support functions face growing workloads and complexity. Appropriately governed AI tools can reduce repetitive tasks, improve access to organisational knowledge, and shorten decision and execution cycles. In administrative and support functions, the effective use of AI is primarily a question of governance, trust, organisational change, and human skills rather than the deployment of individual tools or technologies.

Operational use of AI must meet stringent requirements for safety, reliability, sustainability, and accountability. In safety-critical environments, AI systems must operate with human oversight, clear escalation paths, and well-defined failure modes. Explainable and trustworthy AI is required for deployment in accelerator controls, infrastructure management, and other critical systems. CERN's operational and organisational priorities for AI are to:

- Improve reliability and availability of accelerators, detectors, and infrastructure through predictive and AI-assisted operations.
- Reduce operational cost and manual workload while maintaining or improving performance, safety and sustainability.
- Establish shared, CERN-wide operational AI capabilities that scale across systems and departments.
- Enable responsible use of AI in administrative and support functions to improve organisational effectiveness.
- Ensure that all operational AI deployments comply with CERN's safety, security, sustainability, and governance requirements.

Success in this area is measured by improved uptime, reduced energy and operational costs, increased efficiency of personnel, and sustained trust in the safety and reliability of CERN's operations. A further success criterion is the measurable reduction of pressure on personnel and users, enabling focus on core scientific, technical, and administrative tasks.

7. AI as an Impact and Collaboration Enabler

CERN's AI activities will be developed in close collaboration with Member States, EU initiatives, and industrial partners to ensure access to expertise, infrastructure, and resources, and to strengthen leadership in AI-enabled science. In parallel, CERN will translate AI capabilities developed for high-energy physics into applications addressing societal and industrial challenges, generating socio-economic impact.

CERN will use AI-enabled science and technology to inspire and train future generations of scientists and engineers, integrating AI into education, training, and outreach linked to its research mission.

AI capability development will maximise long-term value for Member States and institutional stakeholders through balanced industrial participation, knowledge transfer and return on public investment, consistent with CERN governance principles. These capabilities will also feed into Europe's deep-tech innovation ecosystem, supporting startup creation and scaling in line with EU technological leadership ambitions, while reinforcing measurable return to Member States and the value of public investment in frontier research.

In engaging with European partners, CERN takes account of the strategic directions of its Member States and contributes to strengthening European scientific and technological capabilities, competitiveness and sovereignty in AI through collaboration and shared infrastructure. CERN's engagement in the European AI landscape takes place alongside established EU flagship initiatives and national AI innovation hubs in AI for science and research infrastructures, including initiatives led by the European Commission (EC) and by other European research organisations. Where appropriate, CERN seeks complementarity and coherence with such initiatives, contributing its unique large-scale research environment and scientific expertise while avoiding

duplication and preserving focus on its core mission. Engagement with European AI-for-science initiatives is pursued proactively and at an early stage, to ensure coherence with CERN's priorities and timely contribution where CERN can add unique value.

While not subject to European Union policy or regulatory frameworks, CERN recognises the importance of EU AI policy priorities where they intersect with scientific research, large-scale research infrastructures, and the responsible development and use of advanced technologies. In this context, CERN seeks active collaboration with the EC and with partner organisations across Europe, including research infrastructures, universities, laboratories, and industry, where such collaboration creates shared value. CERN contributes scientific expertise, operational experience from large-scale research environments, and reference use cases for trustworthy AI in science, while benefiting from alignment, coordination, and joint learning at European level. Engagement is therefore based on mutual interest and reciprocity, supporting both CERN's mission and the achievement of European objectives, while preserving CERN's autonomy over its mission, governance, and technical choices.

CERN's impact and collaboration priorities for AI are to:

- Develop AI activities in close collaboration with CERN Member States, European initiatives, and industrial partners to ensure access to expertise, large-scale infrastructure, and sustainable resources, reinforcing leadership in AI-enabled science.
- Translate AI capabilities developed for high-energy physics into applications addressing societal and industrial challenges, generating measurable socio-economic impact and return on public investment.
- Use AI-enabled science and technology to train and inspire future generations of scientists and engineers by integrating AI into education, training, and outreach activities aligned with CERN's research mission.
- Engage proactively with European flagship initiatives, AI-for-science programmes, and national innovation hubs, ensuring coherence, complementarity, and early alignment while avoiding duplication and preserving focus on CERN's core mission.
- Contribute to Europe's deep-tech innovation ecosystem through balanced industrial participation, knowledge transfer, and support for startup creation and scaling, maximising long-term value for Member States and institutional stakeholders.

8. Decision Framework and Accountability

AI governance and decision-making at CERN are aligned with the Organisation's management principles and with the role of the CIO as a strategic, coordinating, and enabling function. The governance model for AI is based on the principle of freedom in a framework. Under this model, responsibility for scientific direction, operational execution, and local implementation of AI-enabled solutions remains with the departments, experiments, and services. CERN-wide governance does not prescribe research directions, operational choices, or specific technologies. Instead, it defines the shared principles, priorities, interfaces, and decision

mechanisms that enable local autonomy while avoiding fragmentation, unmanaged risk, or duplication of effort. The role of CERN management is to establish and maintain this enabling framework. This includes:

- Endorsing AI as a core organisational capability and strategic enabler for CERN's mission.
- Setting CERN-wide priorities for shared AI capabilities, infrastructure, partnerships, and governance and make appropriate resources available.
- Mandating and overseeing the establishment and maintenance of the AI governance and coordination mechanisms defined in this Strategy in alignment with CERN's mission and objectives.
- Reviewing progress, risks, and value creation.

The CIO, acting under the mandate defined by CERN management, is responsible for steering and coordinating the implementation of the AI Strategy. This includes defining and maintaining CERN-wide AI governance mechanisms, facilitating cross-organisational coordination, and ensuring coherence with CERN's broader digital and ICT strategy. Governance of AI at CERN is implemented through dedicated management and coordination bodies, including the CIO-level C4[6] board and the AI Technical Committee, to provide structured channels for coordination, prioritisation, risk assessment, and knowledge sharing, while maintaining transparency and clear accountability.

9. Resource Allocation and Prioritisation Principles

Resource allocation for AI explicitly reflects CERN's programme priorities. Initiatives that support the timely delivery and achievement of the highest-priority objectives are favoured. Activities that cannot be reconciled with these priorities may be postponed, scaled down, or discontinued. In the context of finite resources, this Strategy sets out clear principles to support informed prioritisation of AI-related investments. AI initiatives will be prioritised based on:

- Demonstrable contribution to CERN's scientific mission or operational reliability.
- Potential for reuse, scale, and cross-organisational benefit.
- Alignment with CERN's sustainability, safety, and governance requirements.
- Long-term maintainability and total cost of ownership.
- Potential for creating wider socio-economic return to Member States.
- Shared infrastructure, platforms, and capabilities that enable multiple use cases take precedence over isolated or duplicative solutions.

[6] C4 stands for CIO Community for Collaboration and Coordination; it is the main steering body of the CIO Community. The C4 is chaired by the CIO and membership is at Head of Department level.

Not all proposed AI initiatives may be funded, irrespective of whether the funding would come from internal or external sources. Decisions will explicitly balance expected value, risk, and resource availability. Where possible and feasible, AI capabilities available in existing CERN solutions should be leveraged, thus maximizing return on investment.

10. Risks, Experimentation, and Failure Tolerance

AI adoption necessarily involves uncertainty, experimentation, and long development horizons. CERN recognises that transformative advances in AI-enabled science and research infrastructures will require sustained exploration of high-risk, high-reward approaches, and that meaningful scientific breakthroughs may emerge only through iterative experimentation over extended timescales. Exploratory and experimental use of AI is actively encouraged across scientific research, technical prototyping, and organisational domains, including administrative processes and operational optimisation. CERN therefore maintains a balanced risk posture that both enables transformative innovation and protects safety, reputation, and operational continuity. All exploratory activity must remain consistent with CERN's governance and ethical frameworks, but these frameworks are intended to enable responsible innovation rather than constrain it.

Deployment in safety-critical or mission-critical systems is subject to strict validation requirements, mandatory human oversight, and clearly defined escalation and failure modes. These boundaries are non-negotiable and reflect CERN's institutional responsibility as a large-scale research infrastructure operating complex technical system. This applies equally to scientific, technical, and administrative AI applications. Failure is acceptable where it is contained, analysed, and used to inform improvement, particularly in experimental domains where learning emerges through iteration. Acceptance and management of this form of scientific and technological risk is essential if AI is to fulfil its potential as a driver of breakthrough discovery, rather than being limited to incremental optimisation of existing approaches. Failure is not acceptable where it compromises safety, scientific integrity, organisational trust, or institutional reputation.

11. Review, Adaptation, and Strategy Lifecycle

This Strategy is designed to remain relevant in a rapidly evolving technological and organisational landscape. It will therefore be subject to regular review. Implementation of this Strategy will include the definition of milestones, success criteria, and reporting mechanisms aligned with its strategic objectives, enabling regular review of progress, impact, and risk by CERN management. This ensures that the Strategy remains aligned with CERN's mission, management priorities, and the evolving European and global context. CERN management will review the Strategy at defined intervals to:

- Assess progress against strategic objectives and outcomes.

- Adjust priorities in response to scientific needs, technological developments, and resource constraints.
- Retire, revise, or introduce objectives and governance mechanisms as required.

Where competing priorities or trade-offs arise, resolution is the responsibility of CERN management, guided by the strategic objectives and prioritisation principles set out in this Strategy.

12. CERN AI Strategy at a Glance

Our Vision

is to establish AI as a trusted, transparent, and integral capability that not only underpins scientific discovery and operational excellence but actively enables new classes of scientific insight and breakthrough discovery at the frontiers of particle physics and large-scale research.

Our Goals and Objectives:

1 AI as a Scientific Enabler

Excel in AI that prioritises HL-LHC and future facilities, extends scientific reach, accelerates discovery, design, data exploitation, and overall physics impact.

- 1.1 Focus AI efforts on maximising the physics reach of the HL-LHC and enabling research goals at current and future facilities.
- 1.2 Use AI to accelerate data processing, improve signal extraction, and optimise detector and accelerator design and operation across the scientific lifecycle.
- 1.3 Establish shared infrastructure, frameworks, and long-term support so AI is a core, scalable scientific capability at CERN.
- 1.4 Deploy validated, reproducible, and interpretable AI methods aligned with CERN's standards of openness and rigour.

2 AI as an Operational and Organisational Enabler

Embrace strategically governed, safety-critical AI that scales, to improve reliability, efficiency, sustainability, and effectiveness.

- 2.1 Use predictive and AI-assisted operations to increase availability, reduce downtime, and manage growing system complexity safely.
- 2.2 Implement shared, interoperable, CERN-wide AI platforms that support both technical systems and administrative functions.
- 2.3 Leverage AI to reduce operational cost and manual workload, and improve sustainability while maintaining or improving performance.
- 2.4 Apply strong governance, human oversight, and explainable AI to meet safety, security, and sustainability requirements.

3 AI as an Impact and Collaboration Enabler

Champion international leadership in AI-enabled science, generating societal impact, innovation, and skills for future generations.

- 3.1 Work closely with Member States, Europe, and industry to strengthen CERN's leadership in AI-enabled science.
- 3.2 Translate AI advances from high-energy physics into societal, industrial, and innovation outcomes, ensuring return on public investment.
- 3.3 Integrate AI into education, training, and outreach to train and inspire future scientists, engineers and administrators.
- 3.4 Contribute to Member State and European deep-tech and AI-for-science initiatives through knowledge transfer, industrial participation, and startup creation.

Everything we do is guided by the following principles:

AI as a core capability	We place AI on the same strategic level as computing, data, and engineering.
Innovation and long-term vision	We balance immediate optimisation and sustained exploratory AI research to enable future scientific breakthroughs.
Responsibility and trust	We deploy AI systems that are safe, scientifically reliable, explainable where required, and aligned with CERN's values, legal obligations, and neutrality.
Openness and collaboration	We advance Open Science while collaborating with Member States, Europe, and industry.
Selective development	We adopt mature external solutions where suitable and focus internal effort where CERN's mission and infrastructure provide unique value.
Sustainability by design	We are mindful of energy use, lifecycle costs, and long-term maintainability in all AI development and deployment decisions.

CERN
CH-1211 Geneva, Switzerland
Office of the Chief Information Officer
https://cio.cern.ch/