AI for Society

Strategy 2024–2028

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We are at the dawn of an era where Artificial Intelligence (AI) is redefining our relationship with technology, and shaping the future of industries, communities and individuals. This pervasive technology presents us with both new opportunities and new challenges. By embracing AI responsibly, we can address global challenges, foster innovation, and create a more prosperous, secure, equitable and sustainable world.

Idiap is a research institute, recognized as of national importance by the Swiss Federal Government, that engages in research, education and technology transfer. Since its foundation in 1991 as the *Institut Dalle Molle d'Intelligence Artificielle Perceptive*, Idiap has been actively contributing to the field of AI. The Institute fills a unique niche for interdisciplinary research and offers a complete value chain from the creation of scientific knowledge to innovation. The distinctive structure of the Institute, bringing together diverse research groups with in-depth disciplinary expertise under a single roof, makes Idiap an ideal partner for projects addressing multifaceted research questions.

This document, which has been created collectively at Idiap, presents our strategy for the period 2024-2028 to bring into play the transformative power of AI. Our ambition is to reinforce the position of Idiap as a leader in key research areas of AI and to build on its unique strengths to positively impact the economy, society and the environment. This strategy emphasizes the ethical and responsible development and deployment of AI, ensuring that its benefits are equitably distributed and that potential risks are mitigated.

The successful implementation of this strategy relies on the support of our main funders: the Swiss Confederation, the Canton Valais and the city of Martigny; the founding members: EPFL, University of Geneva and Swisscom, as well as our national and international collaborators. Their commitment is key to driving progress and ensuring that we maintain the capacity to support the needs and aspirations of society. Along this journey, we remain committed to the principles of ethics, responsibility and transparency, ensuring that AI serves as a force for good in the years to come.

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Professor Andrea Cavallaro
Director, Idiap Research Institute

Objectives

We envision a future where AI **empowers** people, strengthens communities, and protects our planet; a future where AI contributes to a brighter world for all. Idiap's expertise and agility make it an indispensable partner for shaping the global AI landscape and positioning Switzerland internationally, and addressing societal challenges through innovative AI solutions.

During the 2024–2028 period, Idiap will prioritize the following key **challenges:**

Understand the best ways for society and individuals to **interact** with AI systems to ensure beneficial outcomes and a sustainable future for humans.

Reinforce **trust** in digital infrastructures and services by leveraging secure and privacy-preserving technologies.

Strengthen national expertise and technological **leadership** in AI through knowledge dissemination and technology transfer initiatives.

To effectively tackle the aforementioned challenges, Idiap will

- Undertake transformative research and advance knowledge creation and technology transfer via four **research programs.**
- **Diversify** funding sources by balancing competitive research grants and direct industry funding.
- Establish a **research platform** to foster engagement with stakeholders.
- Strengthen national research **collaborations.**
- **Train** the next generation of leaders in AI.
- Engage its **alumni** network in research, innovation and outreach activities.

To achieve these objectives, Idiap will leverage its deep expertise in diverse AI domains and focus its efforts on three **impact scales:**

- **Locally,** to support and anticipate specific needs by working with companies, communities, city and cantonal governments. Our research, innovation and educational activities will help developing the local economy and services in the area of AI. These activities will impact a range of organizations from health to energy sectors, and will offer cutting-edge knowledge to small and medium businesses in the region.

- **Nationally,** to continue leading and contributing to fundamental scientific projects within and across disciplines, advancing the state of the art of AI for Society, and engaging in a dialogue with both specialists and the general public around the opportunities and risks of AI development.

- **Internationally,** to continue attracting global talent, to maintain close scientific links with top-tier international organizations, and to produce knowledge and research outcomes disseminated through open-science scientific articles, code and data.

In its endeavors to achieve the objectives outlined in this strategy document, Idiap is committed to responsible AI development, and consistently adheres to the **10 UNESCO ethical principles for AI**[1]:

1. Proportionality & do no harm
2. Safety & security
3. Right to privacy & data protection
4. Multi-stakeholder, adaptive governance & collaboration
5. Responsibility & accountability
6. Transparency & explainability
7. Human oversight & determination
8. Sustainability
9. Awareness & literacy
10. Fairness & non-discrimination

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[1]https://www.unesco.org/en/artificial-intelligence/recommendation-ethics

Research Programs

Idiap, which occupies a **unique** position in the Swiss research landscape, fosters interdisciplinary knowledge creation and transfer, and complements other research and educational institutions. The Institute has expertise recognized worldwide in a range of AI disciplines, including natural language processing, speech and audio processing, imaging and computer vision, biometrics and forensics, social computing, human-robot interaction, bioinformatics and health informatics, machine learning, signal processing, and multimodal processing of text, speech, images, video and mobile data.

In 2023, Idiap created long-term **research programs** that reflect Idiap's commitment to four strategic directions for the coming decade. The programs are designed to address critical societal challenges and leverage AI for the benefit of society.

The programs are:

Human-AI Teaming, which develops innovative AI solutions that empower people to work effectively with AI systems, fostering human-AI collaboration and co-creation.

Sustainable and Resilient Societies, which develops solutions to anticipate and mitigate future disruptions, foster sustainable societies, and combat disinformation.

AI for Life, which harnesses AI to advance biological understanding, develop personalized medicine, and improve health outcomes.

AI for Everyone, which fosters inclusive AI development and empowers people from all walks of life to contribute to and benefit from AI solutions.

These four programs are intrinsically cross-disciplinary, require a coherent integration of expertise across research groups, and reflect areas in which Idiap already has significant leadership. The activities carried out across the programs will result in the creation of knowledge, presenting multiple opportunities for targeted innovation.

Human-AI Teaming

The *Human-AI Teaming* research program investigates human-AI collaboration by designing **natural multimodal and multilingual interfaces** that seamlessly enable humans and AI systems to communicate, collaborate, and innovate. These interfaces transcend traditional communication modalities, incorporating auditory, visual, textual, gestural, and haptic interactions to create an intuitive experience. The program's overarching goals are to expand human capabilities, mitigate cognitive limitations, foster creativity and collaboration, and drive scientific and technological advancements. Beyond enabling one-to-one turn-taking interactions, we envision complex scenarios where humans and AI systems work seamlessly together to make decisions and solve problems.

This research program leverages Idiap's established expertise in **multimodal interaction** and its unique capability to conduct in-depth multidisciplinary research encompassing verbal and nonverbal communication, language processing, perceptual and cognitive systems, and human-robot interaction. This includes machine understanding of human intentions, motivations, and emotions, and integrating explainable, auditable, and editable knowledge into computational models. The research undertaken in this program enhances the ability of machines to sense and understand human activities, improve information access by creating virtual services that function as on-demand experts, harness human feedback to refine learning systems, and deploy robots to aid humans in daily tasks at the workplace and in domestic settings.

We investigate novel AI systems like conversational interfaces and social robots to **provide adaptive and personalized assistance to humans.** These systems will seamlessly adapt to their physical embodiments, ranging from personal assistants to industrial helpers and medical companions.

Sustainable & Resilient Societies

The *Sustainable and Resilient Societies* research program supports the development of solutions to **anticipate** and help **mitigate** the effects of **future disruptions**, including wars, pandemics, and climate events. These disruptions impact global commodity supplies and exacerbates geopolitical tensions. The program proposes solutions for transformative changes for the creation of sustainable and resilient societies.

This research program develops models to analyze and synthesize evidence from **heterogeneous sources**, including images, videos, speech, and text, to effectively predict technological, natural, and geopolitical threats. We explore data acquisition strategies and optimal sensing chains tailored for efficient AI methods that operate with minimal energy and computational resources, enabling deployment on low-cost sensors and embedded devices.

We create and continuously adapt AI systems for automatically analyzing and combining evidence to **tackle ever-evolving disinformation.** To achieve these goals, we foster collaboration among computer scientists, physicists, political scientists, and legal experts, leveraging their expertise to gain a deeper understanding of emerging harmful processes, predict their evolution, and provide evidence-based measures to mitigate the associated risks.

We develop **predictive models** that identify relationships for decision-making. These models will be validated on real-world regional-scale problems, such as predicting energy consumption in the power grids of Canton Valais. We will, moreover, deploy these models on a larger scale to ensure sustainability of processes across the supply chain. We will explore solutions utilizing time-varying indicators, while striving for the sustainability and efficiency of AI technologies themselves.

AI for Life

Through the *AI for Life* research program, we aim to gain a deeper understanding of **living organisms**, both healthy and affected by complex diseases. We develop novel technologies to facilitate disease diagnosis and treatment, and empower patients, healthcare professionals, and caregivers in their daily lives. This program uses advanced learning and inference methodologies to seamlessly integrate multifaceted, longitudinal, and interventional data, alongside expert knowledge. Through collaborations with clinicians and healthcare companies, we improve the comprehension of biological processes, including diseases and treatment mechanisms, paving the way for assistive technologies that enhanced quality of life.

We collaboratively develop AI models and frameworks that **empower domain experts** in the biosciences to uncover, postulate, and validate the mechanisms driving diseases such as cancer or neurodegenerative conditions, mental health disorders, and rare diseases.

To facilitate the development of **personalized, inclusive, and localized medicine**, we create AI methods that seamlessly integrate information-rich data generated daily by individuals with existing knowledge and datasets, enabling the assessment of behavioral impact, prediction and monitoring of the effects of specific interventions (physical and mental health; environment) or disease progression.

We develop innovative **assistive technologies** that leverage community knowledge and continuously gathered data to foster patient support, enhance comprehensive care, and reduce patient isolation. This research also tackles the communication barriers caused by disabilities, suboptimal communication channels, language differences, and cultural diversity.

The outcomes of this research program will equip clinicians and patients with a more refined and continuous understanding of the impact of interventions on an individual level. By **empowering people with their own data**, research in this program will bridge knowledge gaps in disease understanding and generate compelling evidence for novel therapeutic approaches.

AI for Everyone

The *AI for Everyone* research program aims to **ensure that AI benefits all people**, irrespective of their background or circumstances. To achieve this vision, people are placed at the forefront of AI development and deployment. This program helps mitigate inequities associated with AI by enhancing its accessibility and improving its design to cater to the needs of everyone.

This research program establishes methods for **designing AI systems in collaboration with people**, develop interactive methods and platforms for participatory AI design and deployment, introduce novel data sampling and machine learning techniques that effectively harness data from both majority and minority populations, and cultivate sustainable communities of stakeholders that are locally rooted yet globally connected. These communities encompass people keen to participate in the design and active utilization of AI for a multitude of purposes, including members of minority communities, such as people with disabilities.

This program embraces a participatory approach that **empowers people** to co-design and use AI algorithms throughout the entire AI development cycle. It fosters collaboration with diverse groups of people to address real-world needs, shifting the paradigm from treating people as mere users towards recognizing their role as active participants.

We strive to enhance the potential of **inclusive public discourse** by introducing advancements in opinion summarization, opinion prediction, collaborative filtering, collective decision-making and electronic voting. While conventional voting systems convey limited information, we envision a future where societies embrace AI as a fair, open, and interpretable tool under their control, empowering citizens to actively engage in collaborative problem solving and contribute to societal progress.

Research Centers

Idiap's research centers bring together the expertise of multiple principal investigators and associated research infrastructure to consolidate a critical mass of expertise in key areas of research and development, enabling the delivery of impactful outcomes and attracting collaborators from industry.

Capitalizing on the success of the **Center for Biometrics Research and Testing** and leveraging existing collaborations, Idiap launched three new centers in 2023:

Center for AI Certification, to provide research expertise and services to a diverse range of stakeholders, including the Swiss Confederation.

Center for Assistive Robotics, which leverages Idiap's expertise in human-robot interaction to address specific industrial and societal challenges.

Center for Participatory AI, which capitalizes on Idiap's established track record of collaborative AI development with diverse stakeholders.

The scope of these centers is detailed in the following sections.

Center for Biometrics Research and Testing

The *Center for Biometrics Research and Testing* provides expert biometric security **evaluation and testing services** to industry, government agencies, and non-governmental organizations. Established in 2013 by the Canton of Valais and the City of Martigny, the center arose from the foresight of Idiap's researchers, anticipating the growing demand for expertise in biometric certification and legal compliance. The center's accreditation by the FIDO Alliance, an industry association dedicated to developing and promoting authentication standards, further underscores its commitment to maintaining the highest level of quality in technology evaluation.

The center stands at the forefront of **security, privacy, and identity science technologies**, expanding its expertise beyond its initial focus on biometric security. In addition to designing methods to prevent impersonation with the so-called deepfakes, the center now safeguards biometric data from inversion attacks, deploys audio-visual age verification to protect minors from accessing age-restricted content, tackles face recognition across diverse modalities, and creates responsible synthetic face datasets.

The center is a dynamic **hub for collaborative research**, working together with the U.S. Center for Identification Technology Research. This partnership serves as a catalyst for scientific advancement, driving biometrics research forward while simultaneously providing stakeholders with access to cutting-edge technologies.

Center for AI Certification

The *Center for AI Certification* contributes to advancing AI technologies and their responsible use. The center conducts fundamental research in data lineage, fairness, interpretability, and robustness of AI models. The center supports the **responsible and secure deployment of AI technologies** and contributes technical expertise to the evolving landscape of AI standards and regulations. The General Data Protection Regulation (GDPR) and the Artificial Intelligence Act (AI Act) also emphasize the importance of AI model conformity.

The activities of the center encompass legal and standards analysis, metric formalization, software development, toolbox creation, and data collection. The center plays a key role in providing **validation and certification services** for AI technologies that are becoming integral to various sectors, and thus the demand for safe, certified AI models is on the rise.

Idiap's expertise and reputation in key domains such as security, health and robotics, and the alignment of the center with **international standards**, including ISO/IEC JTC 1/SC 42 Artificial Intelligence[2], positions the center as a leader in AI testing and certification. The commitment to international standards and collaboration across all research groups will ensure that the center remains at the forefront of AI technology development and certification.

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

Center for
Assistive Robotics

The *Center for Assistive Robotics* pioneers research in **human-robot interaction**, specializing in assistive robotics with mobile manipulators. Dedicated to improving the lives of older adults, people with disabilities, and workers, the center's research is grounded in social robotics principles and physical assistance, empowering individuals through physical therapy and environment manipulation.

The center focuses on the development of robots that can rapidly **acquire new skills** through minimal demonstrations and interactions, leveraging Idiap's expertise in human-robot collaboration, learning from demonstration, and end-user programming. It also draws upon Idiap's expertise in sensing human behavior through social signals and non-verbal cues, encompassing gaze and attention tracking, audio sensing, communication models, and affective computing.

The center fosters multi-disciplinary collaborations, bringing together expertise in audio and speech analysis, computer vision, natural language processing, and sign language processing to design comprehensive models for interaction analysis and AI models with **diverse forms of social intelligence** for seamless interactions between humans and robots.

The center engages with stakeholders by co-organizing events with healthcare institutions and related industries, fostering **collaborations** with those seeking to harness the power of embodied AI systems. These collaborations aim to empower workers in manufacturing and agriculture, while also developing systems to assist people with disabilities in performing everyday tasks.

Center for Participatory AI

The *Center for Participatory AI* **empowers stakeholders from diverse backgrounds**, including citizen organizations, government agencies, non-governmental organizations, educational institutions, academic partners, and companies, to collaboratively design AI applications. It fosters a vibrant local Swiss community while also supporting international collaborations.

Guided by a **people-first strategy**, the center prioritizes societal impact and sustainability, embracing an open collaboration model based on co-design, open data and software, and engaging with the public. The center seeks partnerships to tackle issues that local stakeholders are deeply concerned about, with the potential to be addressed through human-centered AI solutions. The center recognizes the significance of both local knowledge and technology, valuing them as essential resources to be shared and mutually enriched.

Many of the Institute's **alumni** have returned to their home countries to pursue academic or industrial careers. Collectively, they represent a unique global reservoir of AI expertise, cultural diversity, and insights spanning both local and transnational contexts. Idiap is leveraging this expansive network to foster the development of AI solutions tailored to local needs and aspirations, collaborating closely with trusted local partners who share AI expertise and are actively addressing real-world challenges in their respective environments.

Innovation

Leveraging a comprehensive value chain that encompasses fundamental research to system development, Idiap is uniquely positioned to efficiently transfer knowledge and technology. By **transferring** cutting-edge **technologies** and cultivating a skilled workforce, Idiap empowers other organizations to enhance their competitiveness through innovation.

We collaborate closely with researchers, industry partners, investors, and entrepreneurs to cultivate an **innovation ecosystem** and translate research outcomes into impactful technologies and ventures aligning with Idiap's mission of positive societal impact and economic development. We also engage with a diverse range of stakeholders through effective communication of the Institute's research and technological advancements.

Idiap adopts a proactive strategy for **licensing** its technologies to industry partners. This strategy encompasses identifying and evaluating the commercial viability of promising AI technologies, establishing and managing a pipeline of AI technologies for licensing, creating compelling video demonstrations showcasing the technologies' capabilities and potential impact, and engaging in targeted marketing campaigns to reach potential industry partners.

We stimulate the creation of **start-up companies** by nurturing innovative ideas from Idiap's research programs, providing comprehensive support to pre-seed teams throughout the proof-of-concept phase, conducting rigorous evaluations to validate the commercial potential of promising AI technologies, and granting start-up initiatives access to Idiap's expertise and infrastructure. In addition, we assist promising teams in securing seed funding, collaborate with The Ark[3] to offer a mentorship program, and provide access to office space at IdeArk[4], Idiap's incubator, to facilitate their operational growth.

Idiap actively promote **commercialization** opportunities to potential investors through the Institute's website and social media channels, targeted communication campaigns, the organization of investors-club events, and by participating in industry events and conferences. Furthermore, the Institute will attract investment for commercialization activities by developing a strong relationship with venture capital firms and other investors.

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[3] https://www.theark.ch/en/

[4] https://www.ideark.ch/en/

We continue fostering **industrial collaborations** through local (The Ark) and national (Innosuisse) funding instruments to facilitate the transfer of our expertise and technology. The Institute's in-depth knowledge of AI models and their deployment supports technology transfer to small and medium-sized enterprises that cannot afford the necessary in-house, in-depth specialized AI knowledge, as well as to large companies that find within Idiap the niche AI expertise they need.

To support our research and innovation endeavors, we are creating andimplementing CollabCloud, an **integrated platform** providing a robust computing infrastructure to foster innovation and technology transfer across all four research programs. This platform will facilitate collaboration among computational and non-computational experts. CollabCloud will support a portfolio of prototypes, data visualization interfaces, and tools for evaluating AI products and services. Additionally, it will provide access to specialized platforms for natural language processing in scientific discovery, biomedical modeling, Human-AI Teaming infrastructure, and applications for Sustainability and Resilient Societies. CollabCloud will streamline the replication of research workflows, empower stakeholders to explore AI models, and provide secure access to shared storage and computing resources for collaborative projects with external partners.

To foster an **entrepreneurial culture** and the acquisition of business skills, we curate a program of external training sessions, such as Innosuisse Business Concept, Innosuisse Start-up Training, and workshops on entrepreneurship, such as The Ark events. To spark creativity and encourage Idiap personnel to tackle real-world problems with commercial potential, we host hackathons like the Idiap Create Challenge and co-organize innovation challenges. Fostering an impact-driven culture that values entrepreneurial initiatives and with the support of The Ark foundation, we defined an entrepreneur-in-residence program offering financial (part-time salary) and non-financial incentives (equity) to attract individuals who aspire to create a new business using the research outcomes of the Institute.

To attract **entrepreneurs** who can support the commercialization activities of the personnel of the Institute (e.g. PhD students at the end of their thesis, R&D Engineers and Researchers), we aim to develop a strong brand reputation for AI research and innovation and host CTO-CEO match-making events.

Education
& Dialogue
with Society

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We lay great emphasis on knowledge **dissemination**. A quarter of Idiap's staff are doctoral students conducting research on a wide range of AI challenges. Many of our senior staff give formal courses at our various partner universities. In addition to a steady stream of research papers published through peer-reviewed scientific journals and conferences, we also organize outreach activities to raise awareness of AI among the general public, disseminating the outcomes of our research programs.

We will expand and diversify our audience by curating events that connect AI experts with the broader public. Specifically, we will offer initiatives to **enhance digital and AI literacy** among citizens and sharing Idiap's expertise in public discourse and media coverage on AI. To this end, we will:

- Foster stimulating discussions on the latest AI research through our **Perspectives on AI** series.

- Democratize AI technology by empowering the community with **open-source distributions.**

- Initiate **AI for Citizens**, an interactive event series held at Idiap to engage diverse audiences in surfacing expectations, beliefs, concerns, and risks surrounding AI, enhance AI literacy, generate ideas to mitigate concerns and risks, and co-create enhanced AI functionalities.

- Empower educators by providing AI **training sessions** to members of national associations like the Swiss Society for Informatics in Education and secondary school directors.

- Host **Open Days** to foster public engagement through discussions, showcases, and career exploration.

- Inspire school children through events like *Futur en tous genres* to explore career paths where their gender is underrepresented.

We will amplify the impact of our events by disseminating engaging content through diverse channels, fostering active online discussions on topical AI issues.

Collaborations

Idiap enjoys a wide range of national and international **collaborations**. We aim to maintain those collaborations and strengthen those with key Swiss partners. These include EPFL across all research programs, the University of Geneva in the framework of the Human-AI teaming and AI for Life programs, the University of Lausanne in the framework of the Sustainable and Resilient Societies program, the University of Zurich in the framework of Human-AI teaming, Sustainable and Resilient Societies and AI for Everyone programs. Also included is the Swiss Center for Electronics and Microtechnology (CSEM) in the framework of AI for Life program. We aim to start a new-long term collaboration with the Swiss Data Science Center (SDSC) and with the partners of the Swiss AI initiative.

Collaborations offer domain **knowledge** for multidisciplinary work or complement Idiap's core domain expertise. The cooperation with university partners is regulated by bilateral agreements, such as a strategic alliance with EPFL, and multilateral agreements, such as the NCCR Evolving Language with the universities of Geneva, Neuchâtel and Zurich; the NCCR RNA & Disease with the University of Geneva, and the SteADI project with the universities of Lausanne and Neuchâtel.

Idiap will continue to actively participate in numerous collaborative **projects**, ranging from small-scale initiatives to high-profile endeavors. To facilitate the sharing of the outcomes generated by Idiap's researchers with the wider community, the Institute has entered into various corporate contributor license agreements to continue playing an important role in large-scale open-source projects.

Communications

Idiap's communication is centered around the four research programs and presents Idiap's unique strengths to positively **impact** the economy, society, and the environment. We will strengthen our digital footprint to engage new communities and form new partnerships with key industry stakeholders, policymakers, and researchers worldwide. Additionally, we will highlight our commitment to equitable AI solutions, risk mitigation, security, and healthcare improvements.

Communication efforts center on increasing Idiap's **engagement** on social media platforms, creating multimedia content presenting the outcomes of the research programs, and coordinating participation of Idiap staff in select external events and initiatives.

Idiap's main communication **objectives** are to attract young talent to train the next generation of leaders in AI, to strengthen Idiap's position as a trusted partner for policymakers and the industry, and to project the values of Idiap as a research institute driven by societal needs and ethical standards.

The core **audiences** are early career researchers, industry, and the academic community. The secondary audiences are citizens, policymakers, civil society organizations and governmental, inter-governmental and non-governmental organizations. Messages intended for *researchers* focus on Idiap's expertise, track record of publications, and successful collaborations. They will also highlight the quality of life in Valais. Messages tailored to *industry* emphasize Idiap's capacity to support projects of all sizes, from conception to implementation, by showcasing concrete use cases and success stories. They will highlight the expertise of Idiap's to foster innovation and drive economic growth. Messages intended for *policymakers* underscore Idiap's local, national, and international impact. They will also show Idiap's commitment to supporting AI-enhanced environments and its capacity to contribute to the global AI landscape. Finally, they will emphasize Idiap's historical legacy and ethical leadership.

Action Plan
& Review

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This strategy document serves as a guide to focus our decisions over the next **five years**. The strategy will be translated into actionable steps through the development of annual implementation plans. These plans will detail the specific activities required to achieve the established objectives within each section of our strategy.

The **annual implementation plans** will outline the specific actions needed to be taken each year and how each action contributes to achieving the goals set out in the strategy. We will establish performance indicators to measure the success of our efforts, providing valuable insights for continuous improvement.

We will systematically **review** our research programs, concentrating on program focus, to evaluate the alignment of the program's direction with current scientific priorities, and program outcomes, to measure the program's achievements.

The programs' **outcomes** will be assessed based on the quality and quantity of publications, the development and dissemination of AI models and datasets to the research community, the translation of research findings into real–world applications and commercial products (technology transfer), and the ability of the programs to support the creation of new companies based on the developed research.

Idiap Research Institute
Rue Marconi 19
1920 Martigny
Switzerland