Activity
Report 2020

*A year of
commitment and action*

Inria

Summary
interactive

> ### *Bruno Sportisse*
> **Inria's CEO**
>
> *2020 was a busy year for Inria, with the health crisis having a particularly big impact. It was a year with its moments of doubt and despair, but most importantly, there was also a lot of commitment and action.*

Inria was committed to fighting the pandemic, making use of our expertise as an institute for research into IT and applied mathematics. This included the projects we worked on with hospital staff as part of our Covid-19 Mission and our TousAntiCovid application, which we coordinated alongside the General Directorate for Health. Our personnel also showed great committed, from our scientists to our support staff, allowing Inria to continue to advance in 2020.

As for action, in February 2020 we signed our Objectives and Performance Contract "Ambition Inria 2023" with the French government. This is both a strategy and a roadmap aimed at strengthening our scientific, technological and industrial leadership in France, both in and through digital technology, as we seek to build our vital digital sovereignty.
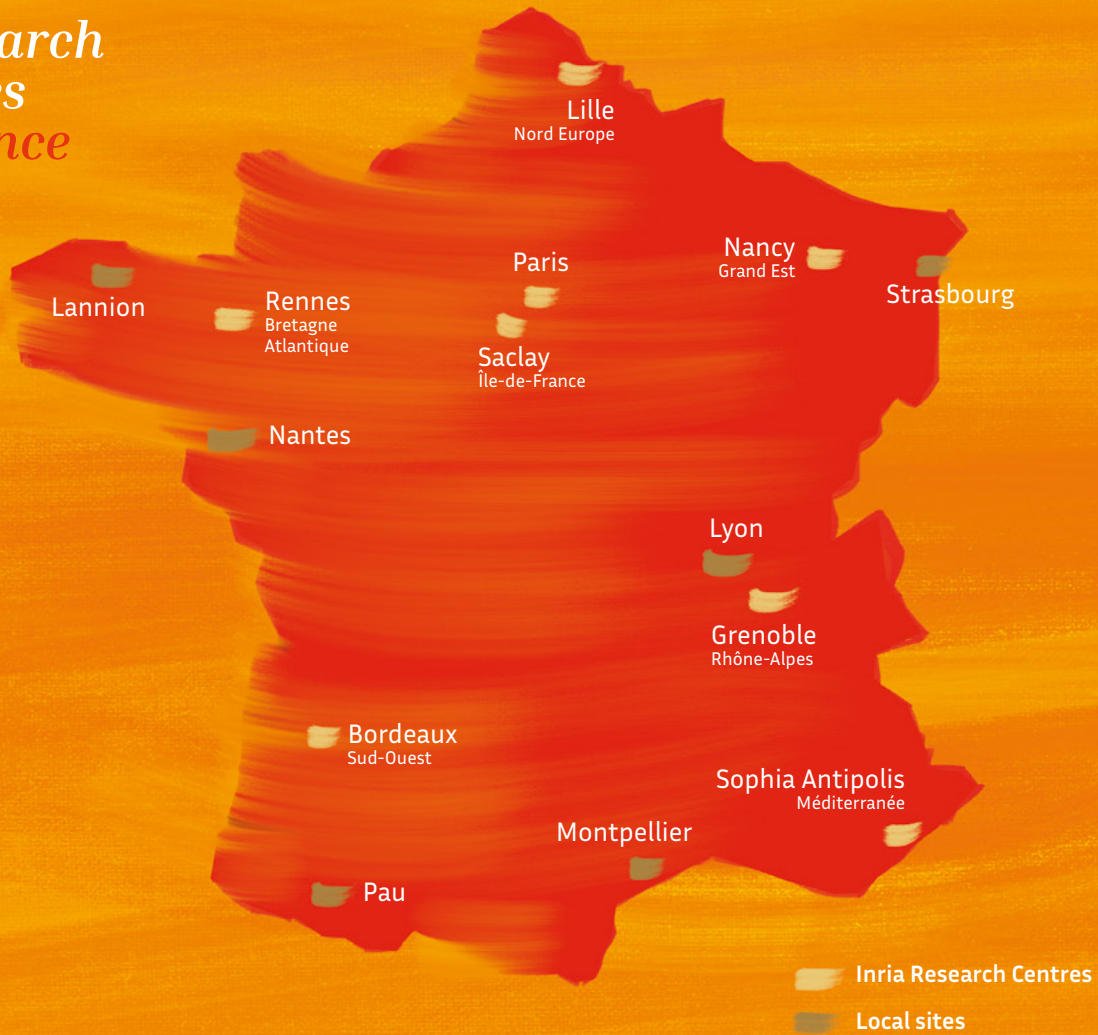
With commitments to strengthening our scientific excellence while making choices and providing long-term support within the range of sectors we operate in; to scaling up in order to make economic impact a priority in our industrial base, while also stimulating entrepreneurship; to working with the government to transform public policy; and to making a firm choice to aid the development of major research universities, "Ambition Inria 2023" outlines clear choices and ambitions for France, the digital sector and Inria. Not only are we confident in our strengths, but we are also fully aware of our responsibilities and, most importantly, open and geared towards impact, with all of our partners.

More than ever, digital technology is set to be a powerful lever in the process of transforming science, education, all types of organisations, the dynamics of innovation, health, public policy and our society, in all its guises. Nothing is set in stone, and it is our collective responsibility to determine which direction it is we take: towards a fairer society in which technology benefits humans; or towards a surveillance society where digital technology is primarily a tool for aiding consumption, controlled by monopolies that are beyond the reach of any democratic checks or regulation. "Giving meaning to digital technology": that is the motto of the Inria Foundation, encouraging us and our partners to consider the impact of digital technology on our society and supporting ambitious projects.

With the Foundation, and with Inria coordinating the Centre of Expertise in Paris as part of the Global Partnership on Artificial Intelligence (essentially the entire digital sector) **2021 will be a year of dialogue between science, technology and society**, the goal being to continue to reflect on these issues, to launch initiatives and to strengthen our collective sovereignty, whichever form this may take.

The Institute will also be fully engaged in ensuring the success of the Recovery Plan, through our participation in acceleration strategies and priority research programmes focused on the digital sector: AI, quantum computing, cybersecurity, digital health, and digital education. 2021 will be the year of digital sciences.

8 Research Centres *in France*

Lille
Nord Europe

Nancy
Grand Est

Strasbourg

Paris

Lannion

Rennes
Bretagne
Atlantique

Saclay
Île-de-France

Nantes

Lyon

Grenoble
Rhône-Alpes

Bordeaux
Sud-Ouest

Sophia Antipolis
Méditerranée

Montpellier

Pau

Inria Research Centres

Local sites

62
ERC
since 2007

4565
collaborators
(2500 Inria's
employees)

200
startups
since 1984

236
millions euros
budget
(25% self-funded)

1490
PhD researchers

200
project teams

"TousAntiCovid" :
Inria helping to tackle the Covid-19 epidemic

In April 2020, the French government tasked Inria with coordinating the development of the StopCovid application. Since renamed TousAntiCovid, the app, with support from both public (ANSSI, INSERM, Public Health France) and private (ANSSI, Capgemini, Dassault Systèmes, Lunabee, Orange) bodies, has helped the health authorities in handling the health crisis.

The aim of the project was to develop a secure application that could be used to inform citizens when they have been in contact with someone who has tested positive for Covid-19, while respecting privacy.

The second version of the application, which was released in October 2020, is more user-oriented. It keeps users up to date with the latest on the health crisis, in addition to providing a wide range of advice geared towards helping citizens to play their part in the fight against the pandemic.

The application employs the use of the ROBERT (ROBust and privacy-presERving proximity Tracing) transmission protocol. Developed by the Privatics project team (at the Inria Grenoble - Rhône-Alpes research centre) and the Fraunhofer Society's cybersecurity institute, this ensures that European standards in relation to data protection, privacy and security are adhered to. The method was validated using a campaign of tests carried out at the Inria site in Rocquencourt.

With more than 60 Inria members involved in the project at some stage (scientists, engineers and support staff), the project demonstrated the Institute's excellence when it comes to collective mobilisation and its capacity to undertake operational projects in support of public policy.

Public discussion surrounding the project also underlined the importance of enhancing dialogue between science, technology and society, particularly as far as digital technology is concerned.

"Ambition 2023":
taking stock of 2020

On 18 February 2020, Inria signed "Ambition 2023", its objectives and performance contract, with the French government for 2019-2023. A year down the line, the time has come for an initial assessment.

A reference document for Inria and its supervisory ministries, the [Objectives and Performance Contract 2019-2023](#) outlines the Institute's strategy, containing a roadmap for how this strategy will be executed. The goal of this document is to enhance France's technological sovereignty in a European dynamic through research and innovation. It aims to boost Inria's impact at all levels, with four main areas of focus:

1 Maintaining
scientific excellence

2 Boosting
economic impact

3 Supporting
public policy

4 Committing
to the development of major research universities

To achieve this, Inria must be both efficient and clear-headed in its organisation, and strive to ensure all members are able to flourish.

A well-established delivery dynamic, centred around openness and partnerships

Nearly a year later, Inria can be proud to have made significant progress on all the aspects of the Objectives and Performance Contract, despite a testing year as a result of the health crisis.
From a scientific perspective, the signature of a strategic agreement with the DFKI (the German Research Centre for Artificial Intelligence) has already led to a number of joint projects. A joint roadmap was drafted through our partnership with the IFPEN, at the intersection between the energy transition and digital technology. Similarly, ties with INSERM were strengthened through a call for expressions of interest. Lastly, Inria and its university partners boosted their appeal through the success of the first "Inria Starting Faculty Position" (ISFP) recruitment campaign. With 47 young scientists recruited to stable positions, 2020 was Inria's biggest ever year in terms of recruitment.

As for innovation, the progress made in 2019 continued, with more than 35 start-up projects overseen by [Startup Studio](#). 2020 also saw an acceleration in partnerships with major industrial companies such as Naval Group, Valeo, EDF and Orange. The launch of the [Inria Academy](#) demonstrates the Institute's desire to see open-source software technology widely shared, particularly among SMEs and intermediate-sized companies.

Inria supported a range of public policies in 2020. The Inria Covid-19 Mission helped to support the development of 35 projects alongside hospital staff, not including the TousAntiCovid application. The ["1 scientist, 1 class: No problem!"](#) initiative, the launch of which was postponed because of the health crisis, accelerated its development: in October, the Inria Bordeaux - Sud-Ouest research centre signed an implementation protocol with the Bordeaux Regional Education Authority. The launch of the Inria-Defence Mission will strengthen ties with the French Ministry for Defence and the defence/security sphere more broadly. Lastly, the launch of the Regalia pilot project demonstrates Inria's commitment to France's Directorate General for Enterprise with regard to the regulation of digital platforms, supporting PEReN (the centre of excellence for digital regulation).

....

The building blocks for the new types of partnership linking Inria and its university partners have started to be discussed at the majority of sites, with the memorandum of understanding signed with the Institut Polytechnique de Paris (IPP) paving the way.

....

Internally, the Institute has continued to evolve. Continued efforts have been made in relation to disabilities: a provisional agreement was signed with the Fund for the Inclusion of People with Disabilities in Public Service, aimed at accelerating the employment of people with disabilities. Similarly, Inria's equality plan was adopted in late 2020, the goal being to tackle discrimination and to set an example when it comes to promoting equality. Lastly, with regard to teleworking, Inria has provided flexibility for personnel (separately from the crisis), with up to 90 days of teleworking on offer each year.

> ❝
>
> ### *Jean-Frédéric Gerbeau*
> **Deputy CEO for Science**
>
> *The year 2020 was unlike any other, due to the Institute's remarkable mobilisation on the pandemic front. Nevertheless, the traditional activity continued at a sustained pace.*

Since the start of the first wave of the Covid-19 pandemic, the Institute has launched more than 30 research projects in partnership with public hospitals. A remarkably **diverse range of scientific fields have been represented:** data science, mathematical modelling, robotics, human machine interfaces, privacy, natural language processing, virtual reality, etc. Just as remarkable has been the mobilisation from **all sectors**, including scientists and support personnel.

During the crisis, the Institute has also managed to keep **business running mostly as usual:** 19 new project teams, including 6 headed up by women; 14 new exploratory actions; 3 new Inria Challenges: one dealing with mobility for those with visual impairment, one in quantum computing and one in conjunction with the TARA expedition for studying the marine microbiome, headed up by Inria Chile.

2020 was also **an exceptional year from a recruitment point of view:** more than twice as many permanent researchers joined the Institute compared to previous years. Special mention must go to quantum computing, which was one of the stated priorities of our campaign, and for which we boosted our permanent staff by 30%.

As for EU Projects, submissions for EuroHPC calls for papers experienced a great deal of success, with 5 projects accepted since 2019. This has come about through excellent coordination between project teams, centres, the EU Contracts Department and the EU Partnerships Directorate. Elsewhere, the bilateral partnership with the DFKI in Germany has got off to a flying start, with 4 projects launched already.

On issues linked to the environment and the energy transition, we signed a framework agreement with the ADEME, and launched a new joint laboratory with the IFPEN dedicated to "the convergence of AI, high-performance computing and data analysis for the energy transition". Some ten or so projects have already been jointly-funded by our two organisations.

As far as support for public policy is concerned, we launched the Lab IA with the Inter-ministerial Directorate for Digital Technology, which will handle AI subjects put forward by the government: 3 projects are already underway with the Ministries of Justice and the Environment.

Lastly, in terms of the regulation of algorithms - at the crossroads between political and legal issues and specialist scientific and technological problems - 2020 saw the launch of the pilot project REGALIA, in close conjunction with the Ministry for the Economy.

Pierre-Louis Curien
Inria - French Academy of Sciences Grand Prize 2020

An emeritus director of research at the CNRS, Pierre-Louis Curien has been a leading figure in basic computer science research in France for more than 35 years. At both a national and an international level, he has been influential in developing a specifically mathematical theory for programming languages. Since its creation, the pi-r2 project team, which he jointly founded with Hugo Herbelin, has played a vital role in designing, developing and maintaining the Coq programming language. Pierre-Louis Curien was also a prominent figure in the discussions that paved the way for the launch of the INS2I at the CNRS.

Inria Awards 2020
Researchers in the spotlight

Stanley Durrleman
Winner of the Inria - 2020 Inria-French Academy of Sciences Younf Resercher Award

Stanley Durrleman's research concerns the development of artificial intelligence systems capable of learning the dynamics of difficult-to-observe biological processes, including the progression of neurodegenerative conditions such as Alzheimer's or Parkinson's. Over the course of the past ten years or so, Stanley Durrleman has made a number of significant breakthroughs, laying the groundwork for an emerging field of research at the junction between dynamic systems, differential geometry and machine learning. His team has also been working in collaboration with pharmaceutical companies, using these predictions to target the best possible time for testing a treatment and evaluating to what extent this might change the progression trajectory of a disease. His work has contributed towards the emergence of precision medicine in neurology.

Pl@ntnet
Inria - French Academy of Sciences - Dassault Systèmes Prize

PlantNet, undoubtedly one of the most important technological innovations in recent years, has something of an unusual back story, in that it can trace its roots back to digital science, life sciences and citizen science. Set up in 2010, PlantNet team has been behind a number of major methodological and algorithm-based contributions: visual match search function employed in the application draws on innovative deep learning technology, enabling absolutely anyone to recognise plants through a combination of crowdsourcing and the development of original, interactive tools. The application is also used in a wide range of educational programmes.

2020 awards and distinctions

Alessandro Rudi
ERC Starting Grant

Alessandro Rudi, a researcher with the Sierra project team, was awarded an ERC Starting Grant to launch the REAL project. Rudi's aim is to improve machine learning algorithms by making them more reliable and by minimising energy use.

Ida Tucker
L'Oréal-UNESCO Award

Ida Tucker, who is studying for a PhD in cryptography as part of two project teams (LFANT and ARIC), designs advanced cryptographic systems that are both versatile and effective, combining sophistication and security. One of the subjects she has worked on is functional encryption, which enables measured access to information. This is of use to hospitals carrying out clinical trials who wish to share certain information on patients, while other data is kept confidential.

Cécile Patte
L'Oréal-UNESCO Award

As part of the MƎDISIM project team, Cécile Patte worked on poromechanical modelling of the lungs applied to pulmonary fibrosis. She decided on the subject of her PhD after speaking with doctors at Avicenne Hospital (Assistance publique – Hôpitaux de Paris - the Paris university hospital trust): the researcher took part in the development of innovative models in the field of organ and tissue biomechanics. Customised for individual patients based on clinical data, including medical imaging, these will be used to assist with making diagnoses and prognoses for pulmonary diseases.
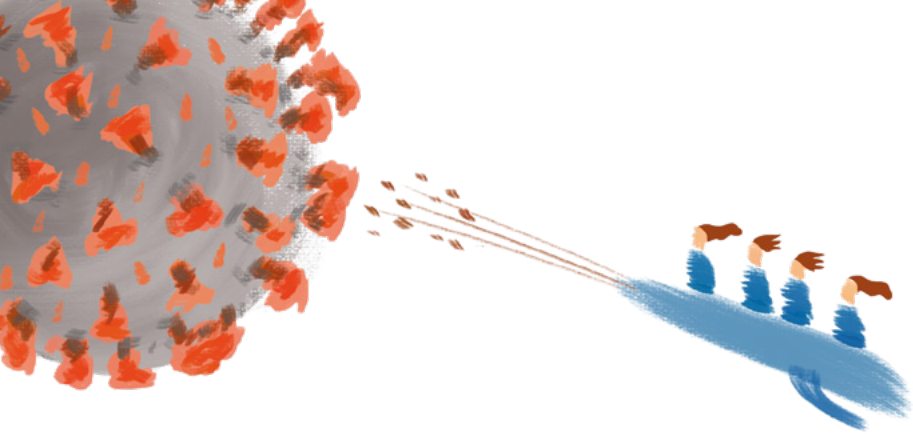
The Inria Covid-19 Mission:
supporting action research with direct impact

In March 2020, Inria launched the Covid-19 Mission, the goal of which is to assist those involved in the health crisis (clinicians, hospital workers, epidemiologists, public authorities and patient associations) by delivering operational solutions with quick turnaround times. Given the level of urgency, the Institute took the decision to opt for entrepreneurial project management, bypassing calls for papers.

More than thirty projects were launched, demonstrating the unprecedented engagement of all Inria personnel, whether scientists, engineers or support staff. We have picked out a few of these.

ICUBAM

The contagiousness of Covid-19 infection increased the number of patients with acute respiratory distress syndrome and the need for resuscitation beds. In order to better anticipate the need for resuscitation bed openings, it appeared crucial to monitor the evolution of the number of resuscitation beds available in hospitals.

In response, Julie Josse and her partners developed ICUBAM, an application that ICU doctors can use to add real-time information on their unit's host capacity to a database, which then displays this in map form.

Exoturn

A multidisciplinary team of doctors, robotics researchers and ergonomists collaborated to provide exoskeletons to medical staff working with Covid-19 patients in medical intensive care units, in order to relieve their physical strain.

Serena Ivaldi and her team launched the ExoTurn project to provide physical assistance to care personnel whose work involves putting patients in a prone position, which places great strain on the back.

. . . .

ScikitEDS

In the current pandemic context, the AP-HP has to continuously monitor the flow of Covid-19 patients passing through each of the 39 hospitals. This has been done by harnessing the data stored in its "Entrepôt de données de santé" (EDS in French, means health data warehouse).

The partnership with Inria has made it possible to develop a tailor-made tool to visualize, analyze, and automatically monitor the data of more than 100,000 patients on a daily basis.

. . . .

GestEpid

The GestEpid project, in partnership with Bordeaux University Hospital and Public Health France's Nouvelle-Aquitaine Intervention Unit, was set up to analyse the spread of the Covid-19 epidemic in France, with a particular focus on the Nouvelle-Aquitaine region.

Its aim is to quantify the impact of both lockdown measures and the loosening of lockdown measures using dynamic models.

IFP Energies nouvelles and Inria
join forces for the energy transition

IFP Energies nouvelles (IFPEN) and Inria are launching <u>a strategic partnership on high-performance simulation and Artificial Intelligence</u> (AI) for the exploitation of data for energy transition.
It aims to propose innovative solutions based on the synergy between IFPEN's and Inria's skills in the fields of transport, energy, environment and digital sciences and technologies.

FIVE RESEARCH THEMES HAVE ALREADY BEEN JOINTLY IDENTIFIED

- **Modeling** and monitoring of floating wind turbines
- **Acceleration of simulations** based on complex modeling
- **Assisted discovery** via molecular simulation of new catalysts for transforming raw materials (biomass, solar energy) into biofuels and bioproducts.
- **Modelling** the 4D time evolution of sedimentary basin deformation
- **Knowledge management** and selective search assisted by AI approaches of multiform documentary data.

> *This new partnership illustrates our common will to put digital transformation technologies at the service of the energy transition, and thus to contribute to the development of technological innovations.*

Pierre-Franck Chevet
IFPEN Chairman

Inria and DFKI
Sign Memorandum of Understanding for Cooperation in AI

Inria and the DFKI, the German Research Centre for Artificial Intelligence, signed a memorandum of understanding aimed at building a strategic partnership between France and Germany on artificial intelligence. The goal is to pool our strengths in order to overcome obstacles in the fields of health, cybersecurity, robotics and industry.

AFTER A JOINT EVALUATION BY INRIA AND THE DFKI <u>FOUR PROJECTS WERE SELECTED</u>

- **Moveon**
A solution for improving the reliability of tracking systems in dynamic environments

- **IMPRESS**
Improving the representation of the meaning of words using knowledge and giving machines a better understanding of languages

- **MePheSTO**
Using AI to detect psychiatric disorders

- **Climactic**
Data and AI to tackle new challenges facing the manufacturing industry

> *This MoU between Inria and DFKI documents that we are not only talking about Franco-German AI cooperation but also actively coordinating research and defining joint projects. We are looking forward to the collaboration because we are bringing together the French and German vision of AI for the benefit of people and society. In both countries, programs have been initiated that fill "l'intelligence artificielle au service de l'humanité" and "KI für den Menschen" with content, thus creating value for France and Germany, but also for European society*

Antonio Krüger
Scientific director and managing director of the DFKI

REGALIA, a project dealing
with the regulation of algorithms

REGALIA was set up to develop a software toolkit for the regulation of algorithms for web platforms.

The pilot project was set up to support the Interministerial Centre of Excellence for Digital Regulation, launched in August of last year and linked to the General Business Directorate.

The aim is to facilitate and accelerate the task of the regulator by providing a "digital test bed" for regulating the main families of algorithms online, such as recommendation and pricing algorithms. This should also be able to provide statistical evidence of any

disloyalty, bias or discrimination that is identified, just as testing would in the physical world. It will be used to assist legislators by simulating the impact of regulatory changes on specific types of algorithms.

Long-term, stakeholders in the digital sector, concerned about the loyalty of their recommendation algorithms, may also need self-regulation tools, which REGALIA can help to develop.

For this purpose, REGALIA will draw on use cases provided by regulators in France, in conjunction with the Interministerial Centre of Excellence for Digital Regulation, launched in August of last year and linked to the General Business Directorate.

“

REGALIA will be a strategic partner of the Pôle d'Expertise de la Régulation Numérique and, through it, of the State services and regulatory authorities that play a role in the regulation of digital platforms. Auditing is a much less developed field of research than algorithm design, which makes collaboration with a partner of excellence such as Inria, and more particularly its REGALIA cluster, essential.

”

Thomas Courbe
French Companies Directorate CEO

Fête de la Science 2020
fully digital and open to all

For nearly thirty years, French scientists have come together each year to share expertise with the wider public at the Fête de la Science.

Despite the current health crisis, 2020 was no exception. As was the case in previous years, Inria scientists shared

their expertise with children and adults. All of the presentations were **virtual and broadcast live through the use of video streaming, editing and video conferencing tools.**

Each day focused on a different subject linked to nature: the ocean, the climate, responsible digital technologies, robots, plants, agriculture, the universe and

health. This unique, participatory and free event gave the wider public - who aren't always able to travel to attend this type of event - the opportunity to discover the world of research through a fun programme for all ages.

> ## François Cuny
> **Deputy CEO for Innovation**
>
> *As a result of the health crisis, we weren't expecting 2020 to be particularly conducive to innovation, especially with our industrial partners. But as it turned out, the year was packed with achievements for us to be proud of, which was a pleasant surprise. This could never have happened without everyone playing their part, from our scientists to our support staff.*

Among these achievements, we entered into new industrial partnerships: **2020 saw the launch of our first joint project team with an industrial partner.** ASTRAL was set up in Bordeaux as part of a strategic partnership with Naval Group and will work on advanced methods for machine learning and control.

Following Naval Group's example, a dozen or so other French manufacturers committed to working with us in 2020, setting up joint project teams or tackling joint challenges.

In terms of supporting tech startups, Inria Startup Studio, which was launched in late 2019, has moved from strength to strength, with 2020 seeing the recruitment of a number of Innovation and Partnerships Project Managers. With one for each Inria centre, these individuals will deal exclusively with start-ups, working closely with project teams and entrepreneurs in addition to assisting our university partners.

The volume of startups supported by Inria tripled in the space of a year, rising from an average of 10 projects to around 30 in 2020. This trend is set to continue in 2021: Startup Studio won the SATT-Incubateurs-accélerateurs call for projects launched by the French Ministry for Higher Education, Research and Innovation as part of the Future Investment Programme.

2020 was also the year of opensource technology, as Inria launched Inria Academy to provide continuous education on digital technology.

Beginning in the summer, and despite the health crisis, Inria Academy was able to deliver a number of training courses on Inria's flagship opensource software programs, including Coq, Pharo, SOFA, Scikit-learn and RIOT. The primary target is French SMEs and intermediate-sized companies.

Finally, we also used this year to continue with the development of Inria Chile, to support EU consortia and to strengthen our research teams by recruiting specialist development engineers.

In 2021, the focus will be very much on technology and innovation.

Startup Studio
celebrates its first birthday

In September 2019, Inria launched its Startup Studio, which provides specialist support for deep tech projects. One year on, Startup Studio has already taken 30 projects under its wing, and is aiming for 100 a year by 2023.

Supporting talented scientists looking to become entrepreneurs

One year on, Startup Studio, which is targeted at PhD students, postdoctoral researchers, interns, engineers and Inria researchers, as well as employees of other partner research bodies in France and leaders of projects external to Inria, has attracted close to thirty startup projects. All of these startups develop technology aimed at making breakthroughs in industries ranging from agritech, edtech and medtech to e-commerce and transport.
In recent months, despite the health crisis, all project leaders have been given support tailored to meet their needs, including funding; hosting; specific tools; advice; and logistical, technological and sometimes even moral support: "Being an entrepreneur is a solitary pursuit. You question yourself a lot, and it can be frustrating, but there are little victories as well. The weekly catch-ups with Sophie and Hervé (the directors of Startup Studio) are like a lifebuoy - project leaders sharing experiences provides a way of constantly putting results in perspective (whether good or bad), enabling a greater degree of objectivity on events", explains Laurent Bachet, founder of Greenfarm Robotics. The startup, which Inria Startup Studio has been supporting since May, develops suspended wire robots that are an alternative to tractors, helping farmers to overcome constraints and damage linked to the soil while reducing the impact agriculture has on the environment.

The number of projects to triple by 2023

Inria Startup Studio is now setting its sights higher, and is aiming to support around 100 start-ups a year by 2023.

This strategy, which was outlined in the 2019-2023 Objectives and Performance Contract Inria signed with the French government, is being followed at all Inria centres, where specialist entrepreneurial staff are being taken on. These specialists work closely with project leaders on a daily basis, providing operational support and instilling a culture of entrepreneurial dynamism in order to help potential new projects to emerge.

....

Most importantly, they also work with our university partners, given that Inria Startup Studio is dedicated to digital entrepreneurship for the entire academic world.

A few Inria Startup Studio projects

Aureax
Provides cyclists with a haptic navigation solution, allowing them to navigate safely while keeping eyes and ears focused on what matters.

Flit Sport
Have developed a medical (cardiac) monitoring solution for top-level athletes to help them train better, using a smartphone app connected to a cardiac belt.

Gazouyi
Is a project that uses a specific application centred around child development to assist parents.

Inria Academy, providing tech support for the digital
transformation of SMEs and intermediate-sized companies

As part of its "Ambition 2023" contract of objectives and performance, Inria is developing a continuing education offer on digital technologies within [Inria Academy](.).

The Institute has committed to supporting the emergence of digital technology by sharing opensource software tested in major sectors linked to the economy, health, education, software security and machine learning. Inria Academy was set up to have a real impact, to boost value creation and to grow employment.

Supporting the digital transformation of the French ecosystem by facilitating technological penetration

This training offer is intended primarily for companies, particularly SMEs and small and medium-sized businesses, developing a job base in France and more broadly in Europe. Deployed progressively from autumn 2020, it is based in particular on software distributed in open source by Inria.

Training given by software creators

Our training providers, scientists and developers contributing to opensource software are more than capable of making this transfer over to engineers and company developers. They are qualified to lead research and are experienced in supporting professionals in training, especially on software. This system is reinforced by Inria Learning Lab's latest developments in the field of educational innovation through digital technology.

High-powered software

This training body which, it is planned, will become an independent subsidiary of Inria, has a catalogue that will expand over time, drawing on the nearly 1,500 programs that have their roots in research carried out by the Institute alongside our academic partners.

This software, developed by Inria's research teams, represents a significant and constantly evolving technological heritage, which is also available to developers and companies. To meet the needs of companies and accelerate the appropriation of these technological nuggets, Inria Academy offers customized training in these software in a wide variety of fields such as proof verifiers (Coq), advanced object-oriented programming (Pharo), machine learning (Scikit-learn) or physical modelers (SOFA).

Inria's flagship software programs

Coq
Evidence checkers, highly prized by computer scientists.

Pharo
Advanced object-oriented programming, adopted by both academia and industry.

RIOT-OS
An operating system designed for the internet of things.

SOFA
A physics engine for multi-body simulations, widely used in the medical and the robotics fields.

Scikit-learn
Machine learning toolbox for data science and AI.

"

The creation of Inria Academy will contribute to accelerating the dissemination of the culture and uses of free software in the TSIs. This is an additional asset for these companies, which are now resolutely committed to digital transformation.

"

Alexandre Montay
CEO of METI

A closer look at two startups
launched in 2020

Intrusion prevention with Malizen

Malizen, a start-up created in the wake of research undertaken at CentraleSupélec and the Inria Rennes-Bretagne Atlantique research centre, has designed a solution for visualising intrusions into IT systems.

Called ZeroKit, this innovative tool will enable security experts to operate more intuitively and to respond more quickly in the event of a cyber-attack.

Behind the initiative is the security branch of the Direction Générale de l'Armement (the French Government Defence procurement and technology agency). The subject of their joint work with Inria was viewing suspicious incidents, leading to a prototype that gave analysts a much clearer view of attempted intrusions into systems. In order for this technology to be transferred to industry, the decision was taken to launch a start-up, with Inria's support. Malizen was launched in January 2020 at the Centre for Cyber Excellence.

Its main program is called ZeroKit, a reference to so-called "zero day" attacks involving the use of previously unseen methods of intrusion, unknown to automatic antivirus programs. When faced with this type of malware, expert security analysts are often the last line of defence. They are the ones responsible for identifying the slightest anomaly, noticing a machine operating unusually slowly, picking up on odd network connections, etc. Sometimes, however, they have to respond to security incidents. Their first task is to understand the situation. They then have to seek out the origin of the intrusion, before assessing the scale of the problem.

> "
> *Using this interface, analysts will be able to see patterns emerge. This might be a lot of unusual activity on a bank's server in the middle of the night, for example.*
> *The expert will be able to display the IP addresses, ports and so on, to identify any strange connections and to then correlate these with other incidents.*
> "

Damien Crémilleux
Malizen CTO

Tessael, new experts in geological simulation

Tessael is a start-up launched in 2020 that specialises in geological meshing. Its aim is to minimise environmental risks for underground operators while maximising efficiency.

Tessael provides meshing solutions based on GeO2 technology, which has been developed since 2010 by Alice/Pixel, a joint undertaking between Inria and Loria.

Through its new GeO2 geological meshing technology, Tessael is able to perform and optimise extremely accurate 3D simulations of subsurface environments, opening up new opportunities in three sectors: geothermal energy, geological storage and the oil and gas industry.

For the purposes of these simulations, an underground space and its surfaces are divided up into geometric units, with the overall picture referred to as a "mesh".
GeO2 uses the "high quality" meshes it generates, coupled with 3D visualisation technology, to make precise and accurate measurements within complex geological formations - a major breakthrough in the field of subsurface exploitation. GeO2 is also a decision-making aid for those operating in these industries, helping them minimise both environmental and financial risks while making exploration and production operations as efficient as possible.

> "
> *I firmly believe that our GeO2 geological meshing technology will play a key role, not only in the fossil fuel chain, but also in the energy transition. We intend to be active participants in the development of the industrial fabric linked to geothermal energy and the underground storage of CO2, both in France and overseas. The close collaboration between Tessael, Inria, the University of Lorraine and Loria will enable us to overcome the technological obstacles currently standing in the way of manufacturers.*
> "

Wan Chiu-Li
Founder of Tessael

> **Guillaume Prunier**
> **Deputy CEO for Administration**

As was the case for all companies, 2020 saw Inria confronted with an unprecedented crisis. However, through the engagement of all employees, most notably our support staff, Inria held firm, continuing to serve the State and the citizens of France.

We can be very proud of the fact that our organisation managed to weather the storm.

We were able to transition smoothly to working from home on a mass scale, despite the sudden nature of the lockdown announcements. Thanks to the mobilisation of our local crisis units and our HR and Legal departments, we were able to switch over successfully to working from home in a legally compliant way, while managing personnel and individual situations. Our IT staff made sure we all had the resources we needed to work from home, while our facility management and maintenance staff made sure our sites remained secure, and that we were then able to safely open back up again, despite very specific constraints. Our financial and accounting staff, meanwhile, made sure we were able to continue to purchase the materials we needed and to pay our suppliers, who the crisis was particularly hard on.

We can also be proud of the way our Institute rallied together,

unsurprisingly through research and innovation: our raison d'être. We have been highly responsive in our support for public policy, drawing on the resources allocated to us by the State in order to react quickly. These projects were made possible through the engagement of our scientists and our support staff, whose cooperation was vitally important. Mention must also go to the IT Department, who set up servers and websites; the Legal Department, who made sure contracts

and agreements were secure; the Data Protection Officer; the Security/Defence Officer; our Innovation and Partnerships Project Managers, when companies were involved; and our Experimentation and Development Departments, who supported technological developments. All of the skillsets that make Inria what it is were put to the most effective use.

Despite the context, we were also able to kickstart our digital transformation by rolling out an electronic signature system, an instant-messaging service and a collaborative office suite, all in the space of a few weeks.

We also continued to work on large-scale projects, such as the setting up of a human resource management system alongside the replacement of our ERP (the SIRHIA-SIFI project). We also launched new projects, through which we will be able to accelerate our development in 2021.

Let us therefore approach 2021 with confidence, and dare to go further. Let's dare to get things done, to transform ourselves, to serve and to dream big. Let's dare!

Inria commits
to the digital transformation of government organisations

Inria is a partner of Lab IA, a new initiative set up by the Interministerial Digital Coordination Directorate (DINUM) to support French government agencies in the process of digital transformation and modernisation through artificial intelligence.

In 2019, in partnership with Inria, the DINUM set up a joint initiative through which French government agencies would be able to modernise via the deployment of projects centred around artificial intelligence: Lab IA. This joint programme provides support to a range of government agencies on a wide variety of real-life problems that could be improved through the use of digital technology, such as the detection of abusive clauses in contracts or improving mapping processes.

The goals of Lab IA

- **To support projects** in the public sphere centred around AI
- **To make shared tools** available in order to aid the development of a French AI community
- **To get public figures accustomed** to AI technology and to provide training
- **To develop ethical AI** and transparency with regard to citizens
- **To build a sustainable partnership** with the AI research ecosystem
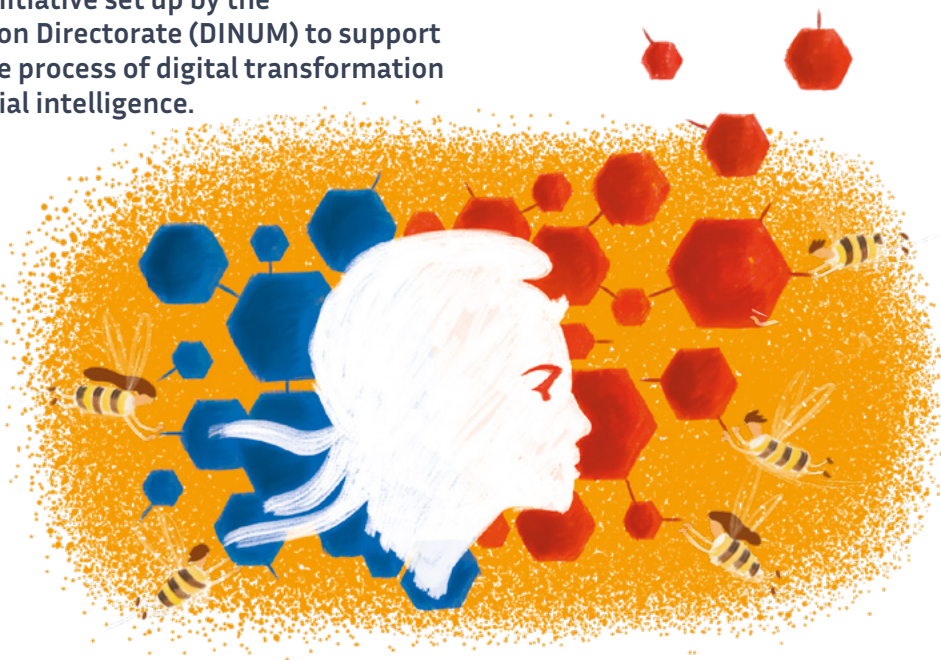
The 3 projects currently being supported by Inria

1 **The acceleration of the Litto3D programme ®** ((high-resolution relief mapping) run by the Shom (Service hydrographique et océanographique de la marine - France's Naval Hydrographic and Oceanographic Service)
The aim: to improve undersea mapping.

2 **Processing data sets** on the positions of GNSS stations and modelling for the international terrestrial reference system on behalf of France's National Geographic Institute (IGN)
The aim: to make it easier to calculate the position of terrestrial reference points using satellite data.

3 **Developing a solution for identifying** divergences in case law for the French Court of Cassation
The aim: to group together legal rulings on similar issues and to detect divergent interpretations of the law in order to ensure uniform interpretation of the law.

Inria's commitments for the environment

Officially launched in 2020, Inria's Environment Plan is centred around research and innovation, improving the Institute's carbon footprint and supporting public policies.

As outlined in Inria's Objectives and Performance Contract 2019-2023, the environment is now one of the Institute's priorities. After the emergence of a number of internal initiatives in 2019, such as the MakeSEnS working group, in 2020 the Institute took the logical next step of deploying a global Environment Plan structured around four main objectives:

1. **To enhance societal impact** on environmental issues through research and innovation in digital
2. **To reduce the Institute's carbon footprint**
3. **To support** public policy on the environment
4. **To communicate about Inria's actions** on environmental issues

An 11-member steering committee was set up for this very purpose, which will meet every three months to discuss the progress made on different projects. Four working groups (travel, materials, buildings and digital tools) have also been deployed, the goal being to explore actions that could be taken in order to reach the targets set by the Environment Plan.

Inria's Environment Plan steering committee:

Guillaume Prunier - Administration Department
Céline Serrano - Administration Department
Jacques Saint-Marie - Science Department
Isabelle Chrisment - Responsable de l'équipe RESIST (Nancy) ;
Vincent Heyer - Financial Department
Catherine Fourot-Stamm - Financial Department
Eric Cohen - Financial Department
Benoit Chauvin - Financial Department
Jean-Philippe Babut - RH Department
Marine Guinle - Head of communication Team in Bordeaux
Arnaud Beck - Communications Department

Inria unifies its IT Department

In support of the Institute's digital transformation, in 2020 the IT Department implemented a strategy aimed at standardising practices and tools. The first stage in this process of harmonisation involved bringing together national and local bodies for IT system maintenance, and developing and executing the Institute's catalyst projects in relation to technical, administrative, financial or human resources plans, in addition to user support.

The following stand out from these major undertakings:

- major software programs, chiefly for assisting support staff, which saw the development of new tools for streamlining internal communication and reducing administrative timeframes. This included an internal chat service (Mattermost), our electronic signature system and our future ergonomic management tool, Y2
- our new Raweb preparation tool, named RADAR
- Inria's future CRM
- the implementation of a national strategy for computing resources: these will be pooled and coordinated at a national level and in-step with Silecs (formerly Grid 5000 and FIT), helping to standardise and streamline the Institute's practices while reducing its environmental impact.

The formation of a unified IT Department has made it possible to pool efforts, enabling the sharing of knowledge and expertise. More effective and coherent when it comes to taking intersectional and interdisciplinary departments into account, unification also provides a better way of showcasing individual skillsets, in addition to helping personnel to develop and greater sharing of experience.

One thing the IT Department can be very proud of is having successfully switched to lockdown without this having any negative impact on institute activity, undertaking major projects (such as the Covid-19 Mission or StopCovid/TousAntiCovid) and continuing to handle even the most unpredictable demands.
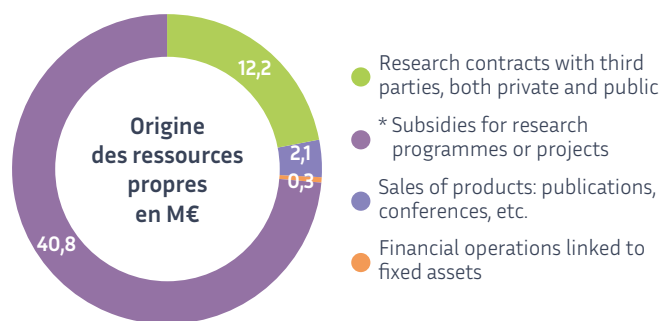
Financial Report
Annual budget report for the 2020 financial year

Inria's **initial budget** for 2020, which was voted on in November 2019, was €236.7 million for resources and €238.6 million for expenses.

With regard to the execution of the 2020 budget and in terms of income, the **Public Service Grant** stood at €178 million, compared to €176.6 million in 2019 and €172.2 million in 2018.
This accounts for 75% of all income for the 2020 financial year.

Own resources received stood at €59.4 million, giving a budget execution rate of 96% in relation to the figures outlined in the last amended budget. This accounts for 25% of all of the Institute's resources for 2020. The primary origins of own resources were as follows:

Origine des ressources propres en M€

- 12,2 — Research contracts with third parties, both private and public
- 40,8 — * Subsidies for research programmes or projects
- 2,1 — Sales of products: publications, conferences, etc.
- 0,3 — Financial operations linked to fixed assets

* €13.7 millions from the ANR (the French National Research Agency), €11.4 million from other public partners, €16.7 million from the EuropeanCommission and €16.9 million from private partners.

Total resources received stood at **€237.4 million** in 2020, giving an execution rate in relation to the amended budget of **100.3%**.

Expenses can be broken down as follows: €177.3 million for personnel expenses (80.9% of total expenses), €138.2 million of which was spent on Contract Staff Payroll, with the other €39.06 million spent on permanent personnel payroll.

In terms of personnel "below the threshold" (paid through the Public Service Grant), there were 1,605 full-time equivalents. The figure was also 1,605 in 2019 and 1,616 in 2018, while the initial budget forecast for 2020 was 1,636 full-time equivalents. In terms of personnel "above the threshold" (paid through own resources), there were 848.6 full-time equivalents, compared to 766 in 2019 and 730 in 2018.

€37.5 million **on non-scheduled operating and investment expenses** €4.4 million **on expenses linked to scheduled investment operations**

Overall, expenses for 2020 stood at €219.2 million against an initial forecast of **€238.6 million**, giving a budget execution rate of 91.9%.

2020 expenses can be broken down as follows:
- €150.9 million on scientific activity for Research Centres (aggregate 1), 68.9% of total expenses for 2020
- €21.2 million on joint research initiatives (aggregate 2), 9.7% of total expenses
- €47.2 million on support functions (aggregate 3), 21.5% of total expenses

The scientific subjects corresponding to the Institute's main objectives are outlined in the attached table, factoring in all expenses irrespective of their source of funding and including all aggregates.

TEAM EXPENSES PER SUBJECT IN €M	109,860
Applied mathematics, calculation and simulation	16,467
Algorithms, programming, software and architectures	24,268
Networks, systems and services, distributed computing	17,423
Perception, Cognition, Interaction	26,538
Digital health/biology and the digital planet	25,164

Certification of the financial accounts

As has been the case since 2010, the 2020 accounts were certified by two external auditors. With regard to the 2020 fiscal year, the auditors lifted the reservation that had previously been issued in relation to physical inventory and the monitoring of fixed assets.

The 2020 accounts revealed a profit of €9.3 million (compared to a pro-forma profit of €5.9 million for the previous year).

This change was down to the following main factors:
- an increase in subsidies and assimilated income (+ €2.6 million), which can be explained by an increase in the subsidy for public service expenses (+ €1 million) and by an increase in other operating subsidies (+ €0.9 million), in addition to donations and bequests (+ €0.7 million)
- an increase in direct income from activity (+ €2.7 million), reflecting an increase in income from contracts with private partners (+ €2.4 million)
- a decrease in other income (write-backs on depreciation and provisions) of around €2.1 million, which can be explained by the exceptional nature of the level of write-backs on provisions for litigation from the previous financial year
- a sharp decrease in consumption from third parties (- €10.9 million), resulting from a sizeable reduction in "Travel, assignments and receptions" (- €9.7 million), linked to a significant drop in travel as a result of the health crisis
- an increase in payroll costs (+ €8.6 million)
- an increase in other operating costs (+ €3.3 million)

The balance sheet total (assets and liabilities) stood at €286.1 million for 2020, compared to €259.7 million for 2019 (pro-forma).

PROFIT AND LOSS ACCOUNT 1/2

ITEM	2020 Amount (in euros)	2019 (PRO FORMA) Amount (in euros)	Variation 2020 / 2019 %
Subsidy for public service expenses	178 107 799	177 053 106	0,6%
Operating subsidies granted by the State and other public entities	37 970 355	37 054 439	2,5%
Grants allocated to funding operating charges	-	-	-
Donations and bequests	883 980	212 415	316,2%
Allocated tax income	-	-	-
SUBSIDIES AND ASSIMILATED PRODUCTS	**216 962 134**	**214 319 960**	**1,2%**
Sales of goods or services	14 428 194	12 750 354	13,2%
Income from the sale of assets	15 351	40 140	-61,8%
Other management income	1 820 077	744 205	144,6%
Inventory and self-constructed assets	-	-	-
Income earned for provision of a public service	-	-	-
DIRECT INCOME FROM ACTIVITY	**16 263 622**	**13 534 699**	**20,2%**
Write-backs on depreciation and provisions	17 964 362	19 467 589	-7,7%
Write-backs of asset-related funds	4 861 080	5 431 798	-10,5%
OTHER INCOME	**22 825 442**	**24 899 387**	**-8,3%**
OPERATING INCOME	**256 051 198**	**252 754 046**	**1,3%**
Purchases	54 686	104 987	-47,9%
Use of goods and supplies, works and services	27 399 304	38 330 700	-28,5%
Payroll costs	166 169 273	157 556 188	5,5%
Other operating charges (incl. losses/write-offs)	22 419 116	19 160 596	17,0%
Depreciation and provisions, net accounting value of assets disposed of	30 710 611	31 540 844	-2,6%
OPERATING COSTS	**246 752 990**	**246 693 315**	**0,0%**
NET INCOME (OR LOSS) FROM ACTIVITY	**9 298 208**	**6 060 731**	**53,4%**

PROFIT AND LOSS ACCOUNT 2/2

ITEM	2020 Amount (in euros)	2019 (PRO FORMA) Amount (in euros)	Variation 2020 / 2019 %
Income from shares and loans	-	-	-
Net income from sale of financial assets	-	-	-
Interest on non-capital receivables	-	-	-
Income from short-term investments and cash	-	-	-
Income from sales of short-term investments	-	-	-
Foreign exchange gains	-	7 957	-100,0%
Other financial income	-	-	-
Write-backs on depreciation and provisions	-	48 410	-100,0%
FINANCIAL INCOME	**-**	**56 367**	**-100,0%**
Interest	-	-	-
Net loss on disposals of securities	-	-	-
Foreign exchange losses	-	9 552	-100,0%
Other financial costs	-	-	-
Depreciation and provisions for financial costs	-	166 053	-100,0%
FINANCIAL COSTS	**-**	**175 605**	**-100,0%**
NET FINANCIAL INCOME (OR LOSS)	**-**	**119 238**	**-100,0%**
Corporate tax	-	-	-
FISCAL YEAR PROFIT OR LOSS	**9 298 208**	**5 941 493**	**56,5%**

inria.fr