



LABORATOIRE  
BORDELAIS  
DE RECHERCHE  
EN INFORMATIQUE

**LaBRI**

**LaBRI**  
**2024**

LaBRI is a research unit attached to the CNRS, the University of Bordeaux and Bordeaux INP. LaBRI has been a partner of Inria since 2002.

LaBRI's missions cover three key areas: research, training and technology transfers. The research conducted at LaBRI is both fundamental and purpose-driven. It targets the IT sector at large. Training mainly focuses on PhD programmes, as well as dissemination activities aimed at younger audiences. Technology transfer is achieved through collaborations with industry and the creation of start-ups.

LaBRI is firmly rooted in its ecosystem. Funding from the Nouvelle-Aquitaine Regional Council towards a building extension, equipment, and PhD and post-doctorate scholarships was one of the cornerstones of its development.

**[www.labri.fr](http://www.labri.fr)**

LaBRI (Laboratoire Bordelais de Recherche en Informatique – Bordeaux IT Research Laboratory) is a joint research unit (UMR 5800) under the supervision of:



Publication date: March 2025

Publishing management: LaBRI Board of Directors

Editorial coordination: Auriane Dantès - LaBRI Communications department

Graphic design: Manon Hans (MaHa Communication)

Photo credits: @ LaBRI; @ Boris Mansencal; @ Romane Marcel; @ Gautier Dufau

Translation: Aquitaine Traduction





# CONTENTS

<b>LaBRI in figures</b>	<b>4</b>
<b>A word from the Director</b>	<b>5</b>
LaBRI organisation	7
CombAlgo Department	8
I&S Department	12
M2F Department	14
SATANAS Department	18
SeD Department	22
SaR Department	26
<b>Cross-cutting areas</b>	<b>28</b>
Artificial Intelligence	28
Digital Health	29
<b>Chairs</b>	<b>30</b>
Cybersecurity	31
AI	32
MTI	33
<b>New arrivals</b>	<b>34</b>
<b>Missions</b>	<b>35</b>
Communication	36
Structuring projects, Innovation and Transfer	37
Specific courses of action	38
<b>AFoDIB</b>	<b>39</b>
<b>SCRIME</b>	<b>40</b>
<b>Glossary</b>	<b>43</b>

# → LaBRI in figures

Total staff: **309**



**80**  
women



**229**  
men

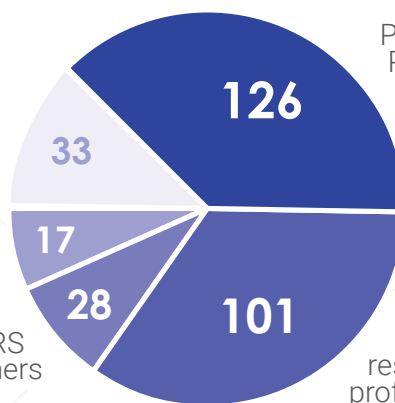


**29**  
nationalities

non-teaching  
and administrative staff  
(ITA BIATSS)

Inria  
researchers

CNRS  
researchers



PhD students  
Post-doctorate students  
and research and teaching fel-  
lows (ATER)

## Scientific publications\*



**87**  
journal  
papers



**136**  
conference  
papers



**6**  
collections  
of works



**37**  
theses  
defended

\*HAL extraction

## Budget



**€418K**  
in grants



Regional  
contract

**€240K**  
spent

**€700K**  
acquired



European  
projects

**€16K**  
spent

**€503K**  
acquired



ANR (National  
Research Agency)

**€1,120K**  
spent

**€536K**  
acquired



PEPR (Priority  
Research  
Programme and  
Equipment)

**€301K**  
spent

**€0K**  
acquired

## Leveraging



**4 platforms**

SCRIME, PlaFRIM, LSD,  
Volbrain



**22 software tools**



**16 start-ups**



## A word from the **Director**



**Xavier  
BLANC**

2024 was a very special year for our laboratory. We were all deeply affected by the sudden and brutal departure of our colleagues and friends Vinh-Thong Ta on 15 February and Abel Kahsay Gebreslassie on 15 October. We will remember the moments we shared with them. They left a lasting mark in our laboratory and pushed us to listen to each other and strengthen the ties between us.

On the scientific front, 2024 was marked by a few disappointments quickly counterbalanced by some very good news. In fact, BAIA, the proposal we had put forward for AI clusters, was not accepted despite excellent scientific reviews. However, some of our results received awards, particularly in the field of formal methods, software engineering, digital health and high-performance calculations. In particular, Samuel Thibault and Brice Goglin received the Inria - French Academy of Sciences - Dassault Systèmes Innovation Prize for their hwloc open-source software.

Our laboratory was also reorganised to make some of our activities more visible. Several new research teams were created, Synthèse and NeS, and the LaBRI teams were aligned with

Inria EPCs (shared project teams) in the Satanas department. From a multidisciplinary perspective, our research continues, with, among others, LaBRIC (a collaboration between LaBRI and BRIC, a laboratory specialised in cancer research) and the collaboration with SanPSY. IT is increasingly becoming essential as a science and the interfaces with other disciplines offer new horizons.

This brochure presents the activities undertaken at LaBRI in 2024. We will detail the results obtained by the laboratory's five research departments and present the role of the Research Support department. The desire to support and promote the emergence of new themes is also presented, particularly through our AI and Digital Health lines of research, and also through the Chairs endorsed by our members. Lastly, we detail the missions completed by our members as well as the activities we have supported.

We hope you enjoy reading this issue.





LABRI

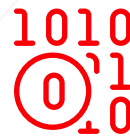
# ORGANISATION OF LABRI



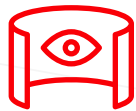
# 5 DEPARTMENTS AND 17 RESEARCH TEAMS



**Combinatorics  
and Algorithms**  
(CombAlgo)



**Supports and Algorithms  
for High-Performance  
Digital Applications**  
(SATANAS)



**Image and Sound**  
(I&S)



**Systems  
and Data**  
(SeD)



**Formal Methods  
and Models**  
(M2F)



**1 Research  
Support  
department** (SaR)  
consisting of 3 teams:

- Administrative,
- Finance,
- Systems and networks



**2 cross-cutting missions +  
specific courses of action**

- Communication
- Societal challenges



**2 cross-cutting  
areas**

- Artificial Intelligence (AI)
- Digital Health (E-Health)



**3 Bordeaux Foundation  
Chairs**

- Cybersecurity
- AI
- MTI



# COMBALGO - Combinatorics & Algorithms Department

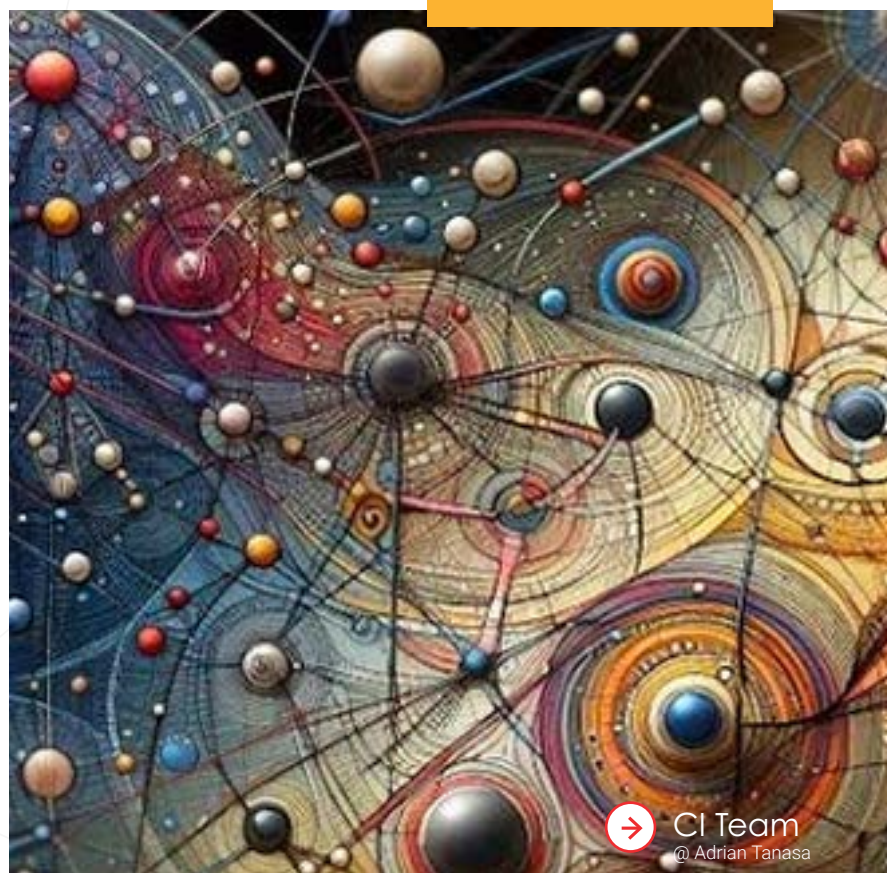


This department analyses and designs algorithms and structures of discrete combinatorial data. Each team participates in four weekly seminars:

- + Distributed Algorithms submit algorithms to a non-centralised environment between several communicating entities.
- + Combinatorics and Interactions describes, codes and breaks down the fundamental discrete structures of computer science and other sciences.
- + Graphs and Optimisation investigates graphs in terms of their combinatorial and algorithmic properties relating to optimisation.
- + Quantum Computing and Information draws on many of the previous concepts for quantum machines and states.

## KEY EVENTS

Department members have started working on various projects this year. One ANR-funded project on distributed algorithms focuses on energy. Another one discusses Anosov flows. One of the HQI's five quantum houses, promoting the academic or industrial use of the first quantum machines, is run by members who work with the SATANAS department on potential HPC-quantum hybridisation, as well as with neighbouring laboratories (IMB, LOMA, XLIM, etc.).





## AD Team

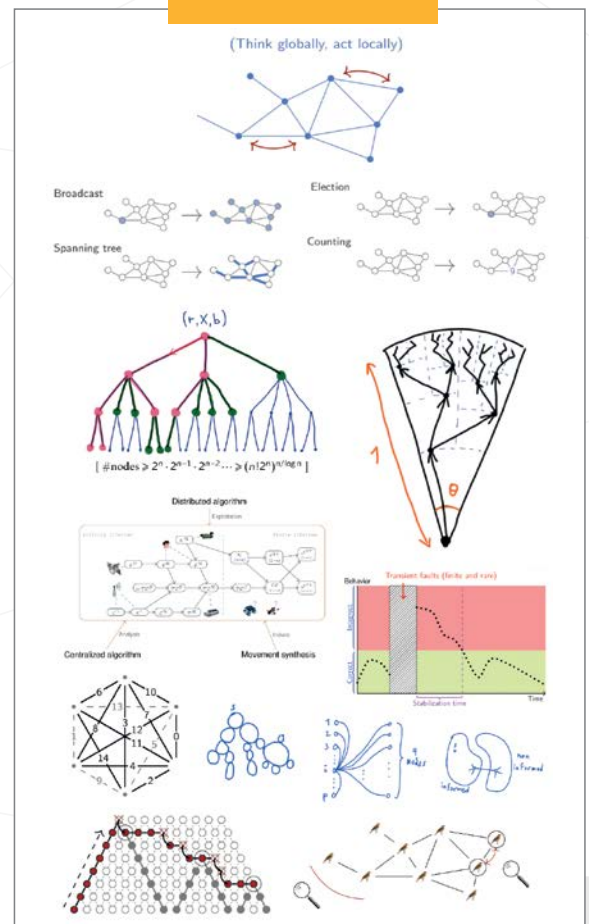
The development of networks and the increasingly widespread use of unreliable terminals with intermittent connectivity has led to the need for research into designing reliable Distributed Algorithms which are resistant to the vagaries of connectivity, can be scaled up, and with formally provable behaviour. Topics covered include the use of proof assistants such as Coq to prove the formal specification of distributed algorithms; fault-tolerant algorithmics; modelling and studying the algorithmic properties of large-scale distributed and dynamic networks; mobile agents; distributed big data; local computational models; modelling natural algorithms (biological or animal-inspired), probabilistic distributed algorithms, etc.



### KEY EVENTS

In 2024, the AD team published works presented at leading conferences in the field: PODC (self-stabilisation with low computational steps), DISC (rapid activation of a set of robots in geometric space by robots that are already active), TACAS (Coq certification of a Karp-Miller algorithm) and SIROCCO (construction of a spanning tree in dynamic networks).

In 2024, three theses on various topics were defended: accessibility in dynamic graphs, proof assistants and Petri nets, and white-box cryptography.



## CI Team

Combinatorics is the study of discrete structures that appear in computer science, mathematics, statistical physics, biology and, in fact, just about everywhere. Among the most widely studied are trees, paths in a grid, permutations, tables, combinatorial maps, polynomials, etc. The group's main research activity aims to obtain theorems, i.e. mathematical results describing the discrete structures in question, their relationships and their behaviour. These results apply in particular to the analysis of algorithms and the study of models in statistical physics, quantum field theory and quantum gravity. At the national level, this community organises events such as Journées de Combinatoires de Bordeaux (Bordeaux Combinatorics Days), held every year since 2009 by team members and during which LaBRI hosts around fifty participants.

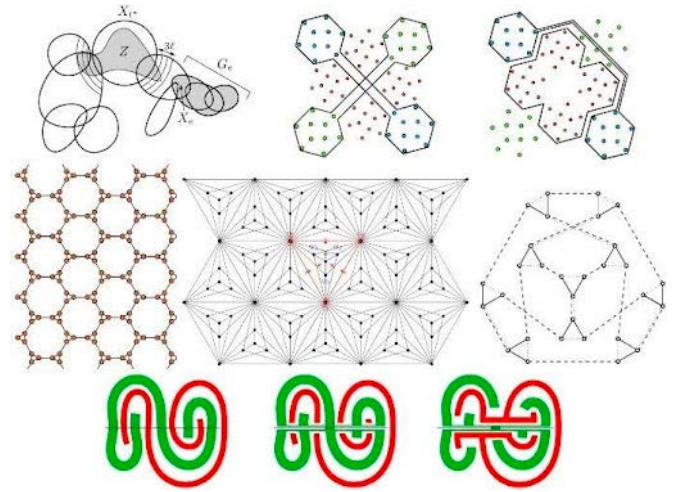


### KEY EVENTS

In 2024, one of our team members, Mireille Bousquet-Mélou, published a paper entitled "Intervals in the greedy Tamari posets" in collaboration with Frédéric Chapoton (CNRS Strasbourg). The paper studies a certain type of poset (partially ordered set), and the enumerative link between their intervals and that of certain planar maps. The paper was published in diamond open access (i.e. at no cost to the authors or readers) in the 2024 volume of the prestigious "Combinatorial Theory" journal.

## GO Team

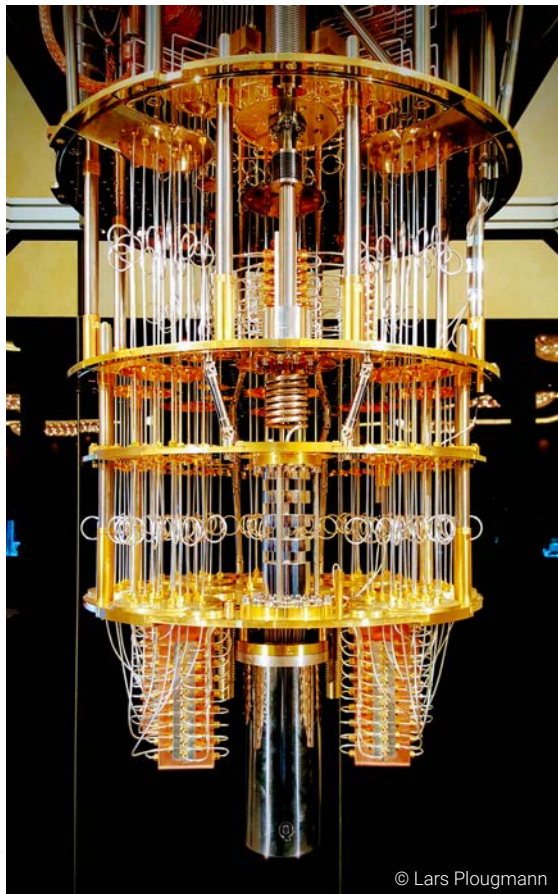
Graph theory is a powerful tool for modelling complex combinatorial structures. Our research focuses on the development of this theory and its applications, particularly in the field of network communications. We analyse classic problems in their most recent developments and introduce new lines of research. Our expertise in graph theory lies particularly in the structure of graphs. We use it for a variety of purposes, including analysing the parameters of general graphs and more highly structured graphs (planar, of bounded tree-width, with forbidden minors, etc.), graph colouring, computing compact routing tables, distance labelling, communication algorithms, graph coding and graph games.



### KEY EVENTS

In 2024, the team published four papers in the Journal of Combinatorial Theory, Series B, the leading journal in the field.

These papers, most of which were co-authored by PhD students in the team, covered issues such as efficient edge colouring, cubic graph structure and infinite graph minors. During the year, members of the team joined forces with the editorial board of the SIAM Journal of Discrete Mathematics and the STACS steering committee.



© Lars Plougmann

## ICQ Team [new team]

Quantum computing is a recent branch of computing that emerged in the early 1980s. It draws on the laws of quantum mechanics to extend the capabilities of today's computing and communications tools. Although quantum computers are still in the prototype stage, there are precise mathematical models that anticipate their potential. In this context, the ICQ team focuses on the computational gains offered by quantum algorithms, their practical implementation in quantum machines and, more generally, the nature and use of quantum information.



### KEY EVENTS

The ICQ team welcomed its first four PhD students in 2024. Three of them arrived as part of new collaborations with IBM France, the Laboratoire Ondes et Matière d'Aquitaine and the Institut de Mathématiques de Toulouse. Their thesis projects focus on the optimisation of quantum circuits, quantum query algorithms, the simulation of fermionic systems and quantum graphs. The ICQ team also organised the "Quantum Algorithms for Massive Data" workshop in early 2024, bringing together around forty experts in the field.

**LaBRI**

THÈSE

PRÉSENTÉE À

L'UNIVERSITÉ DE BORDEAUX

ÉCOLE DOCTORALE DE MATHÉMATIQUES

D'INFORMATIQUE

par Ema FALOMIR-BAGDASSARIAN

POUR OBTENIR LE GRADE DE

DOCTEUR

SPÉCIALITÉ : INFORMATIQUE

Calcul dynamique de chemin par c

**LaBRI**

université  
"BORDEAUX"

THÈSE





# IMAGE AND SOUND - I&S

## Department



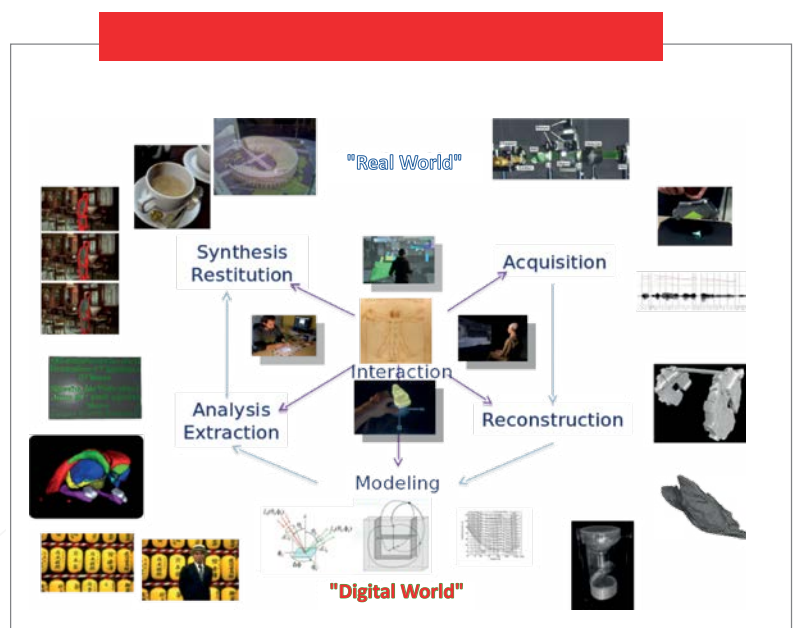
© Inria / Photos: C. Morel

The I&S department conducts research into the acquisition, processing, analysis, modelling, synthesis and interaction of audiovisual media, as well as the use of this media for data exploration and communication.

It manipulates a very broad spectrum of data which includes 2D and 3D images, videos, speeches, music, 3D data, EEG, physiological data, etc. The various stages in the processing chain involve modelling phases for both analysis and synthesis. Applications are aimed at health, medicine, education, games, the environment, etc.

### KEY EVENTS

This year, the department helped to organise numerous national and international events. In particular, we co-organised the Via4Climate + Sustainability Workshop: IEEE VIS 2024 Workshop on Visualization for Climate Action and Sustainability in conjunction with the IEEE VIS conference, and the 3<sup>rd</sup> Workshop on Explainable and Ethical AI in conjunction with the IEEE ICPR international conference. We have also developed new AI methods in order for a chest MRI to be used for clinical diagnosis.



## MANIOC Team

We design multimodal visualisation, acquisition, restitution and interaction systems, and study the underlying human-machine interaction processes. We develop tools for 3D modelling and visualisation to help bridge the gap between the real and virtual worlds. We are exploring approaches based on augmented reality (AR, VR), tangible interaction, brain-computer interfaces and physiological interfaces. This research is being conducted by the Manao, Potioc and Bivwac (Inria Centre at the University of Bordeaux) shared project teams.

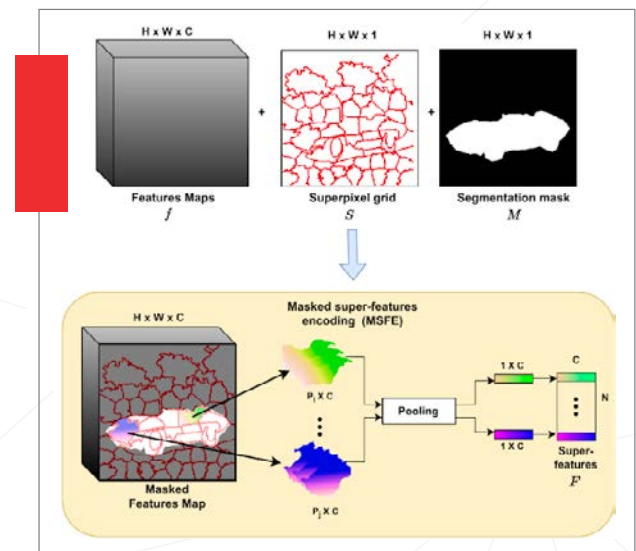
## KEY EVENTS

A number of key events in 2024 focused on Brain-Computer Interfaces (BCIs). Manioc organised the 2024 International Neuroergonomics Conference in Bordeaux, a leading BCI conference (>200 participants, co-chaired by F. Lotte). Our work on variability in BCIs led to D. Trocellier receiving the "Best Poster Award" at the International Graz BCI conference. Finally, somatosensory BCIs will be developed in the team, thanks to S. Rimbert obtaining a Young Researcher ANR (STIM-BCI) and an exploratory action (DCode-Brain) on the subject.



## TAD Team

Our team conducts research on multimodal data (images, video, speech, music). Our main areas of focus are: learning of representations (linguistics, musical symbols, graphs in imaging), frugal learning (sparsely annotated data), and the explainability of neural networks. Our work has applications in digital health (diagnostic assistance, 3D imaging, speech), segmentation/classification and music creation/composition (SCRIME). The team engages in interdisciplinary collaborations (agronomy, archaeology, health) and in LaBRI's AI and Digital Health divisions.

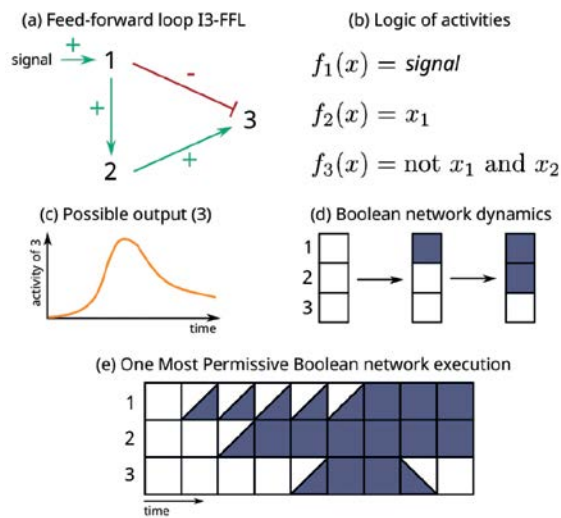


## KEY EVENTS

Many of this year's highlights relate to our work on medical imaging. Pierrick Coupé has been appointed to the steering committee of the VBHI (Precision and Global Vascular Brain Health Institute) and has been invited to Oxford by the French Embassy for a conference on the challenges of AI in healthcare. Finally, the French metal band Praetorian performed a sample of their repertoire, without amplifiers and using distortion effects reconstituted by AI, at a concert for the general public broadcast in quadraphonic sound using techniques developed by the team.

# FORMAL METHODS AND MODELS - M2F

## Department



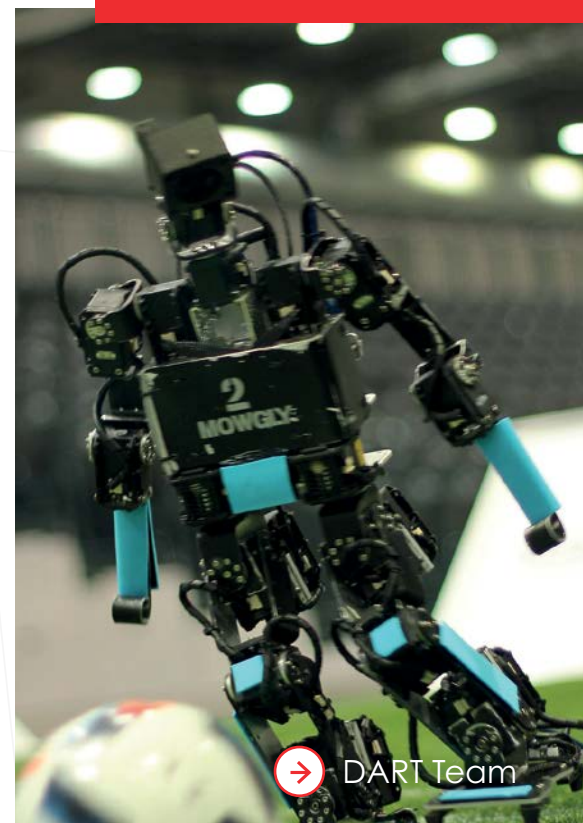
M2F's research themes are rooted in automata theory, logic and algebra. These areas are being developed as fundamental research, in particular by the LX team, which is characterising the expressiveness of certain logics and the algorithmic complexity of associated decision-making problems. These developments are used for various applications:

- to create trustworthy programmes and protocols (MTV team),
- to improve queries in databases and knowledge bases (RATIO team),
- to automatically generate programmes from specifications (SYNTHESIS team),
- to control robots and intelligent transport systems (DART team).

## KEY EVENTS

- Creation of the SYNTHESE\* team,
- Co-organisation of the MIMM 2024 project ("Moi Informaticienne, Moi Mathématicienne", highlighting women in IT and maths),
- Creation of the CNRS IRP (International Research Project) "Le Trójkąt" with the city of Warsaw,
- Organisation of and participation in the programme committee for the Highlights 2024 conference in Bordeaux,
- Participation in robotics demonstrations at Place Pey Berland in Bordeaux,
- Participation in MonProjetSup, career guidance software for secondary school students, presented at the European Education Fair.

\*This team does not feature in this 2024 version but will be presented in the next edition.



→ DART Team



## DART Team

Decision-making is at the heart of our research, which ranges from game theory to machine learning. Using a bio-inspired approach, the Inria MNEMOSYNE joint team is modelling the higher cognitive functions (mainly in mammals) that underlie the emergence of autonomous behaviour. The members of RHOBAN are working on robotic applications and embodiment, particularly implementing learning methods, as well as more traditional model-based methods. Another centre of interest is the design of autonomous farming robots, particularly with the ROBSYS Impulsion Research Network.



## KEY EVENTS

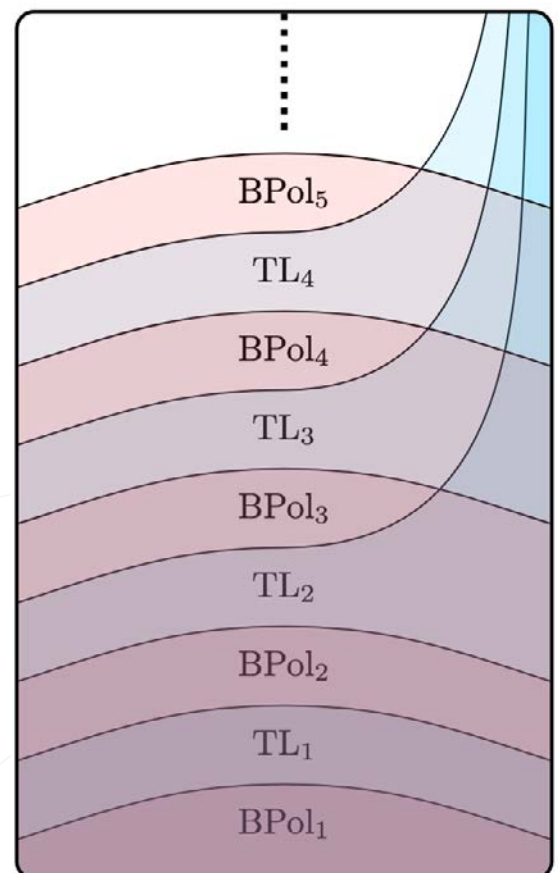
- Organisation of RobNA days (Bordeaux). Conference (~ 50 participants), demonstration (6 stands) (~ 800 visitors).
- Organisation of the workshop on Humanoid Soccer Robots 2024 (<https://whsr-2024.github.io/>) at the Humanoids 2024 IEEE-RAS International Conference on Humanoid Robots (Nancy, 30 participants).
- Organisation of a day on trustworthy AI and safe, sustainable mobility, in partnership with the Trustworthy AI Chair.
- Organisation of the "Dynamo - Données pour une analyse des Nouvelles mobilités Actives: Modélisation et Optimisation" conference with CEREMA.
- 6 theses defended
- 19 papers published

## LX Team

Something worth noting about theoretical computer science is that many computational models are defined in purely logical terms. Thus, the expressiveness of automata computational power is the same as monadic second-order logic, while the existential formulas of Peano's arithmetic correspond to Turing machines. Such correspondence has far-reaching consequences. We can study computational problems from a logical angle, and conversely, logic-based questions through the lens of computation. The research led by the LX team falls within this in-between area.

## KEY EVENTS

In 2024, the team's scientific output remained high, with three papers presented at the ACM-IEEE Symposium on Logic in Computer Science (LICS) and one paper published in the TheoreticCS journal. The team, led by Vincent Penelle, also organised the Highlights 2024 conference, which attracted over 130 participants, while over 30 took part in the Highlights Collaborative Research Week that followed. Lastly, the CNRS International Research Project "Le Trójkąt" led by Nathanaël Fijalkow in Bordeaux, Paris and Warsaw, began this year for a five-year period.



@ Thomas Place and Marc Zeitoun

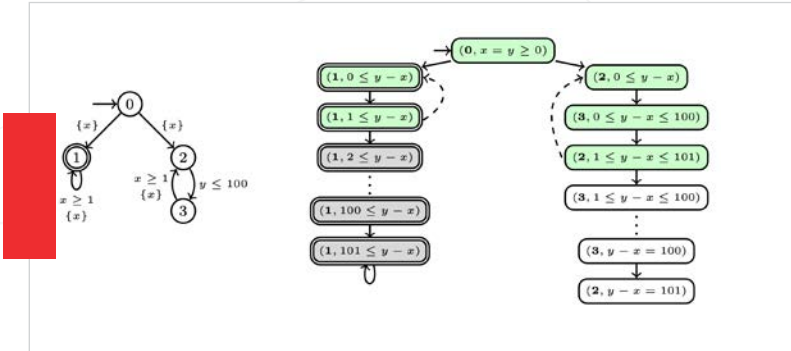
## MTV Team

MTV team members design models and algorithms for the formal verification of systems and programmes. Our research covers theoretical issues such as decidability and the complexity of verification problems, as well as practical applications including the development of verification tools and the analysis of biological processes. The team consists of 14 permanent researchers and 11 PhD/post-doctorate students.



## KEY EVENTS

One researcher, one research professor and two (post-)doctorate students were recruited, while two PhD students have defended their theses. We welcomed a dozen guest researchers for talks and collaborations. Among our main scientific contributions, research on proving ParcourSup algorithms led to the development of an extension to the Why3 tool which generates proof-certified Java programmes. It is included in the latest distribution of Why3, used for formal programme design in many projects.



## RATIO Team

RATIO focuses on reasoning with data, knowledge and constraints. The team works on reasoning applied to knowledge representation, description logics and ontology languages, automated reasoning, SAT resolution, constraint satisfaction problems, database theory, logic and automata on complex data, and incomplete and inconsistent information.



## KEY EVENTS

The RATIO team has a number of key events to report. Meghyn Bienvenu rejoined the team after over a year spent as an intern at the Franco-Japanese JFLI laboratory based at the National Institute for Informatics (NII) in Tokyo.

Joanna Fijalkow has also returned to work following her maternity leave. Papers were presented at KR'24, PODS'24 and published in the TheoretiCS journal, and guest talks were given at KR'24 and SUM'24, among others.

Meghyn Bienvenu, Diego Figueira and Pierre Lafourcade won the "Ray Reiter Best Paper Award Runner-Up" at KR'24.

Lastly, Diego Figueira has been promoted to Research Director at CNRS.



Y. Awuklu



M. Bienvenu



D. Figueira



J. Fijalkow



R. Jean



D. Kozhemiachenko



P. Lafourcade



S. Lombardy



S. Maabout



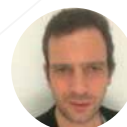
R. Morvan



V. Penelle



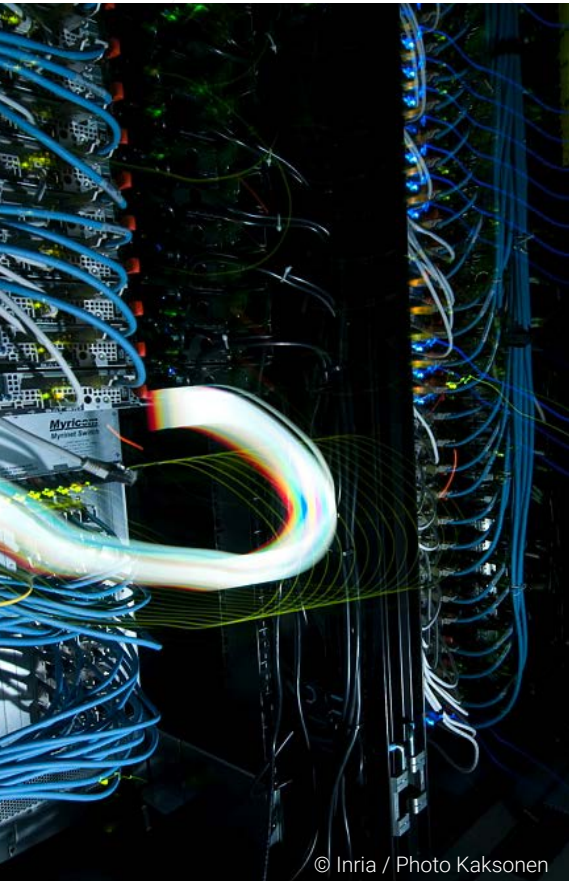
L. Simon



M. Zeitoun







© Inria / Photo Kaksonen

The SATANAS department contributes to the design and development of robust, high-performance simulation tools for hybrid and multicore exascale architectures. Solving these problems requires a multidisciplinary approach involving applied mathematics, scientific computing and information technology. The department is developing skills in a variety of areas, including programming paradigms, sophisticated scheduling mechanisms and innovative digital methods for scientific applications with a strong societal and economic impact.

## KEY EVENTS

Brice Goglin and Samuel Thibault were awarded the Inria - Académie des sciences - Dassault Systèmes Innovation Prize in recognition for their hwloc open-source software, which is widely used to help identify and locate supercomputer resources.

Following on from the European MICROCARD project, the STORM and TADAAM teams are participating in the exascale simulation of cardiac electrophysiology on a sub-cellular scale at the MICROCARD-2 European centre of excellence, led by the University of Bordeaux.

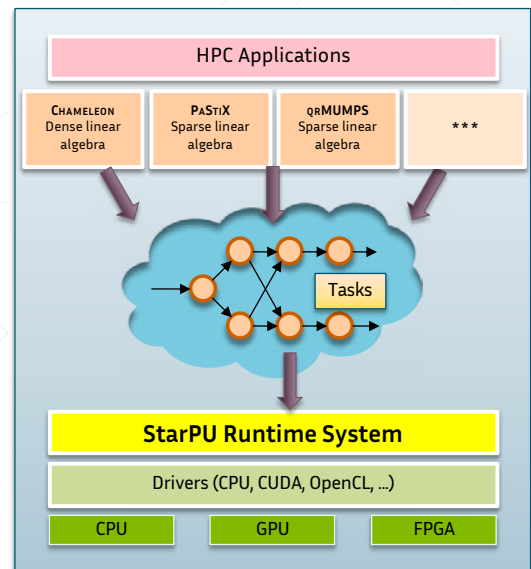
The department has been restructured into three research teams.



© Inria/Maison de la simulation/Photo H. Raguet

## STORM Team

STORM studies the efficient application of supercomputers through the development of execution supports (StarPU, StreamPU) and libraries (DUF, MIPP) to facilitate the expression of parallelism, abstract hardware complexity and optimise execution time and energy consumption. CORHPEX software explores performance optimisation spaces. PARCOACH checks that parallel and distributed constructions are correct. EasyPAP software supports the teaching of HPC programming techniques.



StarPU execution support has been developed to dynamically schedule the tasks of intensive computing applications on heterogeneous computing platforms.



## KEY EVENTS

Inria's LLM4DICE exploratory action led by Emmanuelle Saillard and Mihail Popov uses Large Language Models to identify and correct errors in parallel programmes.

Raymond Namyst has been appointed director of the Post-Exascale High-Performance Computing programme at Inria's Digital programme agency.

Alice Lasserre won the "Best Paper" award at the PDSEC symposium of the IPDPS 2024 conference for her work on multicriteria mesh partitioning.

The AFF3CT software was presented at the DGA Information Management Centre developers' day.

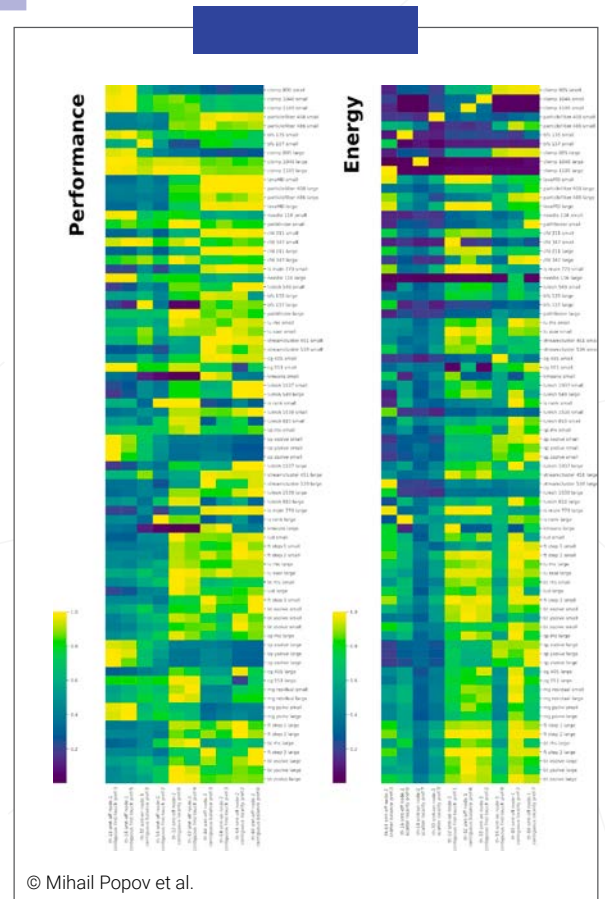
## TADaaM Team

The TADaaM team examines the movement of data. For calculations to be made quickly, the data must be in the right place at the right time. The team models computing platforms and applications to understand how they interact. Then specifically designed scale-up algorithms dynamically allocate resources according to the needs reported by the applications. This research is implemented in internationally distributed software (hwloc, Scotch) and in international standards which we contribute to (MPI).

## KEY EVENTS

DECoHPC is a joint team bringing together Inria and 4 Brazilian institutions (LNCC, UFF, UFRGS and CEFET-RJ). It aims to analyse parallel storage requirements, characterise the energy consumption of data movements, and study their performance, particularly in AI applications.

An engineer has been recruited for the Scotch software consortium to speed up related industrial and scientific developments. The draft agreement has been finalised and the first members are expected to officially join the consortium soon.



## TOPAL Team

The TOPAL team aims to build effective tools to optimise the operation of applications in high-performance computing platforms, in particular regarding linear and tensor algebra applications and machine learning. To achieve these objectives, we are focusing on the following issues: using runtimes to manage the dynamic performance of resources, implementing compression to minimise memory footprints and data exchanges, and limiting energy consumption.

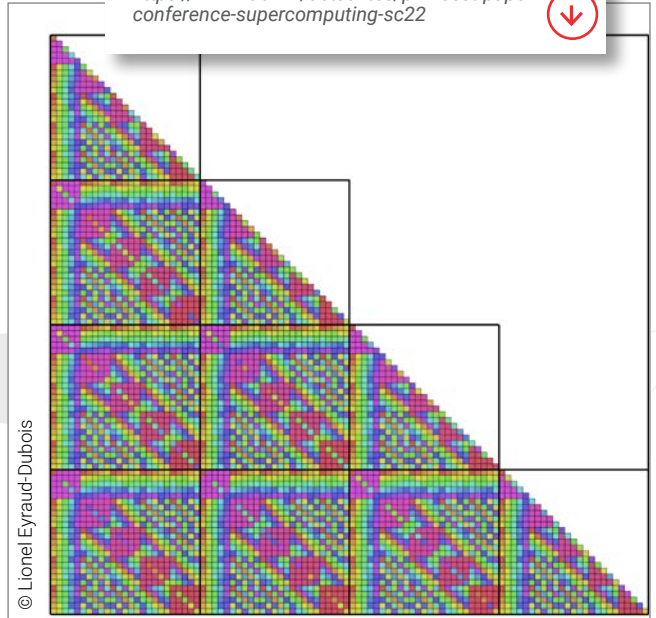
## KEY EVENTS

As part of a joint project with Qarnot Computing, E. Korkmaz and her colleagues were shortlisted for the "best paper" prize at the EuroPar 2024 international conference for their work on scheduling problems under energy constraints.

The TOPAL team is involved in the EuroHPC DARE project, which aims to develop European processors and accelerators based on the RISC-V instruction set. In this context, the focus is on developing high-performance digital libraries for targeted architectures.

The Triangular Block Cyclic distribution halves the number of communications required for symmetrical operations, compared with standard Block-Cyclic distribution. Here is an example using 30 processors and a matrix of 100 tiles on a side.

<https://www.labri.fr/actualites/prix-best-paper-conference-supercomputing-sc22>







# → SYSTEMS AND DATA - SeD Department

Two key aspects underlie the use of digital tools: the IT systems that govern their behaviour and the data they manipulate. Our department focuses on these pillars to simplify the implementation of tools, improve their performance and reliability, offer easy interaction for users, and study their impact and uses to increase sustainability. Our research draws on interdisciplinary partnerships in fields such as autonomous drones, bioinformatics, digital health, IoT and agronomy.



## KEY EVENTS

In 2024, NeS, a new team dedicated to digital technology and sustainability, joined the SeD department. A weekly working group has been organised on this topic for over a year, which led to the creation of the team. The team already includes five permanent members (Aurélié Bugeau, Olivier Gauwin, Gaël Guennebaud, Nicholas Journet and Anne Vialard) who have redirected their research interests and come from other departments.

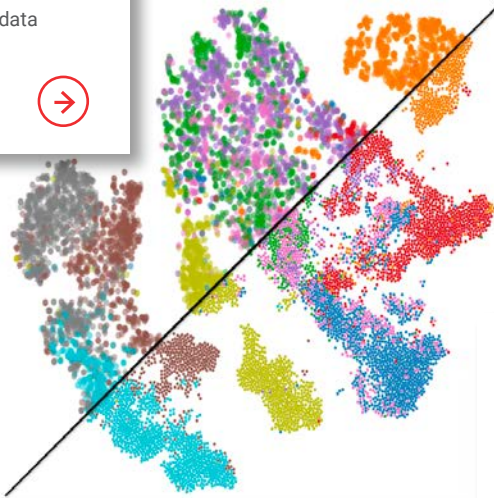


## BKB Team

Advances in data acquisition, storage and processing have led to an explosion of data since the 2000s. The BKB team focuses on the life cycle of this data, from production to visualisation, storage, modelling and analysis. Although our work aims to develop generic methodological tools, we mainly study real data and problems, in collaboration with experts in various fields. Our research is of particular benefit to biology and health, the humanities and social sciences, and explainable AI.

Dataset for AI classification.  
Each circle represents a piece of data  
(10,000 in total).

The data overlaps due to a  
lack of space. The readability is  
significantly degraded.



GIST provides...  
an appropriate scale factor  
Optimum data movement



Overlaps have been eliminated.  
The structure of the design has been  
preserved.  
All information is legible

## KEY EVENTS

Loann Giovannangeli was awarded a runner-up prize in the GDR IG-RV 2024 thesis competition for his thesis entitled "Génération et Evaluation de Visualisations avec des techniques d'Apprentissage Automatique" (Generation and Evaluation of Visualizations with Machine Learning Techniques), supervised by Romain Bourqui. During his thesis research, Loann Giovannangeli focused on the use of supervised and unsupervised machine learning methods to produce visualisations. He also suggested using deep neural networks to determine the quality of visualisation for specific tasks.

## NeS Team [new team]

The aim of the NeS team (Digital Technology and Sustainability) is to inform societal choices in terms of the environment, resilience and social equity. It studies the use of digital technology to support the digital transition, the socio-environmental impacts of digital technology and how to teach about the digital transition. In particular, the team aims to propose and improve impact assessment methodologies. It addresses this issue using appropriate mathematical models, dynamic simulations, scenarios, in situ experiments and interactive exploration tools.

Prospects  
and scenarios

Understanding  
the impact of  
technology

Research  
Topics

Science  
and Society

Sharing and  
Teaching

## KEY EVENTS

In addition to their scientific papers, NeS members played an active role in 2024 in:

- developing Computer Hardware and Research Activity modules using the GES 1point5 tool with the Labos 1point5 research group. (Benaben et al., Estimation de l'empreinte carbone d'une heure de calcul sur un cœur CPU ou sur un GPU, 2024),
- the Shift Project working group on the networks of the future,
- the AFNOR-led working group drafting specifications on frugal AI.



## PROGRESS Team

The Progress team develops software systems operating in complex environments, with a particular focus on code quality, performance optimisation and security. A noticeable feature of the Progress team is its commitment to implementing and evaluating systems under realistic conditions, as well as creating start-ups. The team covers application areas such as video streaming, e-commerce applications, aerial surveillance systems and intelligent transport systems.



## KEY EVENTS

Jean-Rémy Falleri, Floréal Morandat and Xavier Blanc won the prestigious “Most influential Paper” award at the *Automated Software Engineering 2024* conference, one of the leading events in the sector. This prize rewards the papers from this conference that have had the greatest influence on research over the last ten years. They were singled out for their work presented in the paper “*Fine-grained and accurate source code differencing*”, which introduces a new approach to analysing the development of software systems, i.e. inferring syntactic changes.

ExtractMethod\_v0.java

```
1 public class AccountManager {
2     private String name;
3     private double outstanding;
4
5     void printOuting() {
6         // Print banner
7         System.out.println("Details of account");
8         System.out.println(name);
9         System.out.println("");
10
11         // Print details
12         System.out.println("name: " + name);
13         System.out.println("amount: " + outstanding);
14     }
15 }
16 }
```

ExtractMethod\_v1.java

```
1 public class AccountManager {
2     private String name;
3     private double outstanding;
4
5     void printOuting() {
6         // Print banner
7         System.out.println("Details of account");
8         System.out.println(name);
9         System.out.println("");
10
11         // Print details
12         printDetails();
13     }
14
15     void printDetails() {
16         System.out.println("name: " + name);
17         System.out.println("amount: " + outstanding);
18     }
19
20 }
```



ACCUEIL

EXIT





# RESEARCH SUPPORT - SaR Department

Essential to the running of the laboratory, the SaR department (Research Support) has 20 staff divided into three teams, i.e. Administration, Finance, and Systems and Networks, as well as SCRIME.

Its mission is to ensure the implementation of the laboratory's scientific policy via the following activities:

- Management of budgets and scientific credits,
- Interfacing with external partners,
- Monitoring of calls for projects,
- Reception of staff and visitors in accordance with ZRR (strict security regime area) procedures,
- Management and administration of the laboratory's administrative resources,
- Management and administration of the laboratory's IT resources,
- IT support for research projects.



## KEY EVENTS

Faced with an active and constantly changing public research environment, the SaR department successfully adapts its range of administrative, financial and technical support services to provide professional and seamless assistance.



Magali  
Hinnenberger

Director of the laboratory,  
Member of the Management Board,  
Head of the SaR department.



Annick  
Mersier

Her duties at SCRIME include the administrative, financial and logistical management of Arts and Sciences projects. She supports the Platform's managers and users, facilitating their research and creative work, mediation activities and the organisation of events.



## ADMINISTRATIVE TEAM

In compliance with the rules and procedures of the ZRR (strict security regime area) and the constraints of our supervisory authorities, the team's tasks are as follows:

- Welcoming new members (permanent and contractual staff, guests, trainees),
- Managing FSD (Security Officer) requests,
- Updating information systems (Reseda, directory, mailing list, IDNUM),
- Recruiting contractual staff,
- Room management, office allocation, key and badge management,
- Internal and external communication.



Safia Amsili



Laurie Dantas



Auriane Dantès



Claire Douvier



Cathy Roubineau



Sara Savineau

## KEY EVENTS

- Expansion of the team with the arrival of Claire Douvier (reception) and Sara Savineau (communications),
- Handling of 88 contract files, 82 trainees, 129 guests and 144 FSD (Security Officer) files,
- Drawing up of 108 internship agreements, including 55 paid internships,
- Recruitment of 30 contractual staff,
- Creation of the PREFACE interface (to facilitate the management of external staff),
- Improvements to the FASCIL data entry application (form for new trainees, contractual staff and guests),
- Organisation of lab breakfasts to strengthen group cohesion in the lab,
- Creation of a procedure for staff leaving the laboratory,
- Creation of a "Best practices" guide for new trainees,
- Creation of regular communication content on the laboratory's scientific activities (website, newsletter, annual report).

## FINANCE TEAM

LaBRI operates on financial resources attributed by its three supervisory bodies – CNRS, the University of Bordeaux and Bordeaux INP –, as well as its own funds, representing a total budget of around €2 million per year. These resources are managed by the finance team, who assists agents with all financial procedures and ensures that expenditure is in line with public accounting rules. Constant changes to such rules and tool developments require managers to adapt their working methods and acquire new technical and professional skills.



Isabelle Garcia



Chloé Godard



Ophélie Lacaule



Emmanuelle Lesage



Elia Meyre

## KEY EVENTS

- In 2024, the finance team processed 620 assignments and 650 orders using 80 different funding sources.
- The team also managed the logistical and financial organisation of five selection committees and three symposiums.
- An audit was carried out by the CNRS in September 2024 to ensure that public expenditure was in accordance with the regulations and instructions in force at the institution. The audit results were particularly positive, and the team was praised for its professionalism.
- In December 2024, Chloé Godard took up the position of Chief Manager.

## SYSTEMS AND NETWORKS TEAM

The Systems and Networks team manages the administration, maintenance and development of the laboratory's information system.

Its line of work includes infrastructure administration, i.e. IT (rooms, networks, servers), equipment management, user support, web application development, IT security and support for researchers' experiments.



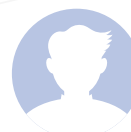
Matthieu Bectard



Michaël Fontaine



Timothé Gadéa



Alexandre Issouli



Pierre Lacroix



Gabriel Larrouy



Pascal Ung

## KEY EVENTS

### Staff changes:

- Departure of Benoît Capelle, Head of Production, who passed the Research Engineer competitive examination at the Rectorat de Bordeaux (Bordeaux Board of Education)
- Promotion of Michael Fontaine to CNRS Research Engineer
- Recruitment of a new research engineer, Gabriel Larrouy, through a CNRS competitive examination
- University of Bordeaux contract recruitment of a new design engineer, Timothé Gadéa
- Arrival of Mathieu Bectard, a Licence Pro ADSILLH student (vocational sandwich degree)

### Organisation:

- Following these major staff changes, the team now forms a single entity and is redefining itself through structuring projects that will lead to changes in services, technologies and working methods.

### Security incident management:

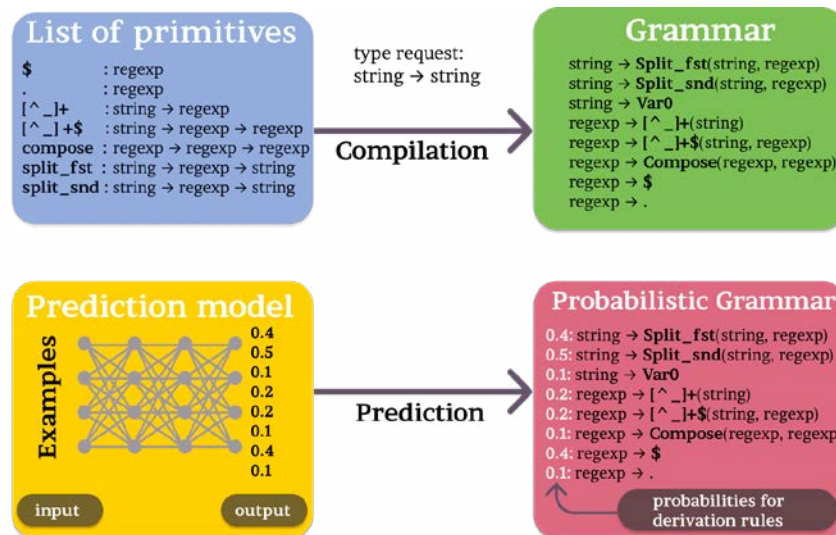
- Break-in and theft of a computer from a ground floor office



Cross-cutting area

# ARTIFICIAL INTELLIGENCE

- AI



The LaBR.AI research area, the first to be created at LaBRI, brings together around 50 researchers and PhD students from various departments, promoting thematic diversity in AI. It studies application approaches (LLMs for software engineering, programme synthesis, HPC applied to AI, AI in healthcare, data visualisation) and specific topics:

- **Processing of imperfect data:** Available data offers a huge potential, but relevant and reliable information is hard to find. The data comes from a wide range of sources and is inputted in different ways, with varying degrees of accuracy.

- **Explainability and developments in models:** A trained neural network can rely on irrelevant elements for its decision-making. To increase trust in these models, we are developing methods to identify the key elements influencing decision-making, whether in an image or in data. We also propose approaches to ensure that they are continuously updated after they are rolled out, guaranteeing their relevance over time.

- **Verifiability and trust in AI:** Despite some remarkable technological advances, few studies place trust at the centre of AI objectives, limiting its use in critical contexts. To remedy this, we are exploring formal methods to guarantee verifiable properties of models and decisions. We are also working on programme synthesis to automatically generate systems that comply with precise specifications, thereby reinforcing the reliability of AI-based solutions.

## KEY EVENTS

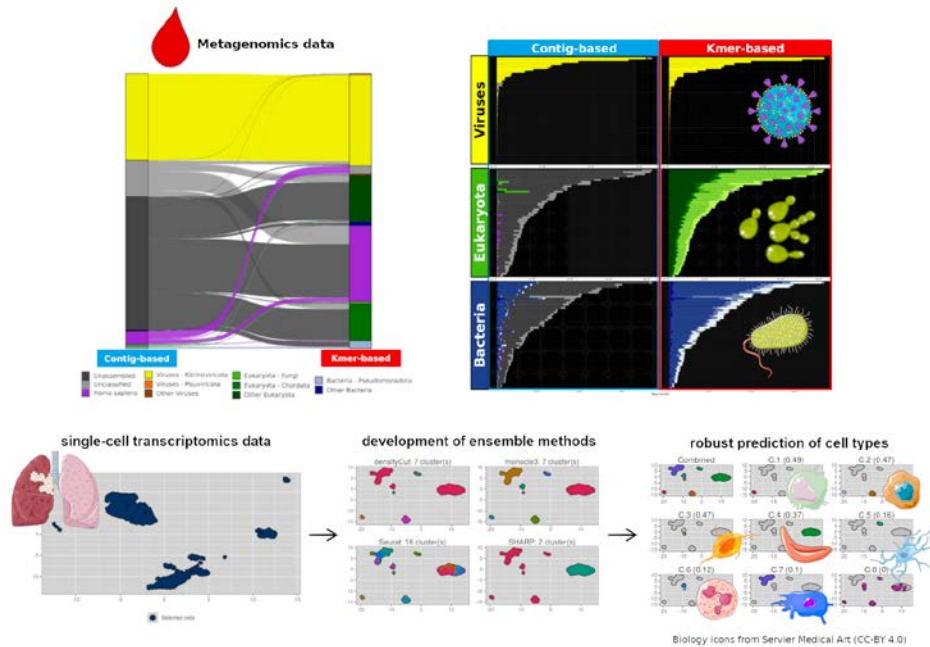
- Six papers were presented at the Knowledge Representation 2024 conference, including one that won the "Best Paper Award".
- The first "Programme Synthesis" days were held at LaBRI, supported by the IFM and RADIA research groups.
- The "Explainable and Ethic AI" workshop was organised as part of the ICPR 2024 conference.
- Software for continuous and online learning (Move-to-Data) was filed.
- The Trustworthy AI Chair was awarded the "Diffusion des Savoirs" (Dissemination of Knowledge) prize by the Bordeaux University Foundation.



Cross-cutting area

# DIGITAL HEALTH

## - e-Health



The aim of LaBRI's Digital Health research area is to develop methodologies to diagnose neurodegenerative diseases, predict markers and therapeutic targets, and provide support for disability, rehabilitation and prevention.

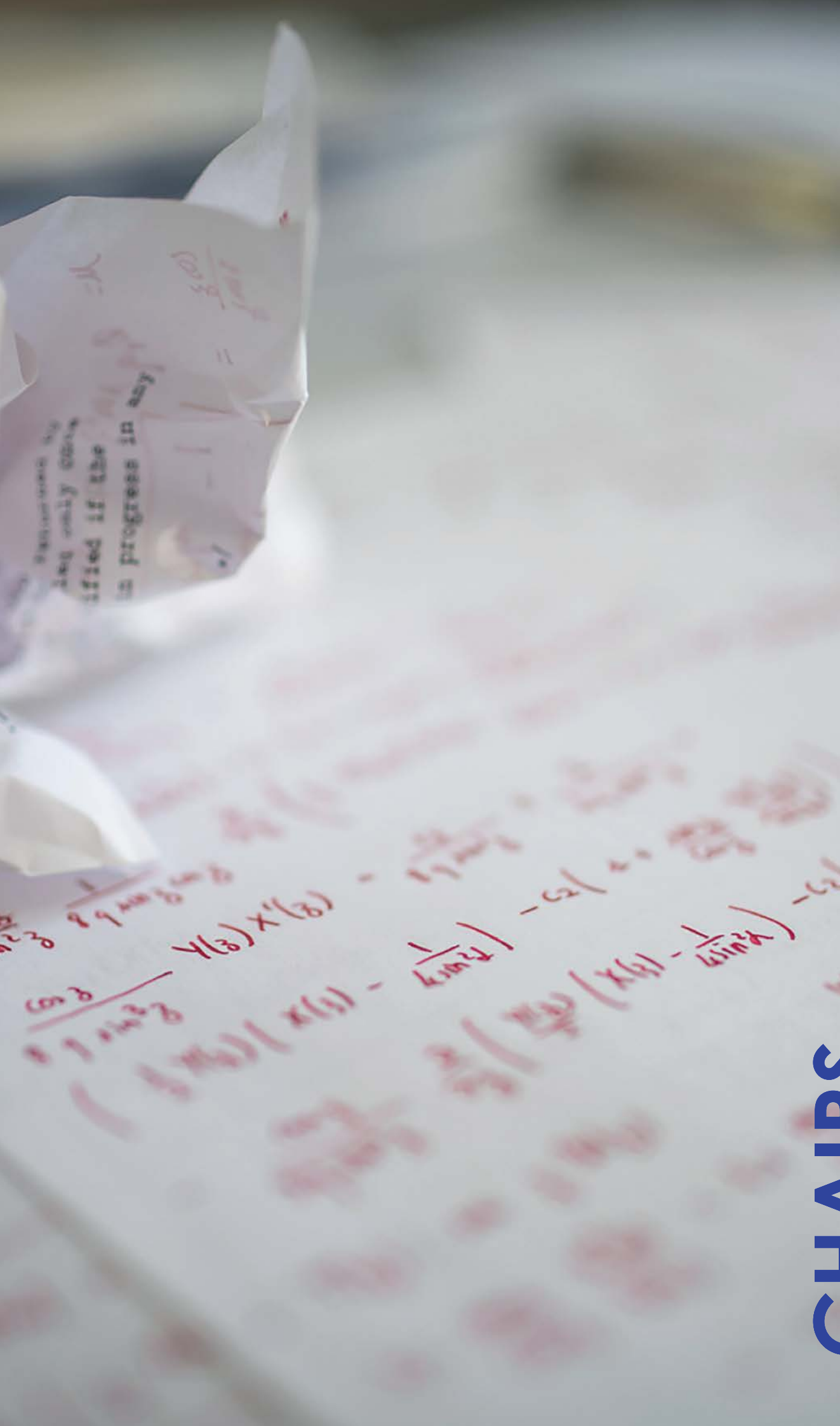
Such methods involve the analysis of medical images, multimodal and omics data, knowledge representation, modelling of dynamic systems, automatic learning and reasoning, stochastic simulation of cell models, and the design of new man-machine interfaces.

### KEY EVENTS

- CNRS "Health data sciences" CPJ (Junior Professor Chair) recruitment.
- Collaboration with BRIC (Bordeaux Institute of Oncology), with funding for co-supervised Masters internships and an interdisciplinary PhD between LaBRI and BRIC.
- Digital health (post-)doctorate students' morning on Wednesday 20 March 2024. The event fostered fruitful discussions between PhD students and LaBRI researchers.
- Ten seminars with guest speakers were organised in 2024.







# CHAIRS



# CYBER RESILIENCE OF DIGITAL INFRASTRUCTURES

(Cybersecurity)



The Cyber Resilience of Digital Infrastructures Chair is endorsed by ENSEIRB MATMECA - Bordeaux INP in partnership with the University of Bordeaux and the Bordeaux University Foundation. It is supported by public and private partners such as Adacis, Advens, Beware Cyberlabs, CATIE, Synacktiv and Tehtris.

The Chair's mission is to build and structure a network of academic and business partners to work on cyber resilience, with four components:

- Produce knowledge and research for practical applications
- Develop a range of training courses in collaboration with professionals
- Leverage the technology transfer from the public to the private sector
- Provide advice and expertise in the field of cyber resilience



## KEY EVENTS

- Graduation ceremony for the 2<sup>nd</sup> DE ECIN class,
- Contribution to the *Sud-Ouest* magazine "Études dans le Sud-Ouest: la cybersécurité, un secteur toujours aussi porteur" (Studying in Southwest France: cybersecurity remains a buoyant sector). March 2024,
- Co-organisation of the 2024 Cybermatinée Sécurité conference with *Le Monde Informatique*,
- Hack-it-n 2024: 10<sup>th</sup> technical conference on cybersecurity,
- Science INPhuse Conference/Debate on cybersecurity, October 2024.



# TRUSTWORTHY ARTIFICIAL INTELLIGENCE (AI)



The Trustworthy AI Chair, operated by the Bordeaux University Foundation, with Bordeaux INP and the University of Bordeaux in partnership with Kedge Business School, is led by Laurent Simon (LaBRI). The Chair aims to develop trustworthy artificial intelligence which is verified, ethical, explainable and responsible. It draws on multidisciplinary expertise and develops research, training and dissemination activities to promote the controlled deployment of AI technologies in companies.

It is sponsored by Floa, AtHome Solutions, FieldBox, Guy Hoquet and CATIE.



## KEY EVENTS

- A "Mobility and Artificial Intelligence" workshop (with the Mobility Chair), and another on large language models were organised.
- The Chair was awarded the "Diffusion des Savoirs" (Dissemination of Knowledge) prize at the Foundation's gala, in recognition of its 15 invitations to give presentations, 4 conferences for the general public, 7 articles in the written press and 3 interviews in the audiovisual press.
- A new thesis was co-funded on the use of large language models for medical diagnosis (Andrew Zamaï).
- A student citizens' convention on the adoption of AI in education has been announced for 2025.
- An "AI Expert" university diploma has been introduced.



# MOBILITY AND INTELLIGENT TRANSPORT (MTI)



The Mobility and Intelligent Transport Chair (MTI), supported by Bordeaux INP and the University of Bordeaux, and backed by the Bordeaux University Foundation, conducts research, training and experiments dedicated to cooperative intelligent transport systems. Its aim is to pave the way for more efficient and sustainable mobility by tackling major scientific challenges such as communications, data processing, perception, artificial intelligence and security.

Supported by eight patrons – Aximum, Cesi, Egis, Gertrude, Keolis Bordeaux Métropole Mobilités, NeoGLS, CEREMA and Two Roule – the MTI Chair is at the heart of the technological and societal challenges of tomorrow's mobility.



## KEY EVENTS

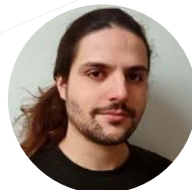
- Acceptance of the 2024-2028 European SCALE project (Strengthening C-ITS Adoption and Lining-up across Europe), which will co-finance the setting up of a C-ITS certification site on-campus, among other aspects.
- Acceptance of the 2024-2028 SIMON project (Intelligent Surveillance and Optimised Maintenance of Non-Structuring Networks) as part of the CORIFER 2024 call for projects.
- Validation of the R3MOB regional research network consolidation phase (2024-2028) by the region.
- Signing of a springboard agreement between the University of Bordeaux, Bordeaux INP and Keolis Bordeaux Métropole Mobilités (KB2M) to strengthen collaboration on mobility-related issues.

# → NEW ARRIVALS



## **Benjamin Bach** - Inria research fellow (CR)

Benjamin is a researcher at Inria in the Bivwac team, where he works on data visualisation, interactive interfaces, analysis and communication tools, and data literacy education. His methods include design, implementation and human-centred evaluation.



## **Jean Basset** - Associate professor (MCF)

Jean joined the Manao team in the I&S department in September 2024. His research lies at the crossroads between computer graphics and cognitive science, and focuses in particular on 3D animations, stylised rendering, the perception of animated videos and artistic control.



## **Mathieu Bectard** - Work-study student

In November 2024, Mathieu joined the Systems and Networks team in the SaR department (Research Support) as an apprentice.



## **Claire Douvier** - Non-teaching and administrative staff (BIATS) at UBx

In March 2024, Claire joined the administrative team of the SaR department (Research Support) as a receptionist, replacing Sylvie Le Laurain who retired.



## **Timothé Gadéa** - Fixed-term contract engineer

Timothé joined the Systems and Networks team in the SaR department (Research Support) in November 2024 as an engineer on a fixed-term contract, replacing Benoît Capelle.



## **Loann Giovannangeli** - Associate professor (MCF)

Loann joined the BKB team (SeD department) in 2024, to cover the Information Visualisation topic (VIS). His research focuses on designing algorithms and methods based on machine learning to generate, process and evaluate visualization techniques (graph drawing, scatter plots, etc.).



## **Chloé Godard** - Non-teaching and administrative staff (BIATS) at UBx

In December 2024, Chloé joined the Finance team in the SaR department (Research Support) as team leader.



## **Mathieu Hilaire** - Associate professor (MCF)

Mathieu joined the MTV team (M2F department) in September 2024. His research focuses on infinite-state transition systems and the complexity of associated specification and verification issues. He is also interested in game theory.



## **Hicham Lakhlef** - Professor

Hicham arrived in September 2024. His research focuses on distributed and parallel protocols for the self-organisation of mobile objects, energy-efficient communication in the Internet of Things, security with key and trust management, and the application of stochastic processes and machine learning in the IoT.



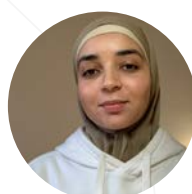
## **Gabriel Larrouy** - CNRS studies engineer (IE1)

Gabriel previously worked at the University of Bordeaux. He joined the Systems and Networks team in the SaR department (Research Support) after passing a competitive examination to become a Studies Engineer at CNRS.



## **Adélaïde Raguin** - Junior Professor Chair

Adélaïde joined the MTV team (M2F department) in December 2024. Her research focuses on building biophysical models on a microscopic scale to reproduce and explain the stochastic dynamics of complex biological systems in a wide range of applications, from medicine to the bioeconomy.



## **Sara Savineau** - Student

To support the laboratory's communications activities, Sara joined the SaR department (Research Support) on a student job contract in December 2024.





# MISSIONS





# COMMUNICATION

## COMMUNICATION

Meaning, listening, exchanges, definition, restitution



The aim still is to maintain both internal and external communication to raise the profile of LaBRI.

- Coordinating and/or designing various internal and/or external communication tools.
- Organising recurring and/or one-off events.
- Collecting and publishing information via various communication channels: website, newsletter, Bluesky and X accounts, reception desk TV.

Head of Communications: Auriane Dantès

### KEY EVENTS

- Update and publication of the annual report (2023 edition)
- Preparation and publication of LaBRI's calls for projects booklet + highlights on the website
- Production and distribution of various posters
- Coordination of the Fête de la Science (science festival)
- Organisation of LABRI's two Annual General Assembly Meetings, including surprises at the end
- Organisation of symposiums



Contact

communication@labri.fr  
or auriane.dantes@labri.fr

## Mission



# STRUCTURING PROJECTS, INNOVATION AND TRANSFER (PSIT)

The scope of this mission includes LaBRI projects of a structuring nature (large-scale projects, complex projects, highly innovative projects). From a practical point of view, these projects may involve our supervisory bodies, companies and other socio-economic stakeholders. The aim is to support, facilitate and increase the transfer of LaBRI's expertise and results towards the socio-economic fabric and develop structuring and privileged partnerships. At the same time, the aim is to bring socio-economic issues to the attention of LaBRI.

These objectives are perfectly in line with our supervisory authorities' roadmaps on the subject of leveraging the technology transfer.

The two key words here are visibility and fluidity.

**Visibility** firstly, by helping to identify valuable potential for leveraging. A great deal of research carried out at LaBRI could lead to technology transfer or collaborations with the socio-economic world but sometimes we do not see the potential due to our proximity to the subject. The aim is to make these existing possibilities visible, to bring them to light by clarifying which technology transfer and which fundamental research and results could be developed (in all forms). Leveraging the technology transfer can come in the form of collaborative projects, joint laboratories and structuring projects, as well as software and patent registrations, licences, scientific competitions, company start-ups, etc.

Then there is **fluidity**, by having a facilitating role.

Generally speaking, the aim is to understand the existing mechanisms to leverage the technology transfer and create structuring projects, as well as the associated procedures, in order to facilitate their adoption and use by LaBRI members. This includes help in putting together applications if necessary.



## KEY EVENTS

Since its creation, the committee has put LaBRI researchers in touch with major groups (Siemens, Ariane Group, Lectra Systems, Thales) and innovative start-ups (Enchanted Tools and Wavestream Labs, for instance). It has also brought together start-ups from LaBRI through meetings and a newsletter, and has worked to raise awareness of intellectual property issues in the IT sector among laboratory members. Finally, it has been in regular contact with the SATT Nouvelle-Aquitaine, the incubators in Bordeaux and the University bodies responsible for technology transfer and industrial relations.

## Composition of the committee:

Project coordinator: Serge Chaumette

Committee members: Nadine Couture, Cyril Gavaille,  
Raymond Namyst, Laurent Simon



## Contact

psit@labri.fr



# SPECIFIC ACTIONS

Here are some of the major initiatives undertaken by the laboratory to improve quality of life, support change and successfully complete the ecological, environmental and societal transition.



## Key events:

### **Actions supporting gender equality:**

- Continuation of the mentoring programme based on the model of previous years, resumption of single-sex meals.
- Screening of "Picture a Scientist" to the whole lab, a film raising awareness of the impact of stereotypes in academia.
- Organisation of the "Moi Informaticienne, Moi Mathématicienne" programme for secondary school girls (67 interns accepted out of 120 applications) with the IMB.

### **Psychosocial risks:**

- A dozen laboratory members attended a training course organised by the Charles Perrens psychiatric hospital on Mental Health First Aid.
- As part of the psychosocial risk prevention programme, the laboratory's staff, particularly PhD students, were invited to attend two seminars on Impostor Syndrome.
- Once a month, during the Monday Lunchtime Meetings on Transitions, discussion sessions and seminars on computer science research in the Anthropocene were organised.
- A prototype online tool was developed to analyse the environmental impact of missions.





The Association de la Formation Doctorale d'Informatique de Bordeaux (AFoDIB) supports the integration and training of PhD students in computer science in Bordeaux. Throughout the year, it organises events to foster exchanges between PhD students, post-doctorate students and members of LaBRI and Inria Bordeaux, regardless of their field of research. By joining the association (annual membership fee of €5), everyone can take part in the many activities on offer and contribute to boosting the local scientific community.

[afodib.labri.fr](http://afodib.labri.fr)



#### KEY EVENTS

This year, the AFoDIB has increased the number of opportunities to get together, with several events at LaBRI and elsewhere. Between the integration day to welcome new PhD students, seminars to discuss our research, games evenings and nature outings, there was something for everyone. The aim remains the same, to create links and stimulate PhD life.

#### Composition of the association:

President: Taissir Marcé  
Vice-President: Lamyae Hassini  
Treasurer: Méline Trochon  
Vice-Treasurer: Romain Delpy  
Secretary: Oscar Fontaine



**Contact**

[labri.afodib@diff.u-bordeaux.fr](mailto:labri.afodib@diff.u-bordeaux.fr)



The Studio de Création et Recherche en Informatique et Musiques Expérimentales (Studio for Creation and Research in Computer Science and Experimental Music) conducts scientific research aimed at enhancing how music is experienced in its various dimensions including listening, performance, composition, analysis and learning. A large part of our work covers music informatics, particularly related to artificial intelligence. Our research is promoted through projects bringing together scientists and artists, as well as mediation and educational initiatives intended for the music community and the general public.

## KEY EVENTS

- Opening of the METAscène visual and musical performance on 20/09/24 in the MECA hall during European Heritage Days. METAscène was commissioned by the Office Artistique de la Région Aquitaine from SCRIME.
- Concert at L'Inconnue music school in Talence on 18/10/24 on the theme of scientific experimentation with the guitar, featuring performances from the Praetorian and Montag groups.
- Educational activities (about art and culture) in three schools in the Bordeaux area.









# → GLOSSARY

**HPAA:** Algorithmes et Applications Haute Performance (High-performance algorithms and applications)

**AD:** Algorithmique Distribuée (Distributed algorithm)

**AFoDIB:** Association de la Formation Doctorale d'Informatique de Bordeaux (Bordeaux Computer Science PhD Training Association)

**ANR:** Agence Nationale de la Recherche (French National Research Agency)

**BIATSS:** Bibliothèques, Ingénieurs, Administratifs, Techniques, Sociaux et Santé (Library, Engineering, Administrative, Technical, Social and Health staff)

**BKB:** Bench to Knowledge and Beyond

**CHU:** Centre Hospitalier Universitaire (University hospital)

**CI:** Combinatoire et Interactions (Combinatorics and interactions)

**CNRS:** Centre National de la Recherche Scientifique (French National Centre for Scientific Research)

**CombAlgo:** Combinatoire et Algorithme (Combinatorics and algorithms)

**CR:** Chargé de Recherche (Research fellow)

**DART:** Décision et Apprentissage : de la théorie aux applications robotiques (Decision-making and learning: from theory to robotic applications)

**DR:** Directeur de Recherche (Research director)

**EEG:** Electroencephalography

**GdR:** Groupements de Recherche (Research groups)

**GIS:** Groupement d'Intérêt Scientifique (Scientific interest group)

**GO:** Graphes et Optimisation (Graphs and optimisation)

**WG:** Working group

**HPC:** High Performance Computing

**I&S:** Image et Son (Image and Sound)

**AI:** Artificial Intelligence

**ICQ:** Information et Calcul Quantique (Information and Quantum Computing)

**IDNUM:** Digital ID card (University of Bordeaux)

**IHU:** Institut Hospitalo-Universitaire (Hospital-University Institute)

**RHU:** Recherche Hospitalo-Universitaire en santé (Hospital-University Research in Health)

**Inria:** Institut National de Recherche en Sciences et technologies du numérique (National Institute for Research in Digital Science and Technology)

**MRI:** Magnetic Resonance Imaging

**ITA:** Ingénieur, Technicien, Administratif (Engineer, Technician, Administrative staff)

**IUF:** Institut Universitaire de France (Academic Institute of France)

**LaBRI:** Laboratoire Bordelais de Recherche en Informatique (Informatics Research Bordeaux Laboratory)

**LX:** Logical foundations of computing

**M2F :** Méthodes et Modèles Formels (Formal models and methods)

**MCF:** Maître de conférences (Associate professor)

**MTI:** Mobilité et Transports Intelligents (Smart Transport and Mobility)

**MTV:** Modèles et Technologies pour la Vérification (Models and Technologies for Verification)

**PEPR:** Programme et Equipements Prioritaires de Recherche (Priority Research Programme and Equipment)

**PR:** Professor

**Progress:** Programmation, réseaux et systèmes (Programming, systems and networks)

**PSIT:** Projets Structurants, Innovation et Transfert (Structuring Projects, Innovation and Transfer)

**AR:** Augmented Reality

**RATIO:** Raisonnement sur les données, les connaissances et les contraintes (Reasoning with data, knowledge and constraints)

**Reseda:** Reference tool for CNRS staff and organisations

**Robocup:** World football championship for robots

**VR:** Virtual Reality

**SaR:** Soutien à la Recherche (Research support)

**SAT:** Boolean satisfiability problem

**SATANAS:** Supports et AlgoriThmes pour les Applications Numériques hAutes performanceS (Supports and algorithms for high-performance digital applications)

**SCRIME:** Studio de Création et de Recherche en Informatique et Musiques Expérimentales (Studio for Creation and Research in Computer Science and Experimental Music)

**SeD:** Systèmes et Données (Systems and Data)

**SEHP:** High-performance executive supports

**e-Health:** Digital health

**SR:** Soutien à la Recherche (Research Support)

**TAD:** Traitement et Analyse de Données (Data processing and analysis)

**UMR:** Unité Mixte de Recherche (joint research unit)

**ZRR:** Zone à Régime Restrictif (strict security regime area)

**Laboratoire Bordelais de  
Recherche en Informatique**

Bât. A30  
351, cours de la Libération  
33405 Talence - France

**+33(0)5 40 00 69 00**

**[www.labri.fr](http://www.labri.fr)**