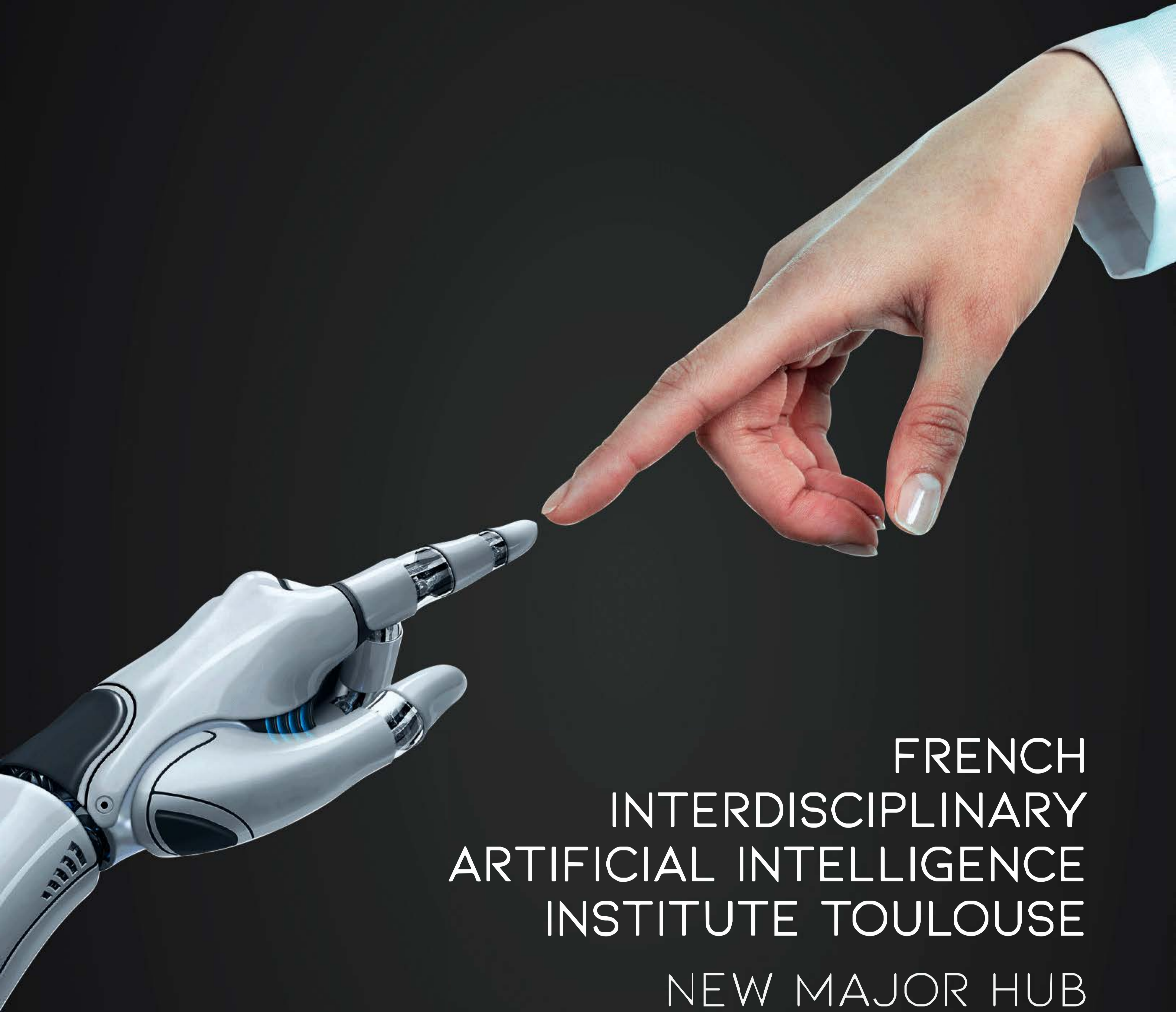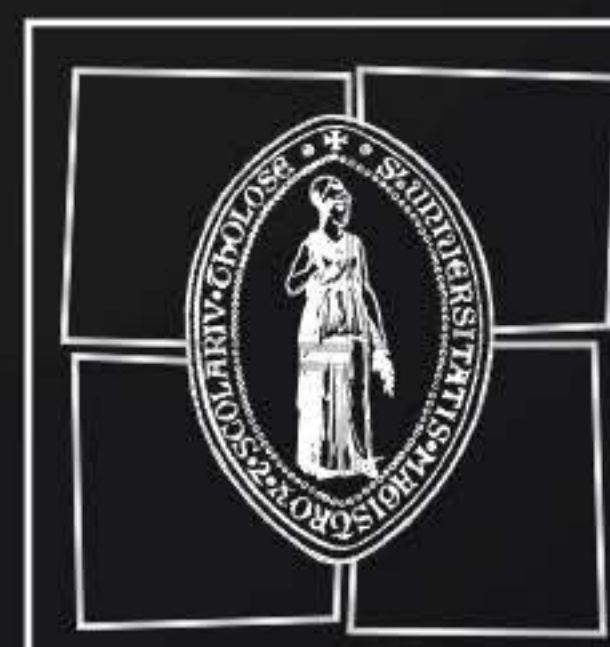# ANITI

ARTIFICIAL & NATURAL INTELLIGENCE
TOULOUSE INSTITUTE

FRENCH
INTERDISCIPLINARY
ARTIFICIAL INTELLIGENCE
INSTITUTE TOULOUSE

NEW MAJOR HUB
FOR ARTIFICIAL
INTELLIGENCE

Université
Fédérale

Toulouse
Midi-Pyrénées

The scientific project is structured around three integrative programs (IPs), which will develop innovative solutions to address challenges raised by our application domains using theoretical advances in core AI scientific areas.



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### ⫸ IP1: Acceptability, Fair representative data for AI

This IP addresses various facets of the acceptability of systems integrating AI algorithms from social, economical, legal or ethical points of view. This includes issues about data that can affect AI algorithms. We will propose new ways of handling data to address data bottlenecks and data biases that can hamper AI systems.

### ⫸ IP2: Certifiable AI toward autonomous critical Systems

This IP will develop new methods, models and tools based on hybrid AI, to support the design and validation of critical autonomous systems for which strong guarantees are required, (e.g., by certification authorities in aeronautics). This program will strengthen and implement the momentum initiated by the IRT-Saint Exupéry on this topic.
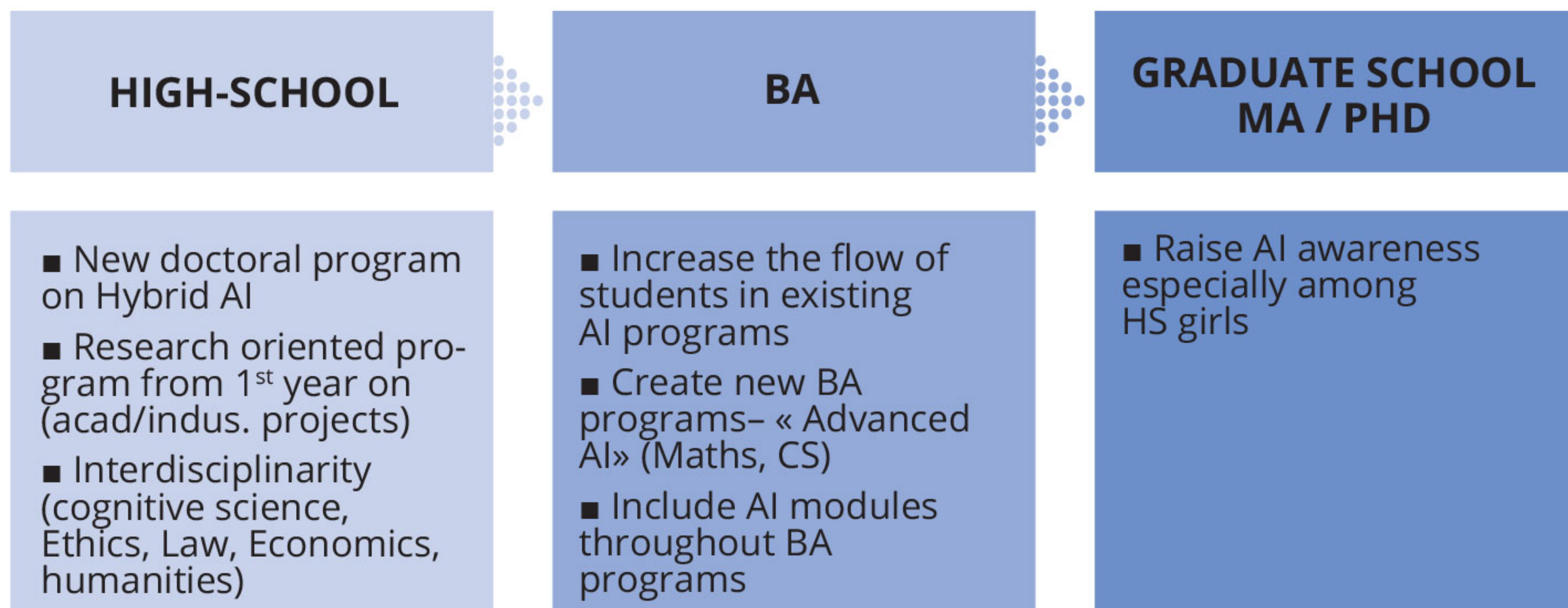
### ⫸ IP3: Assistants for design, decision, and optimized Industry processes

This IP will develop new AI methods to aid human decisions. This program will design advanced AI assistants to increase the performance of design, decision and industrial production related activities. This will lead to the design of cognitive assistants with advanced dialogue and interaction skills, the monitoring of complex systems in order to model their behaviour, predict their evolution, and anticipate corrective actions, and the design of autonomous mobile robots with the ability to interact with humans, cognitively and physically, to perform complex tasks in a collaborative manner.

In total, the project aims to fund more than thirty research chairs, of which about ten will be headed by researchers from international laboratories and universities (e.g. MIT or Brown University in the United States). The project will also promote international mobility and collaboration with an extensive visiting scholar's program to attract outstanding students and the best experts to address the challenges of hybrid AI in the targeted applications

# EDUCATION AND TRAINING PROJECT

The ambition is to become a world leader in hybrid AI education and to double the number of students trained in AI by 2023.

| HIGH-SCHOOL | BA | GRADUATE SCHOOL MA / PHD |
|---|---|---|
| ■ New doctoral program on Hybrid AI<br>■ Research oriented program from 1st year on (acad/indus. projects)<br>■ Interdisciplinarity (cognitive science, Ethics, Law, Economics, humanities) | ■ Increase the flow of students in existing AI programs<br>■ Create new BA programs– « Advanced AI» (Maths, CS)<br>■ Include AI modules throughout BA programs | ■ Raise AI awareness especially among HS girls |

## ⫸ Continuing education

The project will also address the lack and urgent need in industry for AI qualified personnel, by developing apprenticeship programs and devoting significant effort to continuing education. A single portal entry for continuing education for the Toulouse site will be offered, with programs tailored to different levels and different needs.

**TARGETS**

| | |
|---|---|
| Managers & marketing teams | Engineers, Developers |
| Consulting team | Data scientists |

## ⫸ AI scientific culture dissemination

Several actions to disseminate AI scientific culture will be planned, drawing on local strengths.



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# ECONOMIC DEVELOPMENT PROJECT

▶ **Rapid dissemination of new technological possibilities to ANITI partners via IPs**

▶ **Start-up creation**

▪ Via ANITI's Innovation and Business Committee

▪ Up to 1 M€/year dedicated by Toulouse Tech Transfer (early stage funding)

▪ Pre-incubation and incubation management in liaison with innovation clusters (e.r., Aerospace Valley) public and private incubators.

To become a partner and member of the Institute, contact:

**aniti@aerospace-valley.com**

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# +50 PARTNERS

# ANITI PRESENTATION

The ambition of the Artificial and Natural Intelligence Toulouse Institute (ANITI) is to develop a new generation of artificial intelligence called hybrid AI, combining data-driven machine learning techniques with symbolic and formal methods for expressing properties and constraints and carrying out logical reasoning. This approach will provide better guarantees in terms of reliability, robustness and the ability to explain and interpret the results of the algorithms used, while ensuring social acceptability and economic viability. Such guarantees are required by many applications targeted by the project, such as autonomous vehicles of the future.

## ANITI

**2** strategic application sectors targeted
> *mobility and transportation*
> *robotics/cobotics for the industry of the future*
**200+** researchers
**3** integrative programs
**21** research chairs
**50** partners
*Including* some thirty companies

## UNIVERSITÉ FÉDÉRALE TOULOUSE MIDI-PYRÉNÉES

**100,000+** students
Universities in **10** cities
**31** universities, schools & research entities
**1,000+** training courses: BA/M/PhDs
**145** research laboratories and entities
**5th** largest concentration in France
of ERC researchers

## TARGET BUDGET OVER FOUR YEARS

**100 M€** (academia, industry, PIA3 investment programme, institutions)
*Including:*
**24 M€** from the Occitanie region
**4 M€** from Toulouse Métropole

## TOULOUSE AND ITS REGION

**2nd** largest concentration of researchers in France with **6,800** public sector researchers
**2nd** largest creator of startups in France (INSEE, 2018)

ANITI is coordinated by the University of Toulouse: Université fédérale Toulouse Midi-Pyrénées within the framework of France's « Investing for the Future – PIA3 »  program, with the support of the Occitanie Region, the Toulouse Metropole, and the SATT Toulouse Tech Transfer.

ANITI has been selected to be one of four institutes spearheading research on AI in France. ANITI, along with the other 3AI institutes, will start operations this autumn for a renewable 4-year period as part of the French national strategy for Artificial Intelligence, the Programme Investissements d'avenir1 under the Plan Villani 2. These institutes will collaborate and operate as a network with the goal of making France a world leader in artificial intelligence.

# CONTACTS

**Chief Operating Officer:**
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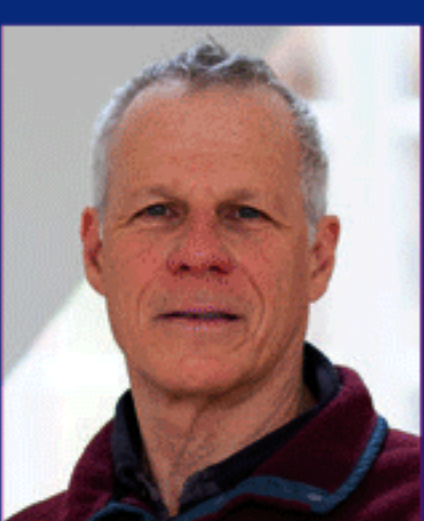
**Scientific Director:**
Nicholas ASHER
nicholas.asher@univ-toulouse.fr

**www.univ-toulouse.fr/ANITI**

# 21 CHAIRS

An international jury reviewed the ANITI proposal and validated the following 21 chairs. Each chair is a small team consisting of a PI associated researchers, post doctoral fellows and Ph.D. students. The chairs are grouped into three integrative programs that provide three distinct sets of themes and challenges that ANITI will address.

## INTEGRATIVE PROGRAM 1:
## ACCEPTABILITY, FAIR REPRESENTATIVE DATA FOR AI

Moral AI
*Principal investigator: Jean-François Bonnefon*

Law, Accountability and Social Trust in AI
*Principal investigator: Céline Castets-Renard*

AI and Competition
*Principal investigator: Bruno Jullien*

Empowering Data-driven AI by Argumentation and Persuasion
*Principal investigator: Leila Amgoud*

Developing AI to Improve Global Governance
*Principal investigator: César Hidalgo*

Fair & Robust Methods in Machine Learning
*Principal investigator: Jean-Michel Loubès*

Data-driven approximate Bayesian computation for fusion-based inference from heterogeneous (remote sensing) data
*Principal investigator: Nicolas Dobigeon*

AI for physical models with geometric tools
*Principal investigator: Francis Gamboa*

## INTEGRATIVE PROGRAM 2:
## CERTIFIABLE AI TOWARD AUTONOMOUS CRITICAL SYSTEMS

Efficient algorithms and Data Assimilation for computationally efficient constrained advanced learning
*Principal investigator: Serge Gratton*

Deep Learner Explanation & Verification
*Principal investigator: Joao Marques Silva*

Large scale optimization for AI
*Principal investigator: Jérôme Bolte*

New certification approaches of critical AI based systems
*Principal investigator: Claire Pagetti*

Game Theory, Convergence for Generalized Adversarial Nets and other ML architectures
*Principal investigator: Jérôme Renault*

AI for Air Traffic Management and Large Scale Urban Mobility
*Principal investigator: Daniel Delahaye*

## INTEGRATIVE PROGRAM 3:
## ASSISTANT FOR DESIGN, DECISION,
## AND OPTIMIZED INDUSTRY PROCESSES

Reverse-engineering the brain
*Principal investigator: Thomas Serre*

Deep learning with semantic, cognitive and biological constraints
*Principal investigator: Rufin van Rullen*

Synergistic transformations in model based and data based diagnosis
*Principal investigator: Louise Travé-Massuyes*

Neuro-adaptive Technology based Mixed-initiative to enhance Man-Machine Teams
*Principal investigator: Frédéric Dehais*

Motion Generation for Complex Robots
*Principal investigator: Nicolas Mansard*

Human Robot Interactions for cobot-industry applications
*Principal investigator: Rachid Alami*

Techniques for reducing complexity of algorithms
*Principal investigator: Hélène Fargier*

AI for Computational Protein Design
*Principal investigator: Thomas Schiex*