

ARTIFICIAL & NATURAL INTELLIGENCE  
**TOULOUSE INSTITUTE**

# General Overview

11/09/20

**ANITI**

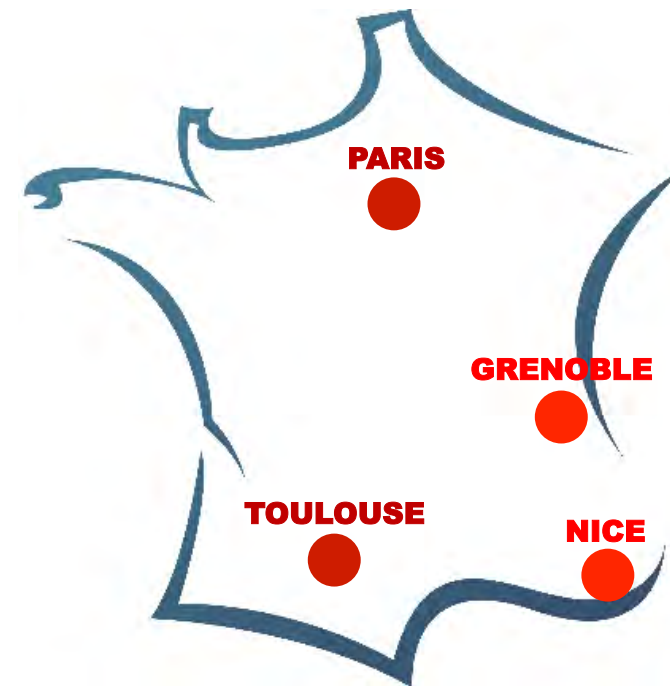
ARTIFICIAL & NATURAL INTELLIGENCE  
TOULOUSE INSTITUTE

Université  
Fédérale

Toulouse  
Midi-Pyrénées

## 3iA: Interdisciplinary Institutes for AI

- Networked centers for research, education and economic development, with high international visibility
- Initial call published: 25 July, 2018
- 4 sites pre-selected: november 6, 2018
- Detailed project submitted February 19, 2019
- Hearing by the international Jury: April 11, 2019
- Decision: April 26, 2019
- 4-year duration, renewable



# Our Ambition

Make possible the **sustainable** use and development of AI in **human critical applicative sectors** (transport...) and in **industry 4.0**

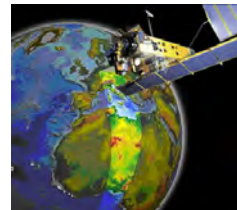


Acceptability

Fairness

Explainability

Robustness



Scalability

Adaptability

**Hybrid AI:** efficient combination of **Model-based & Data-based AI**



# Our Objectives



- ☐ Increase diversity in AI



Education



- ☐ x2 number of graduated students in 2023 vs 2019
- ☐ Develop continuous education to support needs from industry
- ☐ Educate citizens to AI



## One Team



- ☐ Acceptable AI
- ☐ Certifiable AI
- ☐ Collaborative AI



Research



Economical dev.



- ☐ Skills transfer to industry
- ☐ Create and support the development of ~100 SMEs/ Start-up

# How do we get there?

➤ Innovative solutions to address challenges raised by application domains using theoretical advances in core AI scientific areas



ACCEPTABLE  
AI



Co-PI



Leila  
Amgoud



Marjorie  
Allain-Moulet

CERTIFIABLE  
AI



Serge  
Gratton



Gregory  
Flandin

COLLABORATIVE  
AI



Nicolas  
Mansard



Christophe  
Merle



24 research chairs



# Integrative Program: ACCEPTABLE AI

➤ AI systems acceptability from social, economic, legal or ethical points of view, and data related challenges (bias, automatic annotation, representation of multi-source/scale data, ...)

CHAIRS

MORAL AI

PI : Jean-François BONNEFON



EMPOWERING DATA-DRIVEN AI by ARGUMENTATION and PERSUASION

PI : Leila AMGOUD



LAW, ACCOUNTABILITY and SOCIAL TRUST in AI

PI: Céline CASTET-RENARD



AI & ROBUST METHODS IN MACHINE LEARNING

PI: Jean-Michel LOUBÈS



AI MARKET COMPETITION

PI : Bruno JULLIEN



AI for PHYSICAL MODELS WITH GEOMETRIC TOOLS

PI: Fabrice GAMBOA



DEVELOPING AI TO IMPROVE GLOBAL GOVERNANCE

PI : Cesar HIDALGO



FUSION-BASED INFERENCE OF HETEROGENEOUS DATA

PI: Nicolas DOBIGEON



FUNDAMENTAL

INTERMEDIATE

APPLICATION

# Integrative Program: CERTIFIABLE AI



## ML systems foundations, properties, and interactions of ML and analytic models

- robustness, optimisation, verification of performance guarantees, new approaches to support certification and assurance of critical AI systems

CHAIRS

DATA ASSIMILATION AND ML  
WITH PHYSICAL CONSTRAINTS

PI: Serge  
GRATTON



DEEP LEARNER EXPLANATION  
& VERIFICATION

PI: Joao  
MARQUES SILVA



AI & ROBUST METHODS  
IN MACHINE LEARNING

PI: Jean-Michel  
LOUBÈS



LARGE SCALE OPTIMIZATION  
FOR AI

PI: Jérôme  
BOLTE



POLYNOMIAL OPTIMISATION FOR ML

PI: Jean-Bernard  
LASSERRE



EMBRACING NON CONVEXITY

PI: Marc  
TEBOULLE



GAME THEORY AND AI

PI: Jérôme  
RENAULT



NEW CERTIFICATION APPROACHES  
OF CRITICAL AI SYSTEMS

PI: Claire  
PAGETTI



AI FOR AIR TRAFFIC MANAGEMENT  
AND LARGE SCALE URBAN MOBILITY

PI: Daniel  
DELAHAYE



# Integrative Program: COLLABORATIVE AI



## Assistants for design, decision, and optimized industry processes

- Human AI-system interaction and cognition, multimodal language, mobile robotics with physical interactions, anomaly detection and maintenance prediction, solving complex decisions and design problems

CHAIRS

REVERSE-ENGINEERING  
THE BRAIN

PI: Thomas  
SERRE



MOTION GENERATION FOR  
COMPLEX ROBOTS

PI: Nicolas  
MANSARD



DEEP LEARNING WITH SEMANTIC  
COGNITIVE & BIOLOGICAL CONSTRAINTS

PI: Rufin  
VANRULLEN



KNOWLEDGE COMPILATION,  
UNCERTAINTY AND PREFERENCES

PI: Hélène  
FARGIER



NEURO-ADAPTIVE TECHNOLOGY  
TO ENHANCE MAN-MACHINE TEAMS

PI: Frédéric  
DEHAIS



DESIGN USING INTUITION  
AND LOGIC

PI: Thomas  
SCHIEX



COGNITIVE AND INTERACTIVE  
ROBOTICS

PI: Rachid  
ALAMI



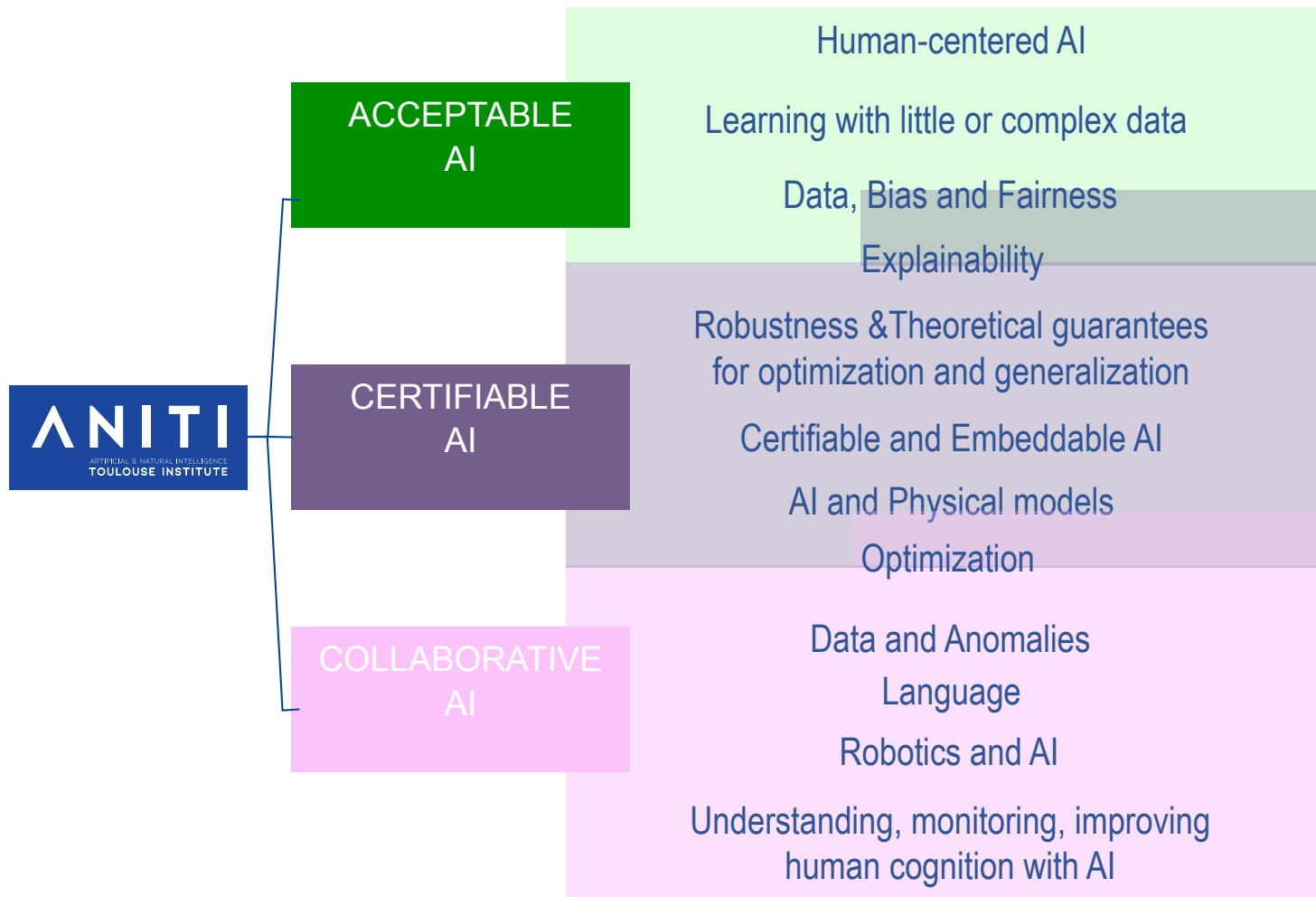
SYNERGYSTIC TRANSFORMATIONS  
IN MODEL/DATA BASED DIAGNOSIS

PI: Louise TRAVÉ-  
MASSUYES





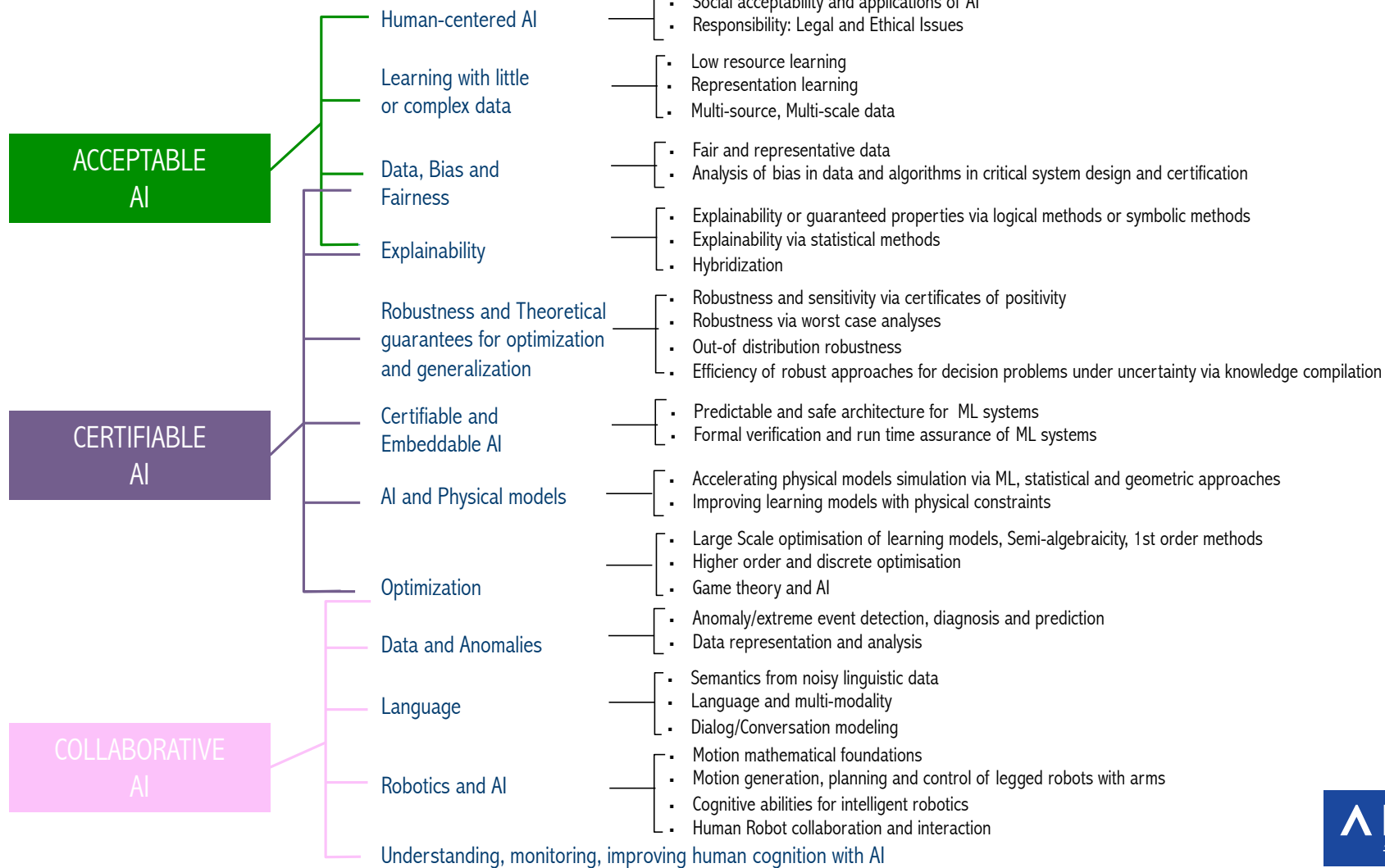
# SCIENTIFIC THEMES - ROADMAP



## Integrative Programs

## Themes

## Threads



# Education and Training Program

## Initial Education

Double the number of students trained in AI by 2023



### HIGH-SCHOOL

- Raise AI awareness especially among girls

### BA

- Increase the flow of students in existing AI programs
- Create new BA programs– « Advanced AI» (Maths, CS)
- Include AI modules throughout BA programs

### GRADUATE SCHOOL MA / PHD

- New doctoral program on Hybrid AI
- Research oriented program from 1<sup>st</sup> year on acad/indus. projects
- Interdisciplinarity (cognitive science, Law, Ethics, Economics, humanities)

## Continuing Education

A single portal entry for continuing education



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.



# Economic Development

- **Rapid dissemination of new technological possibilities to ANITI partners via IPs**
- **Start-up creation and support (100+)**
  - 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.g., Aerospace Valley) public and private incubators



# Partners

+50 PARTNERS



More to come !

# ANITI CAMPUS



scale: 1 km