université PARIS-SACLAY

UNIVERSITÉ PARIS-SACLAY DOCTORAL PROGRAM IN ARTIFICIAL INTELLIGENCE (**UDOPIA**) CALL FOR APPLICATIONS 2022

1 General description of the program

The **UDOPIA** doctoral program in artificial intelligence (AI) has started in 2020 and is building on the extensive forces of Université Paris-Saclay in AI and related areas to create a unique cohort of PhD students trained at the forefront of core AI topics, and applications of AI.

The students will benefit from the rich scientific ecosystem of Université Paris-Saclay, its strong links to industry, and from the existing instruments such as the SaclayIA computing platform. DATAIA Paris-Saclay Institute brings accompanying measures to foster interdisciplinarity, mobility, entrepreneurship, and the wide dissemination of research results to academia, industry and the general public.

2 Nature of the support

The 3-year doctoral program brings together **at least 30** doctoral students in total, who are hired in 2020, 2021 and 2022.

The selected PhD Students will be recruited in 2022 on a fixed-term contract of **36 months** starting in October 2022, with a gross monthly salary of 1975 €.

The doctoral program is co-funded by the **French National Research Agency (ANR)**, the Université Paris-Saclay and its components, associate and partner institutions, notably CentraleSupelec, Chair IDAML from CMLA, Institut DATAIA Paris-Saclay, ENS-Paris-Saclay, Inria Saclay, Labex Hadamard, Université d'Evry Val d'Essonne, Vedecom. It is managed by DATAIA Paris-Saclay Institute, the AI institute of Université Paris-Saclay.

3 Selection/recruitment process

3.1 General recruitment policy

Following the Université Paris Saclay Doctoral Charter, the admission to doctoral schools is based on explicit and public criteria. It is run in accordance with transparent, open and fair procedures, defined by Université Paris-Saclay in application of internationally-recognized principles (e.g.as per the *European Code of Conduct for the Recruitment of Researchers)*. The implementation of this policy is monitored; reports on recruitment campaigns are made public on an annual basis. This policy applies to every applicant, regardless of their disciplinary fields, their career path, or the funding of the related doctoral project.

The UDOPIA recruitment procedure will follow the Université Paris-Saclay process for selecting and matching PhD candidates with doctoral projects in AI. The following

committees will proceed to the selection of the PhD candidates:

- The UDOPIA Program Preselection Committee assesses thesis proposals and suggests a ranking of the projects. It gathers AI experts and representatives of the Université Paris-Saclay Doctoral School;

- The Admission Committees of each Université Paris-Saclay Doctoral School evaluates PhD candidates on a doctoral project relevant to the doctoral school;

- The UDOPIA Program Selection Committee selects the doctoral projects and allocates the resources. It gathers the Program supervision team and experts from DATAIA executive committee and steering committee.

Calendar

- Submission of the projects by the prospective supervisors to the UDOPIA platform before **January 28th 2022 11.59 p.m.** (Paris Time);
- Preselection of the projects by the UDOPIA Program Preselection committee   by February 24th, 2022;
- Submission of the preselected projects by the prospective supervisors on ADUM, the online doctorate information management tool (if not yet done) before **April 17th 2022**;
- Application of the candidates to the preselected doctoral projects on the ADUM platform (Doctoral School calendars);
- Selection of the candidates and projects by the Admission Committees of Doctoral Schools (Doctoral School calendars);
- Final selection of the projects by the UDOPIA Program Committee by **June 24th 2022** and publication of the results by **June 27th 2022.**

3.2   UDOPIA doctoral project submission and preselection

The UDOPIA call opens on November 16th 2021 and closes on January 28th 2022.

Prospective supervisors, who wish to have their doctoral projects funded through the UDOPIA doctoral program, must submit them to the **UDOPIA doctoral project preselection platform:**

→ https://cmt3.research.microsoft.com/UDOPIA2022/Submission/Index

and to the ADUM platform:

→ French: https://www.universite-paris-saclay.fr/recherche/doctorat-et-hdr/proposer-un-sujet-de-these

The prospective supervisors must belong to a component of Université Paris-Saclay involved in the UDOPIA program (see the Eligibility section).

The doctoral project submitted to the UDOPIA platform should follow the form available

on the platform. The description must contain the following information:

- The title in French and in English,
- The summary (15 lines maximum) in French and in English,
- The keywords,
- The UDOPIA topics addressed in the project (see below, Strategic axes),
- The type of funding requested (100% or co-funding),
- The research unit(s) supporting the project,
- The thesis supervisor(s),
- The Doctoral School to which the project is attached and the institution operating the project (i.e., the institution who will receive the funding and hire the doctoral student).

A description of the doctoral project (2000 words maximum), mentioning the following mandatory sections: the scientific and social context of the project, the objectives, the expected impact, the justification of the relevance for the UDOPIA program, the complementary competencies of the supervisors and teams related to the project, the planned research program (including the material and methods that will be used), the expected results and perspectives in terms of future research and applications, a list of bibliography references related to the project (which may include other research results than articles).

The section on the scientific context must contain relevant references to the state of the art. The section on the justification of the relevance of the project for the UDOPIA program must explain why the project is part of the field of research in AI.

The UDOPIA Program Preselection Committee preselects the relevant projects. The selection committee strives to enforce thematic and gender balance, with a good disciplinary diversity and an external perspective through the presence of members from other higher education and research institutions.

The provisional composition of UDOPIA Program Preselection Committee in 2022 is as follows:

→ The deputy vice-rector for doctoral research, Sylvie Pommier,

→ The UDOPIA program supervision team among which, Claire Nédellec, David Rousseau and Frédéric Pascal,

→ Directors of involved doctoral schools, among which, Alain Denise (STIC), Stéphane Nonenmacher (EDMH),

→ An elected representative of doctoral students on the boards of the ICST, EDMH, EOBE or EDSP doctoral schools, acting as an observer, and whose research topics fall within the scope of the UDOPIA Program,

→ Experts in artificial intelligence from Université Paris-Saclay,

→ Experts in artificial intelligence from outside Université Paris-Saclay.

The list of the experts will be published on the UDOPIA page of Université Paris-Saclay website

→ https://www.universite-paris-saclay.fr/programme-doctoral-udopia-en-intelligence-artificielle

The AI experts of the Program Selection Committee will assess the doctoral projects. The UDOPIA Program Preselection Committee will take the decision of project preselection.
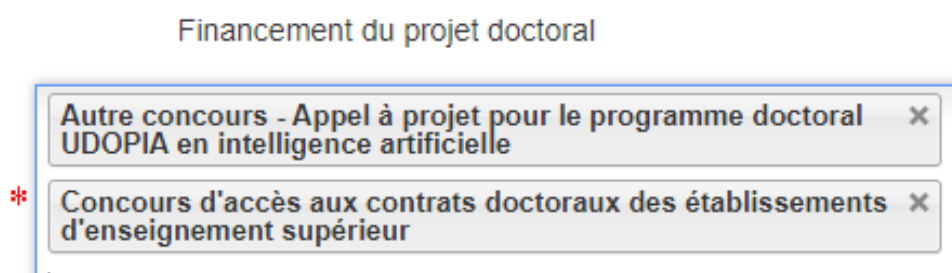
The list of the preselected projects will be then handed to *Maison du Doctorat* on February 18th, 2022. It will inform the Doctoral Schools and the prospective thesis supervisors about the decision.

3.3 Application of the candidates to the preselected thesis projects

Prospective supervisors are invited to publish their preselected doctoral projects - if not yet done - in English and in French at any time but before **April 17th 2022** on the ADUM platform, with their contacts so that the interested students can exchange and prepare the application with them.

→ https://www.universite-paris-saclay.fr/recherche/doctorat-et-hdr/proposer-un-sujet-de-these

On ADUM interface, the prospective supervisors should select one among the two categories of funding, as shown below. Before the UDOPIA preselection decision, the prospective supervisor can select UDOPIA funding to attract doctoral candidates. After the UDOPIA preselection decision, only preselected doctoral projects should appear as eligible to UDOPIA program.

Financement du projet doctoral

Autre concours - Appel à projet pour le programme doctoral UDOPIA en intelligence artificielle	✕
Concours d'accès aux contrats doctoraux des établissements d'enseignement supérieur	✕

The application of candidates to UDOPIA doctoral projects follows the same process as for the other doctoral programs. The UDOPIA preselected doctoral projects will be published on the Université Paris-Saclay ADUM website and other distribution channels so that interested students could easily find them.

→ French : https://www.adum.fr/psaclay/ptUDOPIA

→ English : https://www.adum.fr/psaclay/ptenUDOPIA

Candidates are invited to contact the thesis supervisors, to discuss the thesis topic and its progress and then can submit a complete application to the doctoral school through ADUM.

3.4 Admission by the Doctoral Schools

Each Doctoral School Admission Committee, appointed by the council of the doctoral school, includes an elected representative of PhD students as observer. The nominative composition of these committees, the dates of their meetings and of the face-to-face interviews of the candidates, the eligibility and evaluation criteria are published no later than February. Face-to-face interviews are conducted by the Doctoral Schools Admissions Committees in the spring and results are made public in June.

→ https://www.universite-paris-saclay.fr/en/research/avant/fundings#doctoral-contracts

The Admission Committee of each Doctoral School is in charge of evaluating each candidate's research and communication abilities, as well as the relevance of her/his PhD subject and the adequacy of the prospective supervision team with respect to the state of the art. In the case where the applicant does not hold a Master degree (or equivalent at the French or European level), the committees examine whether the candidate can still be enrolled in the doctoral program, on the basis of his/her skills and expertise.

3.5 The UDOPIA Program Selection Committee

The UDOPIA Program Selection Committee will rank and select the doctoral projects whose candidates have been favorably evaluated by the doctoral schools.

The Selection Committee includes the Program supervision team and experts from DATAIA executive committee or/and steering committee. The results of the selection meeting will be published by June, 27th 2022.

3.6 Eligibility criteria

→ The host research team of the doctoral student must be part of the current Université Paris-Saclay perimeter. List of the laboratories:

https://bibliolabs.universite-paris-saclay.fr/Labs/Definition

→ The projects can involve additional research units outside Université Paris-Saclay, but they will not receive any funding from the University. In addition, in the case of a thesis fully funded, the thesis work must be carried out mainly within the scientific perimeter of the University.

→ In the case of a co-funded thesis, the thesis work may be carried out partially within

the scientific perimeter of the University, and in the laboratories of the co-financing partner.

→ The participating doctoral schools are the twenty-one doctoral schools of the Paris-Saclay Doctoral College:

https://www.universite-paris-saclay.fr/en/doctoral-schools

→ If you have any questions about the eligibility of a project, please send an email to submission-dataia@inria.fr

→ By the time the UDOPIA selection committee is held, the candidate must have successfully completed the admission tests of the doctoral school. Only candidates are eligible who have already been interviewed by the doctoral school and admitted to enroll subject to obtaining funding for their thesis.

3.7 Evaluation criteria

→ Integration of the doctoral project into the strategic axes of the UDOPIA doctoral Program (see section 5);

→ Excellence of the application and scientific potential of the doctoral project for the field: the Program aims for excellence and encourages originality and scientific risk-taking, openness to the broader international and inter-disciplinary context, and the development of new areas;

→ Conditions for a successful completion of the doctoral project;

→ Potential outcomes of the doctoral project and socio-economic impact.

4   How to apply as candidate?

Explore the offer of research subjects and find a potential supervisor here:

→ French : https://www.adum.fr/psaclay/ptUDOPIA

→ English : https://www.adum.fr/psaclay/ptenUDOPIA

Get in touch with this potential supervisor and prepare your application with him/her.

Submit your application to the doctoral school according to the doctoral school's process through ADUM platform before the doctoral school's deadlines in order to be auditioned at the doctoral school's annual Jury before mid-June.

5 Strategic axes of the UDOPIA doctoral Program

Research in AI at Université Paris-Saclay focuses on fundamental issues related to AI, machine learning and data science, as well as on their operational applications in engineering, health and the environment, to name a few.

5.1 First circle: Basic AI and Data Science

Université Paris-Saclay covers a wide range of fundamental topics in AI and Data Science. It includes, but is not limited to:

- machine learning,
- statistical learning,
- optimization for AI,
- meta-learning,
- symbolic AI,
- reasoning, knowledge representation and management,
- model-checking,
- advanced databases.

5.2 Second circle: AI subdomains

This set of research topics addresses applications of the core AI technologies to bridge the gap with the industrial world. The main topics developed at Paris-Saclay include but are not limited to:

- Economics, Management, analysis and protection of data
- Natural Language Processing (NLP)
- Human-Computer Interaction (HCI)
- Signal, image, vision
- Architecture and hardware for AI
- Machine learning with a human focus.
- Trusted AI.

5.3 Third circle: Application domains.

Based on the first two circles, AI research at Paris-Saclay addresses applications in the four national priorities, in both academic and industrial collaboration frameworks, with a particular focus on health on the one hand, and environment on the other. A non-exhaustive list is,

- Health and well-being
- Energy, climate and environment
- Transportation and mobility
- Security and defense
- IA for fundamental Science

6 Presentation of the university and the teams and departments involved.

6.1 Presentation of Université Paris-Saclay

Université Paris-Saclay (UPSaclay), founded by 14 partner institutions, unifies the expertise, culture and best practices of 3 Universities, 4 "Grandes Ecoles" and 7 National Research Organisations. Since 2015, it has been offering graduate cursus across 21 doctoral schools and 350 Master tracks.

Innovation and Excellence. UPSaclay represents about 13 % of France's academic forces in R&D. With 2 Nobel Prizes and 10 Field Medals, it's the top French University (1st European and 13th worldwide) in the 2021 Shanghai ranking. It includes 275 laboratories and 9,000 professors and researchers, one third of whom with the *Habilitation à Diriger des Recherches*. With about 1,000 PhDs per year, UPSaclay represents around 8% of all PhDs defended in France. The number of industrial CIFRE PhDs represents around 10% of all CIFREs in France. UPSaclay also features outstanding scientific facilities, such as Jean Zay supercomputer, Neurospin MRI, Apollo Laser, and SOLEIL Synchrotron.

Doctoral training and research-oriented Masters is a top priority of UPSaclay, with 55% of the students at the graduate level (43,000 Master's, grandes écoles and doctoral students). UPSaclay offers excellent higher education Programs in Computer Science, Mathematics, Engineering, as well as in Physics, Medicine and Pharmacy, Life Sciences, Agriculture, Biochemistry, Chemistry, Food, Environment, Climate, Law, Public Policy, Bioethics, Sociology and Demographics. Each academic track is designed to foster exchanges with industrial partners and start-ups and facilitate entry to the job market.

In 2019, UPSaclay joined forces with 4 European universities (Lund, Munich, Porto and Szeged) to create a pilot European University, EUGLOH, committed to higher education and training on challenges in global health and well-being, in particular based on data science, AI and robotics.

Integration in the ecosystem, socio-economic impact and science-society relations. UPSaclay, in close interaction with its regional ecosystem, aims for the top 10 of international universities for economic impact. It has close links with companies, public services and citizens from the nearby cities, including tight links with large companies (Air Liquide, EDF, IBM, PSA, Renault, Safran, Thalès, …) and SMEs; 100 start-ups are created every year in this rich ecosystem. UPSaclay has developed a series of instruments dedicated to student entrepreneurship and innovation with high socio-economic impact: networks of incubators, of FabLabs; Seed Fund; TTO ("SATT Paris-Saclay").

UPSaclay is strongly supported by the Greater Paris Region, in particular via the research networks (DIM) *Réseau Francilien en Sciences Informatiques* and *MathInnov*, and through

the new AI-oriented Program Paris Region PhD. *La Diagonale,* UPSaclay's transdisciplinary service, fosters the link between the University and citizens, NGOs and high schools by promoting and popularizing science and the arts / science connection, and by relating them to societal challenges.

The Research Ethics and Scientific Integrity Council (POLÉTHIS), created in 2017 at UPSaclay, encourages awareness, in particular for doctoral candidates and supervisors, on emerging ethical issues, such as those typically associated with AI goals and impacts on society and people. It acts as IRB (Institutional Review Board) for approving research that involves personal data.

6.2 Research in Artificial Intelligence at UPSaclay and presentation of the teams involved in UDOPIA

According to Elsevier ("Artificial Intelligence: How knowledge is created, transferred, and used: Trends in China, Europe, and the United States", Jan 2019), UPSaclay is the European leader in AI.

Artificial intelligence (AI) is one of the 7 interdisciplinary research priorities of UPSaclay. Specifically, out of the 6,224 PhDs defended at UPSaclay during the 2015-2021 period (8% of all PhDs in France), more than 750 (over 12%) are associated with one of the 5 most frequent AI keywords. The scientific expertise of UPSaclay in AI covers a broad spectrum ranging from fundamental, algorithmic and methodological research in AI to AI applications in various domains. On the application side, UPSaclay is particularly strong in the sectors of health and medicine, including bioinformatics, and energy and environment, where interaction with AI methods has become widespread.

The research units involved in UDOPIA include Computer Science, Mathematics and Engineering research units, as well as research units in other disciplines, notably Health and Life Sciences and Physics. Some of the main research units quoted below are: CEA-LIST (Laboratoire d'Intégration de Systèmes et de Technologies du Centre d'Etudes Atomiques), CESP (Centre de recherche en Epidémiologie et Santé des Populations, INSERM), CMLA (Centre de Mathématique et leurs applications, CNRS-ENS Paris-Saclay), CVN (Centre de Vision Numérique, CentraleSupélec-Inria), Inria-Saclay (Centre de Saclay, Institut National de recherche en Informatique et Automatique), L2S (Laboratoire des Signaux et Systèmes, CNRS-CentraleSupélec), LISN (Laboratoire Interdisciplinaire des Sciences du Numérique, CNRS), LMO (Laboratoire de Mathématique d'Orsay UPSud-CNRS), LMF (Laboratoire méthodes formelles, Université Paris-Saclay, ENS Paris-Saclay, CNRS), MaIAGE (Mathématique et Informatique Appliquées du Génome à l'Environnement, Institut national de recherche pour l'agriculture, l'alimentation et l'environnement (INRAE), Centre de Jouy-en-Josas Antony), MAS (Laboratoire de Mathématiques Appliquées aux Systèmes, CentraleSupélec), MIA (Laboratoire de Mathématique, Informatique et Applications, AgroParisTech-INRAE), MSH (Maison des Sciences de l'Homme, CNRS-UPSaclay).

6.3 Graduate college presentation

As part of the IDEX Paris-Saclay excellence initiative, founded in 2011, the member institutions of Université Paris-Saclay have created a doctoral college, supported by research and training teams at the highest international level. The doctoral college defines, coordinates and monitors doctoral training across the University. It consists of twenty doctoral schools, which were very favourably evaluated by the High Council for Evaluation of Research and Higher Education (Hceres).

The main doctoral schools involved in UDOPIA are STIC (Information and Communications Sciences and Technologies), EDMH (Hadamard Mathematics Doctoral School), SMEMaG (Mechanics and Energy Sciences, Sciences Mécaniques et Energétiques, Materials and Geoscience), AAIF (Astronomy and Astrophysics, Ile-de-France), PIF (Physics in Ile de France), EOBE (Electrical, Optical and Bio Engineering) and Interfaces, as well as SHS (Human and Social Sciences), EDSP (Public Health), ABIES (Agriculture Food Biology Environment and Health), Particles, Hadrons, Energy, Nuclei, Instrumentation, Imaging, Cosmos et Simulation (PHENIICS), SDSV (Structure and Dynamic of Living Systems), SEIF (Ile-de-France Environmental Sciences)..

Since January 2020, Master degrees, training programs, doctoral schools and research teams are organized into Graduate Schools. UDOPIA will rely primarily on UPSaclay internationally attractive Masters, with 4 tracks in Mathematics (including "Mathematiques, Vision, Apprentissage", created 20 years ago, the most visible and sought-after french Master in mathematical AI), 5 tracks in Computer Science. Masters in Life Sciences and Health, Social and Human Sciences, Electrical Engineering and in Law also include modules relevant to data science and AI. These Masters will ensure that many high profile PhD candidates can apply to the present doctoral program.

7 Description of the Program supervision team

7.1 Program supervision team:

The role of the Program supervision team is:

- To promote the doctoral Program, both internally (laboratories, researchers) and externally (for potential applicants);

- To ensure the quality of the recruitment: the members of the supervision team will participate in the selection committee, appoint other members where necessary and organize their training and information to carry out this mission;

- To animate the AI research community composed of the members of the doctoral Program, the doctoral candidates and their supervisors; and

- To monitor the quality of the doctoral Program together with the doctoral schools, report to the members of the doctoral Program, to the doctoral college, to the academic council of UPSaclay, and to ANR.

The Program supervision team is composed of :

- The deputy vice-rector for doctoral research, Sylvie Pommier and the deputy vice-rector for STEM research Michel Guidal.

- Directors of involved Doctoral Schools

- One doctoral candidate, member of the doctoral Program, representative of the doctoral candidates in the Program.

- Experts in AI from Paris-Saclay.

- Experts in AI from outside UPSaclay.

7.2   PhD Student Supervision Team

The Program supervision team includes several dozens of researchers, members of the research labs and graduate colleges involved in UDOPIA. Altogether, their expertise covers a wide thematic spectrum ranging from core AI issues to AI applications (Section 2).

UPSaclay has spelled out good practices in terms of supervision through flexible guidelines and accompanying actions, including:

- The doctoral charter emphasises the active part that each one (PhD student, supervisor, admission committee, monitoring committee) has to play and the shared responsibilities that the doctoral pathway entails, sets out a reference framework and highlights good practices;

- In order to ensure adequate availability, the number of PhD students placed under the guidance and responsibility of any given thesis supervisor shall not exceed five (three in some Doctoral Schools);

- An annual statistical review is carried out at the UPSaclay level and widely disseminated. It includes a follow-up on the number of doctoral students per supervisor, co-supervision, dropouts, etc.

- Annual satisfaction surveys are conducted among doctoral students and among supervisors and give rise to awareness notes focused on issues that need improvement;

- 2-day training courses to learn how to supervise doctoral students are offered to future supervisors 3-5 times a year, in small groups, with role-playing activities;

- "Supervisors' cafés" are organized once a month to share experiences and good

practices in terms of supervision. Practical information sheets are prepared using the material of these cafés-debates on topics as varied as "conflict management", "preventing loss of trust", "the challenges of internationalization", "hiring", "Individual Thesis Monitoring Committee" …

8 Accompanying measures

Beyond the various research activities described above, the Paris-Saclay ecosystem is developing many initiatives (software development projects, challenges) and hosts major computational resources that support the implementation of AI systems by academic partners.

8.1 Local environment for AI PhD students

Saclay-IA. UPSaclay hosts two national high-performance computing (HPC) centers (CNRS-IDRIS, CEA-TGCC), as well as smaller-size centers (ENS-/CS-Fusion, Inria-Saclay, EP), and laboratory equipment, providing the scientific community with a wide range of computing facilities. Regarding AI specifically, the site hosts the Saclay-IA computing platform: this equipment, initially funded in the context of the Saclay Center for Data Science, has grown from a dozen to about a hundred of recent GPU cards, associated with the appropriate data-storage facilities. Bi-located on CNRS and CEA premises, this equipment is opened to all the academic teams of the site and can also handle requests from industry. Since 2019, the site also hosts the French national computing platform for AI, Jean-Zay, the largest one in Europe (over 1,000 GPUs), providing accessible computational resources for at-scale experiments with computationally hungry machine learning techniques (chiefly Deep Learning).

Scikit-learn. Scikit-learn is a machine-learning library in Python, developed within UPSaclay research laboratories, which has over the years matured from a research project into an industrial open-source software, with a world-wide base of users, thanks to sustained support from the INRIA foundation, the University and its founding members. Scikit-learn nowadays powers many applications of AI and data science, with application domains ranging from medical imaging to product recommendation. The quality of scikit-learn, its algorithms, its interfaces, its documentation, are universally recognized and praised. Importantly, the scikit-learn ecosystem includes academic teams who contribute novel algorithms and use-cases either in the core library or in affiliated projects. This development presents an opportunity for students to get involved (participation to coding sprints, doctoral missions, links with industrial partners of the project).

IPOL. IPOL is an Open Science and Reproducible Research journal of image processing and image analysis. It contains many algorithms and their source codes useful for PhD Students, with an online demonstration facility and an archive of experiments. IPOL is maintained by CMLA at ENS Paris-Saclay, and contains many contributions in AI image

processing by PhD students.

Digiscope. UPSaclay is the home of Digiscope, a unique network of ten interactive visualization platforms featuring ultra-high-resolution wall-sized displays, immersive CAVE environments and large 3D displays, interconnected by a telepresence network that supports remote collaboration. The platforms can be used by researchers and Ph.D. students to visualize large and complex datasets and, using advanced interaction devices, manipulate and explore them. Digiscope supports research activities in Human-Computer Interaction, Big Data, Modelling and Simulation, and is well adapted to visualizing data sets and algorithms used in AI.

8.2 Accompanying measures

PhD AI days. Two annual days dedicated to the AI PhD program will be implemented to foster collaborations between PhD students and hosted laboratories in UPSaclay as well as to make a real-time roadmap of the training program. These days will be decomposed in a half-day seminar to present research progress and a half-day workshop where groups of PhD students will develop future projects on a given topic.

Student training and mobility. UDOPIA will strongly encourage student training and mobility. For this purpose, we will take advantage of two major initiatives of UPSaclay: the **Digicosme** Excellence Laboratory Center in digital science, and **DATAIA Institute**. Digicosme develops three main themes that will define future information and communication systems: reliability and safety, future networks, data intelligence. It carries out actions in the fields of Education, Research and Innovation. DATAIA is structured around several programs to foster activity in AI. Both foster activity in AI, in particular targeting students (summer schools, junior conferences, master stipends, exchange programs, in- and out-going mobility) but also the ecosystem in general (invited professors, biannual conference, support for challenges etc).

Data Challenges. An important line of development for modern AI is based on Challenges. Since the famed Netflix challenge, challenges have been increasingly used to explore real-world problems, through the competition of international teams prototyping efficient solutions. In particular, Université Paris-Saclay maintains and extends the Codalab platform (https://codalab.lri.fr/, formerly developed at Microsoft), with a strong international visibility. Most interestingly, Codalab is used for teaching at the under-graduate and graduate levels, as designing one's own challenge is a fun and efficient way to understand *what is a well-posed machine learning problem*. Codalab is also used in industrial and scientific challenges (e.g. continuing the Higgs Boson Challenge in partnership with the LAL and CERN). Complementarily, the UPSaclay *Center for Data Science* has developed the Ramp framework to handle 1-day challenges in experimental sciences.

Industrial partnership. An important asset of UPSaclay is its strong and rapidly growing

industrial network. Some partners have a long-standing tradition of industrial chairs, and most build upon their own array of industrial collaborations. For example:

- ENS Paris-Saclay has launched the *AI for industry* chair with ATOS, BERTIN, CEA, MICHELIN, SNCF. This chair organizes the startup challenge on AI sponsored by Région Ile-de-France;

- Inria-Saclay has developed bilateral collaborations with Fujitsu and Nokia; it has built a consortium to develop the *scikit learn* library that includes AXA, BNP Paribas, Cardif, BCG, Nvidia, Dataiku and Intel;

- CentraleSupélec has launched 3 education chairs related to AI with Randstad, Givaudan and RTE;

- IBM has opened an R&D center at Paris-Saclay and is developing collaborations with UPSaclay on the topic of AI (Aida project).

To further foster exchange with industrial partners, DATAIA is setting up an industrial affiliation plan: discussions are ongoing with Renault, Total, GE Healthcare, Servier, Sanofi. This framework will allow UPSaclay to monitor changes in AI-related jobs and their impact on the organization of training in the field, so as to avoid the pitfalls of a short-term vision in a fast-changing discipline. We plan to set up an "AI-jobs monitoring board" to bring together members of the Industrial Affiliate Program of DATAIA with training directors and to organize events such as job fairs in AI.

Furthermore, the site can also take advantage of the existence of several Carnot institutes managed by key institutions of the site, which all have AI in their scope. These institutes can facilitate collaborations with industry partners. Carnot institutes active on the site are CentraleSupélec (Science des Systèmes), LIST-CEA, Inria-Saclay, CNRS (Tremplin Carnot Cognition). Inria-Saclay is currently developing a program for start-up development. Finally, UPSaclay collaborates on AI topics with IRT SystemX, Pole de compétitivité Systematic, and ITE Vedecom (sustainable mobility).

All these actions offer opportunities for the students to get acquainted with the types of activities currently developed in industry, as well as the skills to develop in order to meet applicative challenges. The critical asset of Université Paris-Saclay is the breadth of these collaborations, making it possible for students to find their place in a complex and stimulating ecosystem.

9   Impact and dissemination

The AI needs, as expressed by various research domains and by industrial partners, span a wide range of contexts. For instance, in the areas of personalized medicine and human resources, the goal is to deliver efficient and bias-free models and to handle uncertainty

in the face of large, complex, heterogeneous and sensitive data. At another extreme, e.g., in autonomous vehicles, it is of primary importance to secure representative data from simulators, to achieve multi-scale learning for the sake of efficiency, and to assess the scope of validity of the learned models. The students, exposed to such a variety of fundamental and practical challenges, will have every opportunity to acquire and deploy a first rate expertise of data-scientist, addressing the much-feared shortage of modern AI skills.

All participants in the PhD Program will be expected to reach out and disseminate their achievements along the following dimensions:

9.1 Dissemination to the international, national and local AI scientific community

Classical indicators of success include publications in the core AI international venues (non-exhaustive list: AIJ, JMLR, MLJ, OR, EJOR; IJCAI, ECAI, NeurIPS, ICML, ICLR, KDD, ECMLPKDD, ICCV, ECCV, COLT, AISTATS, ICDM). Publication in both the above venues and in the relevant application domains will demonstrate the fundamental and applicative quality of the work. A HAL collection will be set up to group together all of UDOPIA's scientific production in an open archive.

The organization of symposia focusing on junior researchers (such as the Junior Conference on Data Science and Engineering) or workshops foster the dissemination of the advances and contribute to the creation of a (pluri-disciplinary) AI network at the UPSaclay scale. An invitation program, possibly in partnership with Institut Pascal or Maison des Sciences de l'Homme will support thematic weeks or months, focused on an emerging research question.

The UDOPIA Program will organise at least two symposia with proceedings:

- The UDOPIA symposium, bringing together the members of the program (doctoral students and supervisors) in a residential setting and preceded by an interdisciplinary thematic school in artificial intelligence. The course materials of the thematic school and the proceedings of the symposium will be widely disseminated.

- An international conference of doctoral students organised within the framework of the European University EUGLOH around the theme of artificial intelligence for global health, well-being and environment issues, bringing together the doctoral students of the Program and the European University.

9.2 Dissemination to companies and to the general public

Doctoral students will be informed of the possibility of carrying out consultancy missions in AI with partner companies. An appropriate and transparent framework will be defined to:

i) enable companies and in particular SMEs to identify the skills they need;

ii) to implement a smooth contractualization process, establishing a bridge between the academic and entrepreneurial worlds.

In addition, the doctoral college offers a range of training and activities to doctoral students to encourage the dissemination and exploitation of their research work (MT180, Doct'Iliens festival, Docto'preneuriales...). From 2020 onwards, these activities should be devoted successively to each of the University's 7 major challenges, including AI.

Ma thèse en 180 secondes, inspired by *Three-minute thesis* (3MT®, initially designed at the University of Queensland, Australia) lets doctoral students present their research topic, in French, to a general and diverse audience. For the past five years UPSaclay has organized one final round each year, widely attended by local citizens. Some doctoral schools organize a preliminary round to encourage and prepare candidates for the final round. Our plan is to generalize this widely popular initiative, focusing on each of the 7 University challenges including AI.

The *"Doct'Ilien : Ideas for..."* festival series is designed to invite PhD students to consider the possible exploitation of their research in a fun setting. Pairs of PhD students from different disciplines are formed during a short "creativity" training session. They are invited to imagine together a potential use of their research and trained to pitch their project. A hackathon, organized with societal and industrial partners, selects 4 to 6 such projects, presented during a public event. An edition of the "Doct'Ilien : Ideas for..." festivals series will be devoted to Artificial Intelligence.

Finally, the *Docto'preneurials* (two 1-week sessions respectively devoted to a Doctoral Camp and a Valorisation Camp) are intended for doctoral students who have a real business creation or transfer project. The purpose is to introduce themselves to the entrepreneurial ecosystem (SATT, Seed Fund, Incuballiance...), to meet entrepreneurs and to receive tailored training adapted to their project. Sessions focusing on AI and targeting the PhDs in the Program will be organized.