Chair position in Artificial Intelligence offered by The Brittany Region and Inserm

PROFILE : Senior Scientist in Security and Trusted Artificial Intelligence in Healthcare

The LaTIM is a joint research laboratory (UMR1101) of Inserm (French National Institute of Health and Medical Research), the University of Brest (UBO) and IMT Atlantique, associated with the CHRU (University research hospital) of Brest. It is a multidisciplinary research laboratory, which exploits the complementarity between information science and health science. Research is focused on a continuum of prevention, diagnosis and therapeutic actions through the integration of multimodal information. Activities are shared between four teams:

- Therapy action guided by multi-modality imaging in oncology (ACTION) - Its research activities cover the complete chain of multimodality image guided therapies for oncology applications (from image formation to image analysis and radiomics through dose optimization for therapy guidance).
- Multimodality information based interventions in neuro-musculo-skeletal diseases (IMAGINE) - The aim of this team is to develop research and technological innovation for personalized healthcare enhancement in patients with Neuro-Musculo-Skeletal (NMS) diseases.
- Visual system information: instrumentation and analysis (VISION) – Its activities focus on the design, implementation and clinical evaluation of innovative AI algorithms to assist image-guided diagnosis and surgery for pathological human vision, as well as on the investigation of novel optical devices to augment healthy human vision and human vision rehabilitation.
- Cybersecurity of externalized and mutualized healthcare data and processing (CYBER HEALTH) - It covers the transverse activity of developments in the field of security for big-data and associated data processing protocols with the objective to develop secure and trusted innovative solutions and methodologies.

The LaTIM activities are also extended to different software and technological platforms such as the CESIM (Health Sciences Simulation Centre); PLaTIMED (platform of the LaTIM for the design and evaluation of medical devices) giving access to innovative equipments (full-body low-dose EOS X-ray, dedicated operating theatres, double energy CT, intraoperative X-ray and US imaging), PLACIS (intensive computing and storage platform).

The successful candidate will contribute to reinforce the Cyber Health team. At the era of big/open data and of artificial intelligence in the healthcare domain (Health Data Hub, "Plan France Médecine Génomique 2025", PEPR Digital Health), Cyber Health develops innovative solutions adapted to the domain in order, for instance, to protect data from their acquisition to their reuse. Its research activities are organized around two main themes:

1) data protection - where the team work on digital content forensics, watermarking or crypto-watermarking approaches with as objective data traceability, data confidentiality and the fight against information leaks by authorized users;

2) secure processing of externalized/mutualized data – where the objective is to develop secure machine learning approaches for decision aid support with the help of secure multiparty computation, homomorphic encryption …

These themes of research are studied in the context of medical imaging, Big Health Data and AI for decision aid support based on the reuse of clinical data (epidemiology) and of genetic data (GWAS - genome-wide association study). Cyber Health develops and experiments its solutions on several LaTIM platforms as well as on regional and national platforms supported by Inserm.

Mission

The successful candidate will contribute to the Chair on Cybersecurity and Trusted Artificial Intelligence in Healthcare (CYBAILE), an industrial chair leaded by Inserm, supported by the Britany Region, the European Regional Development Fund and in partnership with THALES, AiiNTENSE and SOPHiAGENETICS. The aim of the chair is to develop secure and trusted AI systems in the medical field with, for instance, as purpose decision aid support. Their activities are organized into two research axes: i) the development of secure and scalable machine learning algorithms in distributed environments, respectful of patient privacy, but not only; ii) the deployment of reliable AI based systems that are robust and protected.

In this context, the laureate will in particular be in charge of the study and the development of threats to AI systems in the medical domain (e.g. poisoning and inference attacks) in their training and deployment phases considering distributed environments. In addition, you will have to conduct and develop a research activity turned toward innovative responses to such a threat. You will interact with other chair members, academic and industrial, especially though the co-supervision of Ph.D students. You will be able to conduct these activities on the distributed HDS platforms of Inserm (HDS – certified health data host), having thus access to medical data, clinical contexts and applications as well as to computing means.

You will contribute to the development and **influence of Inserm** through high-level publications, a proactive attitude to contract negotiation, valorization, and an active contribution to the life of the institution.

Skills

Level of training and/or experience required:

- Doctorate followed by a post-doctorate in the field: of machine learning (federated machine learning, adversarial machine learning …), in the domain of image/signal processing, natural language processing **and** of cybersecurity, of data protection/security (watermarking, secure processing of data - secure multiparty computation and cryptography, traceability, digital content forensics).

- Former student of "Grandes Écoles" with professional experience > 6 years

- Highly qualified company executive with professional experience > 8 years

Knowledge

- In depth Knowledge in machine learning (deep learning, adversarial learning …) in the domain of image/signal processing, natural language processing or cybersecurity
- Knowledge in secure machine learning (federated learning ...)
- Knowledge in cybersecurity

- Knowledge of the medical domain
- Programming languages: Python, C/C++, Matlab, Pytorch, Pysyft, Tensorflow …
- Knowledge in information system
- Knowledge in Information and Communication Sciences (ICTs)

Know-How

- Expertise in machine learning (deep learning, clustering, adversarial learning, GAN)
- Knowledge of the machine learning security needs (secure federated learning ...)
- Knowledge on secure machine learning (federated learning ...)
- Knowledge in cybersecurity
- Experience in student supervision (master, PhD)
- Programming (algorithm, software …)
- Your scientific skills and your experience in project management will enable you to develop and participate in partnerships with partners from the economic and academic world, at regional, national and international levels.

Abilities

- Excellent relational and integration capabilities into multi- and inter-disciplinary research team.
- Autonomy, sense of organization, analysis/listening/proposal capacities, critical spirit
- Rigor, ethics, scientific integrity and adaptability
- Confidentiality
- Sensitive to the challenges of sustainable development and social responsibility, you act in an ethical and responsible manner and have demonstrated that these dimensions are taken into account in the projects you have carried out

Offer

We are offering a full-time, permanent 4-year contract for a senior scientist in an intellectually challenging environment. The position is open in Brest, a dynamic and lively city of the Brittany Region, in western France. The position is more precisely on the campus of IMT Atlantique where are located the Cyber Health facilities.

During the contract, this position opens the possibility to apply to the "Research Director" competition at Inserm. "Research Director" is the highest-level permanent research position in major research institutes in France. The starting salary will be 45600 euros gross per year.

Applications

Applications should be sent to **dr-nantes@inserm.fr** before June 24th 2022. If you have questions regarding the administrative aspects, please contact **dr-nantes@inserm.fr**. For more information on the scientific aspects, please contact: Gouenou Coatrieux, full professor at IMT Atlantique (gouenou.coatrieux@imt-atlantique.fr).

The application requires the following documents and should be sent as a **single file in PDF format** exclusively:

- Your CV, following the format on annex 1 below.
- Your scientific application file, following the format in annex 2 below.

Annex 1 Format for the CV

Last Name:
First Name:

1- Personal Information

Last name
First name
Gender
Position
Personal postal address
Professional phone number
Email
Date of birth of child (ren)
Date and duration of military service and/or paternity leave

2- Cursus

PhD degree (year, place)
HDR (French habilitation for PhD supervision) if appropriate
Other diplomas (year, place)

3- Professional experience

Research experience:
Describe the PhD, post-doctoral trainings, current position and any additional professional training.
For each position, indicate the period, the Institution, the country and the name of your mentor(s).

Grant:
Indicate the grants obtained, specify whether you are the coordinator or a partner

Teaching and supervision experience:
University teaching responsibilities (academic year, university, level undergraduate, master, postgraduate)
Supervision of trainees, doctoral students, post-doctoral students

Awards and scientific prizes:
Names and date

Learned societies:
Membership(s) of learned societies, discussion groups (period of duty)

4- Institution where you currently work

Title of the research laboratory
Head of the research laboratory
Name and head of the team leader
Postal address of the research laboratory
Date of arrival in this laboratory

5- Five most important publications or realizations

6- Additional information

Web Site
Domains/Subdomains and Keywords
Language skills
Computer or other skills

Annex 2: Scientific Application file format

Last Name:
First Name:

The presentation of your previous professional experiences and how you plan to invest in the proposed project should not exceed 10 pages (font: Arial 10, references included)

1. Previous work experiences

Describe each experience separately:
- *title*
- *international context and working hypothesis;*
- *applied methodologies;*
- *results – provide details on the following aspects:*
  - *1- personal involvement in case of collaborative working;*
  - *2- specific original features;*
  - *3- contribution to the evolution of scientific knowledge.*

2. Achievements

A/ Publications:

Please highlight your name in the list of authors. Add an asterisk if you are a co-first / co-last / co-second / co-second to last or corresponding author.

All publications stemming from your thesis work, post-doctoral research must be listed separately and classified as follows:

- *original articles,*
- *review articles,*
- *conference proceedings,*
- *informative research papers.*

B/ Instrumental and methodological developments - Products and computer tools
- *software,*
- *databases,*
- *prototypes and demonstrators,*
- *platforms and observatories,*
- *tools presented in solver competitions.*

C/ Valorization

If applicable, aforementioned valorization and transfer activities must be clarified. Please develop on your personal contribution as well as their impact on:
- *fundamental or clinical research progress,*
- *innovation,*
- *society.*

3. Scientific supervision

If applicable, describe the organization of your research group.

4. Position in the chair project

Following your exchanges with the host laboratory and on the basis of your expertise, specify how you plan to develop the proposed project in the medium and long term.
   Describe your envisaged input with regard to:
- *working hypotheses;*
- *strategy;*
- *intended methods and experiments;*
- *synergy with the host lab's research thematic;*
- *foreseeable consequences on the evolution of scientific knowledge;*
- *preliminary data;*

- *human, material and financial resources;*
- *if applicable, working conditions as to the realisation of studies on human beings or animals (consultation of an ethics committee).*