Junior Professor Chair (tenure track) - HUMA²IN
HUman-**M**achine **A**utomatic control and **A**rtificial **IN**telligence

Location: Université Polytechnique Hauts-de-France, Valenciennes; LAMIH UMR CNRS 8201
Duration: 3 to 6 years (depending on the skills of the candidate)
Starting: between September 2023 and December 2023
Gross salary Minimum (depending on the skills of the candidate): 3443 € per month

THE RESEARCH POSITION: Major Assets

1. Beyond the position itself, the advantage is to directly **access to a full-time professorship** at the end of the tenure track period. The chair is financially **highly supported** in research with extra 200 k€ (for 3 years), 2/3 of which is spent on human resources and 1/3 on equipment. In addition the UPHF also provides a doctoral scholarship.
2. As regards teaching, only a portion corresponding to 1/3 of the teaching load is requested, corresponding to 64 hours of teaching time per year. **Speaking French is not required**.
3. The chair is fully included and accompanied inside the department of Automatic Control. It is an important brick reinforcing its activities in this field. Internationally, many collaborations exist, notably with Canada (CRIR and CHUM in Montreal), NTU Singapore, PolyU Hong-Kong, UFMG in Brazil… Research projects related to the field do also exist in the department (CNRS SOUDER-CA, ANR CoCoVéIA, ANR HM-Science) as well as start-ups issued from it (Autonomad-Mobility created in 2015 and Mediwat planned for late 2023).

THE CANDIDATE: Expectations

1. The candidate has a PhD + 2 to 3 years (ideally), a solid research experience attested by publications in renowned international journals. The candidate masters the tools of system control and observation, he/she also has some knowledge about learning methods and has an open mind allowing to link together 3 worlds: automatic control and its fundamentals (robustness, guaranteed performance), AI and its power (learning from data), Human and its complexity (including safety and heterogeneity).
2. Given the strong support and resources available within the chair, it is expected that after 2 or 3 years the candidate will be able to submit applications for highly competitive projects allowing to reinforce its notoriety and improve the research of the department in the field, an ERC project being a very good example.

Schedule

May 15: final date for applying.
The recruitment is done in 2 phases.

1. 1st phase selection on file. Apply online via Galaxie in the "FIDIS" section (more details will be provided later). The application must contain:
    a. an extensive CV, including the candidate’s job history and publications;
    b. a summary of research activities (5 pages max);
    c. a project in line with the Chair application (5 pages max);
    d. letters of appreciation from recognized researchers.
2. 2nd phase. Oral examination (expected May-June; schedule, jury and details will be provided later)

Send the application to Pr. Thierry Marie Guerra at guerra@uphf.fr.

FAQs

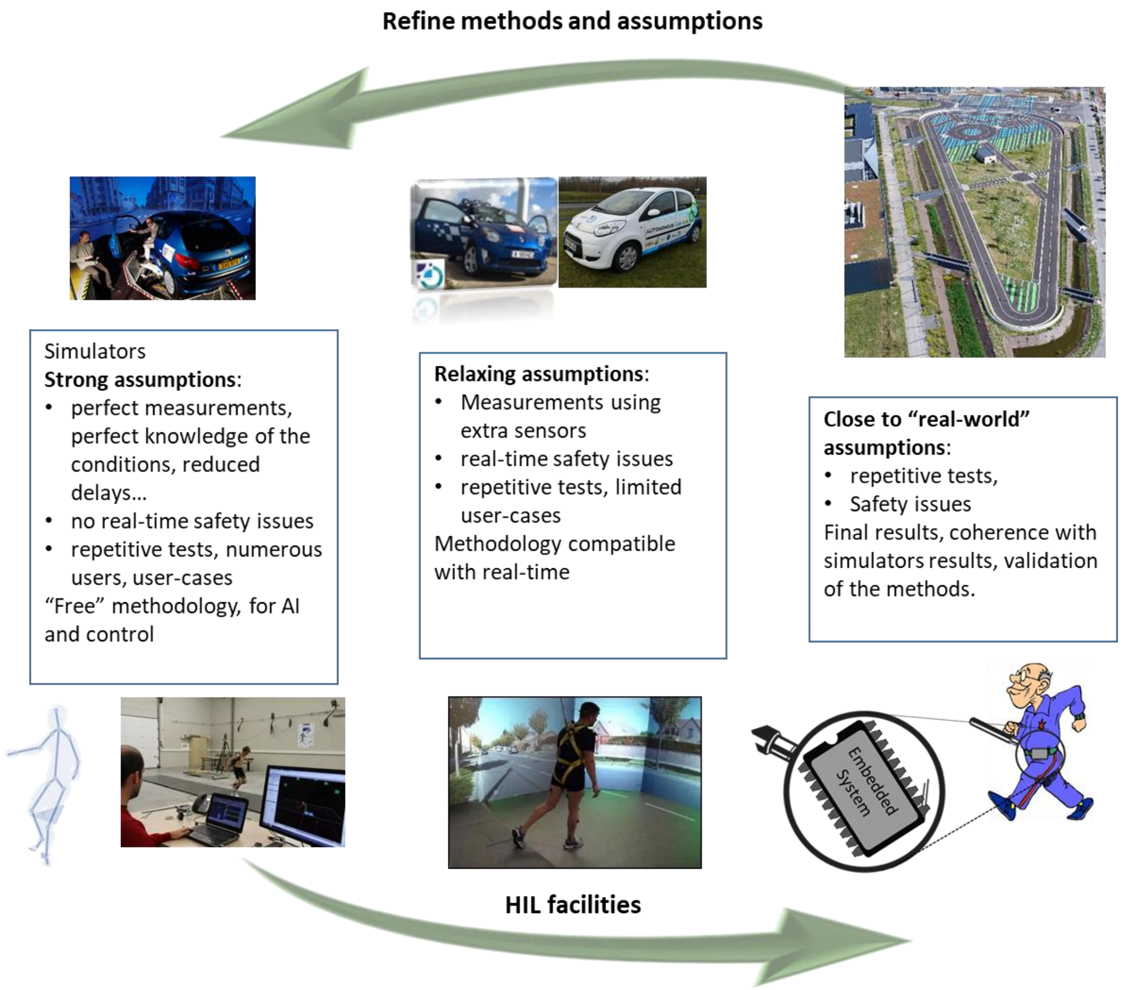
1. PhD + 2 to 3 years? This is ideally, it can be less but then the Tenure track period should be longer (at least 5 years); it can be more but the Tenure track period is at least 3 years.
2. Access to a full-time professorship? If the duties are fully accomplished, the access is direct.
3. Teaching? French is not required; English is mandatory for teaching. Most of the lectures will be given at a Master level.

Summary of the Scientific Project

Keywords: Automatic control and AI, Human-Machine systems, Health, Physical Disabilities

The project enters the important topics, both for Automatic control and for Society. The problem "*that might be the most daunting of all, is how machines should learn when humans are in the loop*" (Recht 2019). What should humans do, what can humans do when interacting with the Machine? How to assist, integrate the Machine with the Human? The project is part of these issues for People with Reduced Mobility (PRM) with a generic vocation (in the sense of the most "independent" possible of the application) by using the fundamentals of Automatic control and by implementing interactions with Artificial Intelligence (AI). The fundamental domains are located on two innovative levels: 1. large-scale systems, taking into account inter and intra-PMR variability, observation, observability; 2. Human-Machine interaction (reinforcement learning, data-based control ...) with the aim of providing guaranteed safe and efficient interactions.
The applications are numerous (assistance, rehabilitation, HM cooperation...) and the LAMIH platforms could be usefully exploited. Projects have already been initiated in this direction, on the health and mobility sides; for example, on shared HM control: ANR CoCoVéIA (2020-23), ANR HM-Science (2022-26 with NTU Singapore). Innovation is also part of the perspectives (patents, start-ups). Existing collaborations will be used both academic (CH Valenciennes, CHU Lille, CRIR Montreal, UMONS, NTU Singapore, PolyU Hong-Kong, UFMG Brazil ...) and industrial (Stellantis, Alstom, Safran, Decathlon...).
The following figure summarizes perfectly the general idea developed for this scientific project through two examples. The top line corresponds to Human-Machine cooperation, for example car shared control (ANR CoCoVéIA and ANR HM-Science). The bottom line corresponds to assistance and/or rehabilitation for disabled people, for example embedded systems to detect and/or assist walking problems for disabled (start-up Mediwat project).
In both cases, the first step is to detect the human's intentions. To do this, one must know what and when to measure in order to find relevant variables that will be observed and will be the basis of any assistance (shared control, movement for an orthosis). AI can intervene in several ways, at the level of data collection and analysis (e.g., eye tracker), detection of intentions, classification of pathologies (e.g., patients at risk of falling). Automatic control will be the basis for guaranteeing relevant information, detecting faults (state observer, UIO), and ensuring robust and efficient "low-level" commands (e.g., safe braking or safe movement assistance for an orthosis).

The different pictures on the figure also show the test facilities available at LAMIH to achieve these objectives. Top from left to right: SHERPA driving simulator, instrumented vehicles, test track; bottom: motion capture systems, all of them being operated by dedicated engineers that will contribute to the project.


Refine methods and assumptions
Simulators
Strong assumptions:
• perfect measurements, perfect knowledge of the conditions, reduced delays…
• no real-time safety issues
• repetitive tests, numerous users, user-cases
“Free” methodology, for AI and control
Relaxing assumptions:
• Measurements using extra sensors
• real-time safety issues
• repetitive tests, limited user-cases
Methodology compatible with real-time
Close to “real-world” assumptions:
• repetitive tests,
• Safety issues
Final results, coherence with simulators results, validation of the methods.
Embedded System
HIL facilities