JOB DESCRIPTION
Tenure Track position
Chaire de Professeur.e Junior
Evolutionary Exoskeleton for Teenagers with Reduced Mobility

The Tenure Track (Chaire de Professeur Junior) is a new way of recruitment allowing access to a full-time job as a full professor. Recruitment is based on a research and teaching project led by a holder of a doctorate or equivalent diploma. The recruited person will sign a research and teaching agreement with the University of Evry Paris-Saclay as well as a tenure contract for a period of 5 years. This new way of recruitment will make it possible to recruit young scientists on a contract of public law endowed with a financial environment and allow access, at the end of a period of 5 years, to a full professor position.

Building on the potential of its members and laboratories, the research produced at Université Paris-Saclay forms part of a dynamic centered on key areas, from pure research to applied science and industrial interest. Université Paris-Saclay has a long tradition of research in three broad areas: Science and Engineering, Life Science, and Social Science and the Humanities. A very wide range of disciplines is thus represented, for which research is carried out with a constant desire for improvement: to be at the cutting edge of science, using the most advanced methods and equipment, working with international networks, and training early career researchers (https://www.universite-paris-saclay.fr/). IBISC (Computer Science, Bio-Informatics, Complex Systems) is a laboratory of Paris-Saclay University (http://www.ibisc.univ-evry.fr). The research responds to major ICT societal challenges in precision and personalized medicine and the vehicle of the future. The IBISC laboratory is composed of 4 teams: AROBAS, COSMO, IRA2, and SIAM. Their scientific activities are divided into two axes: ICT & SMART SYSTEM and ICT & LIFE, each focused on a specific application area which is respectively: drone & vehicle, and precision and personalized medicine.

ICT & SMART SYSTEM: research deals with the design of autonomous and intelligent Mechatronics systems. The concept of a system refers both to the road or air vehicles fleet, robot, software, and services distributed and communicating or smart hardware components interacting with sensors. These devices share the property of being composed of a large number of interacting components with autonomous decision-making while coordinating action to achieve a common goal. Two major questions underpinned the design of such complex systems: the former relates to the design method and the latter concerns the optimization of their collective behavior taking into account the environmental perturbations. Approaches combining methods and theories from different scientific fields are explored: automatic, algorithmic, and formal methods. Applications are specifically targeted at a new generation of Mechatronics systems.

ICT & LIFE: these interdisciplinary research covers a wide spectrum of biological and biomedical issues at different scales of a living organism: data analysis, biological or biomedical signals, biological system modeling, assisted surgical gesture learning, and assistance to the person. The research focuses on the development of theoretical frameworks, algorithmic methods, and platforms to meet the challenges. More specifically, biological data analysis relies on statistical learning, on structure prediction algorithms. The system biology modeling is based on formal methods dedicated to network dynamics analysis. For the assisted surgical gestures learning and robotics assistance for the person, we develop systems coupling signal analysis based on several sensors to decision-making techniques. The applicative scope of the research is devoted to personalized and precision medicine.

Our team at Paris-Saclay university has been investigated since 2005 in the actuating technology named "Servo Electro-Hydraulic Actuator" (SEHA) covered by national and international patents (WO2009118366), (FR1901923). this technology is under development as part of an industrial excellence chair between UEVE and KALYSTA startup. Recently, a maturing project (SEHA) is funded by SATT Paris-Saclay to develop an optimized version of the proposed actuator. The SEHA aims at validating an innovative hydraulic & electric actuator enabling products with the performance of hydraulic components for the simplicity, controllability, volume, and weight of an electric actuator. The final product will be well adapted to robotics applications and more globally to embedded mechatronic systems like Exoskeleton.

Research profile

Design humanoid robots and exoskeletons to emulate the functioning of human limbs (movements and efforts) by combining the mechatronic design of the electrical and hydraulic actuation system with the controls necessary for biomechanics adapted to locomotion. We aim to assist the locomotion of growing adolescents, a complex subject that requires understanding the processes of walking in the transition from childhood to adolescence, and the expected physical properties (degrees of freedom, joint speed, resistance, and rigidity). The project combines our skills in engineering, IT, and data with those of doctors and ergonomists. It will be a question of modeling and adapting the exoskeleton/prosthesis to the growth of the adolescent and integrating the mechatronic and control constraints for natural adaptability of the device during growth; to integrate the adolescent-physical and/or virtual system interaction (sensory coherence in space and time between the desired action and the reactions of the AR/VR systems or the device); to implement mixed reality techniques between the device and its avatar to improve the performance of physical and psychological rehabilitation, ergonomics, psychological acceptability and problems related to use Experience with embedded systems, software, and firmware is mandatory.

Scientific topic: Assistance in the locomotion of adolescents with reduced mobility; Embedded Mechatronics Design; actuation; Control of exoskeletons; Embedded and distributed computing; Artificial intelligence.

Teaching profile

CPJ's teaching activities will irrigate the International Master's "Mechatronics Machine Vision & Artificial Intelligence" (MMVAI, mention E3A, University of Paris-Saclay) created in 2021. This Master's focuses on a new generation of systems mechatronics where the couplings between the different subsystems (mechanical, control, computer) are considered during development and not only post-manufacturing. This program in English is one of the few Masters in Europe and the only one at Paris-Saclay University that combines the teaching of mechatronics and artificial intelligence to train international experts in this field. Master's graduates are an excellent breeding ground for innovative companies and laboratories. The candidate will be required to strengthen the teaching team of the Master and will be tasked with improving its influence and international attractiveness. He will thus be in charge of proposing new module(s) specific to the field and completing the current teaching team by integrating doctors, ergonomists, and industrialists. The relevance of a particular interdisciplinary course will be studied and the repercussions in terms of professional integration will be evaluated.

Keywords: Humanoid assistance robotics, Exoskeleton, Mechatronics, Electrohydraulic actuation, Artificial Intelligence.

Professor Requirements:

- A Ph.D. in the relevant field.
- 3-10 years of experience teaching in an academic setting.
- Published articles and proven experience as an academic.
- Strong teaching and mentoring skills.
- Excellent presentation, and written and verbal communication skills.
- A sound understanding of and passion for the subject matter.
- A growth mindset and excellent networking abilities.

Contact:
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Official Job description form:
https://www.galaxie.enseignementsup-recherche.gouv.fr/ensup/ListesPostesPublies/FIDIS/0911975C/FOPC_0911975C_4273.pdf

French Ministry Application website:
https://www.galaxie.enseignementsup-recherche.gouv.fr/ensup/cand_recrutement.htm

Application Deadline : 10/06/2022, 4:00 PM (Paris time zone)
Expected date of employment: 01/12/2022
Remuneration: Gross annual salary of 55,032 €
Financial Environment: 250,000 € for the project