

# Research Grants for PhD students from the China Scholarship Council

Information Form (please read the guidelines carefully on the website [www-csc.utt.fr](http://www-csc.utt.fr))

Supervisor's name : ARAKELYAN Given names : Vigen

Status (prof., assistant prof., ...) : Full Professor

Laboratory : Research them "Mecaproc" (INSA Rennes / LS2N UMR6004) Website address :

Institution : Institut National des Sciences Appliquées (INSA) of Rennes Website address : [www.insa-rennes](http://www.insa-rennes)

Scientific competence of the supervisor:

Since joining Department Mechanical and Control Systems Engineering at the National Institute of Applied Sciences in 2002, Professor Vigen Arakelian has taught kinematics and dynamics of mechanisms, mechanical systems and Robotics. His research interests span mechanics of robots, robot rehabilitation devices, control of mechanical systems, synthesis of high-speed machines and parallel manipulators, numerical simulation and optimization of mechanical systems by using ADAMS software. He is author of three books devoted to the study of balancing, kinematics and mobility of mechanisms and robot manipulators, four edited books with Springer and more than 150

Two major publications in the field proposed for the PhD :

1. V. Arakelian, S. Briot. Balancing of linkages and robot manipulators. Advanced methods with illustrative examples, Springer, 2015, 291p. (ISBN: 978-3-319-12489-6).
2. Gravity compensation in robotics (Ed. V. Arakelian), Springer, 2022 (ISBN 9783030957490)

Website address of the personal page :

**Supervisor's email :** [vigen.arakelyan@insa-rennes.fr](mailto:vigen.arakelyan@insa-rennes.fr)

**Description of the research work proposed for a PhD** **Topic # (see list) :** VI-7

Title : DESIGN AND ROBUST CONTROL OF UPPER-LIMB EXOSUITS FOR IMPROVED HUMAN COMFORT AND ASSISTANCE / Joint PhD supervision

Subject :

This PhD research focuses on the design and control of upper-limb exosuits for assistive and industrial applications. The student will investigate wearable robotic systems aimed at reducing physical strain for individuals with locomotor disabilities and workers exposed to musculoskeletal risks. The work involves analyzing current limitations of rigid exoskeletons and developing lightweight, soft exosuits that improve mobility while ensuring user comfort and safety. The candidate will define and incorporate human comfort criteria into the exosuit design, particularly focusing on contact pressure distribution and biomechanical safety constraints. Experimental validation will be conducted to assess comfort and usability. In parallel, the student will develop an optimization framework for improving mechanical performance and ergonomics. Finally, the PhD work will address control challenges caused by nonlinear cable friction by designing a robust control strategy to improve accuracy and stability of motion tracking in exosuit systems.

Keywords :

Human-robot interaction, Wearable assistive devices, Cable-driven systems, Assistive technology, Robust control

Expected collaborations :

PhD Supervisor (University of Shanghai for Science and Technology) : Prof. Hongliu Yu  
Hongliu Yu, Professor and PhD Supervisor, currently serves as the Director of the Institute of Intelligent Rehabilitation Engineering at the University of Shanghai for Science and Technology and Director of the Shanghai Engineering Research Center of Rehabilitation Devices. He has long been engaged in teaching and research in the field of rehabilitation engineering, with research interests including rehabilitation robotics, intelligent human-machine

Background required from the applicant :

- Modelling of robots.
- Force analysis and optimization knowledge.
- Study of mechanical systems and programming in Matlab/Simulink.
- Familiarity with the softwares ADAMS and CATIA will be appreciated.

Existence of a PDF file detailing the proposal ("yes" or "no") : Yes

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