

Research Grants for PhD students from the China Scholarship Council

Information Form (please read the guidelines carefully on the website www-csc.utt.fr)

Supervisor's name : MIRAOUI Given names : Abdellatif

Status (prof., assistant prof., ...) : Professor, director of INSA Rennes

Laboratory : Institut de Recherche Dupuy de Lôme (IRDL) Website address : <https://www.irdl.fr/>

Institution : INSA Rennes Website address : <https://www.insa-rennes.fr/>

Scientific competence of the supervisor:

Prof. Abdellatif Miraoui is the director of the National Institute of Applied Sciences in Rennes (INSA Rennes). He was director of the Electrical Engineering Department at the University of Technology of Belfort-Montbéliard from 2001 to 2009, and was appointed president of the Cadi Ayyad University in Marrakech from 2011 to 2019. His research work concerns electric and hybrid vehicles, fuel cells, energy management, etc. He is the author of more than 230 scientific publications (international journals, conferences). He has directed more than 38 PhD theses. According to Google Scholar, his h-index is 46 as of January 31, 2021.

Two major publications in the field proposed for the PhD :

1. B. Celik, R. Roche, D. Bouquain and A. Miraoui, "Decentralized Neighborhood Energy Management With Coordinated Smart Home Energy Sharing," IEEE Transactions on Smart Grid, Nov. 2018.
2. Nanfang Yang, Fei Gao, Damien Paire, Abdellatif Miraoui, Weiguo Liu, "Distributed control of multi-time scale DC microgrid based on ADRC", IET Power Electronics, vol. 10(3), pp. 329, 2017

Website address of the personal page :

Supervisor's email : abdellatif.miraoui@insa-rennes.fr

Description of the research work proposed for a PhD **Topic # (see list) :** I-17 and V-7

Title : Energy management of fuel cell hybrid electric vehicles using advanced machine learning technique

Subject :

During the last few decades, electric vehicles (EVs), and most recently hybrid electric vehicles powered by fuel cells (FCHEVs) are widely considered as a clean transport solution.

To find the maximum energy efficiency situation and the highest performance of fuel cell hybrid energy powertrain, many optimal control strategies were proposed in literature. A common drawback of method proposed is that the patterns of real driving cycles are not considered. The real driving cycle may contain different cycle patterns in a period, which cannot be simply classified as a single driving cycle. Thanks to the recent development of machine learning techniques, using advanced machine learning for the modeling of real driving cycles, as well as to develop the associated energy management control of FCHEVs, could be a viable solution.

This PhD project is therefore expected to deal with this issue by applying state-of-art machine learning techniques for the energy management of fuel cell hybrid electric vehicles, where the main steps should be vehicle and driving cycle modeling and simulation, machine learning based control development, and experimental validation.

Keywords :

Energy management, fuel cell hybrid electric vehicle, machine learning, control algorithm

Expected collaborations :

University of Technology of Belfort-Montbéliard (UTBM), France
University of Western Brittany (UBO), France
Cadi Ayyad University (UCA), Morocco
École de technologie supérieure (ETS), Canada

Background required from the applicant :

Master's degree in electrical engineering and competence in electric vehicle powertrain components, such as battery, electric machine, power converter, etc. The candidate should also have basic knowledges in machine learning field, such as artificial neural network (ANN).

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

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