

# 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 : DAVOINE Given names : Franck

Status (prof., assistant prof., ...): CNRS Researcher (with HDR).

Laboratory : HEUDIASYC Website address : <https://www.hds.utt.fr>

Institution : CNRS / Université de technologie de Compiègne Website address : <https://www.cnrs.fr/en>

## Scientific competence of the supervisor:

Since 2015: CNRS Researcher at Heudiasyc Lab, SyRI team (Robotic Systems in Interaction). International coordinator of the Labex – Laboratory of Excellence MS2T “Control of Technological Systems-of-Systems”. From 2011 to 2014: CNRS Researcher at LIAMA - Sino-European Laboratory of Computer Science, Automation and Applied Mathematics, in Beijing, P.R. China. Member of the Key Laboratory of Machine Perception (Ministry of Education), Peking University, and of the Institute of Automation, Chinese Academy of Sciences (CASIA). Research keywords: Computer Vision and Multi-Sensor Based Perception, Machine Learning under Uncertainty, Information Fusion, System of Systems.

## Two major publications in the field proposed for the PhD :

1. X. Li, Y. Grandvalet, F. Davoine, J. Cheng, Y. Cui, H. Zhang, S. Belongie, Y.-H. Tsai, M.-H. Yang. Transfer Learning in Computer Vision Tasks: Remember Where You Come From. Image and Vision Computing, 93.
2. Q. Liu, F. Davoine, J. Yang, Y. Cui, Z. Jin, F. Han. A Fast and Accurate Matrix Completion Method based on QR Decomposition and L (2,1) Norm Minimization. IEEE Tr. on Neural Networks and Learning Systems, 30(3), March

Website address of the personal page : <https://www.hds.utt.fr/~fdavoine/>

Supervisor's email : Franck.Davoine@hds.utt.fr

Description of the research work proposed for a PhD Topic # (see list) : I-12

Title : Representations and processing of 3D points evolving in a spatio-temporal neighborhood.

## Subject :

In the recent years, there has been an acceleration of methodological developments to analyse and model 3D point clouds, accompanied by a broad collection of applications in computer vision such as 3D object classification, detection, or scene semantic parsing [1]. Several representations of point clouds have been proposed, organized in regular 3D voxel grids, in graphs, in vertical columns, or transformed in collections of images.

→ In connection with these research works, this PhD will address the question of representing and processing 3D points evolving in a spatio-temporal neighborhood. The work will concentrate on the analysis of data observed from event cameras with the aim of better understanding the inherent mechanisms that govern the temporal evolution of points. Such recent bio-inspired cameras differ from conventional frame cameras in the way that they asynchronously measure per-pixel brightness changes, and output a stream of events that encode the time, location and sign of the brightness changes [2].

[1] Y. Guo, H. Wang et al., "Deep Learning for 3D Point Clouds: A Survey". arXiv:1912.12033, Dec. 2019.

[2] Gallego, G., Delbruck, T., Orchard, G., Bartolozzi, C., Taba, B., Censi, A., Leutenegger, S., Davison, A., Conrath, J., Daniilidis, K., Scaramuzza, D., "Event-based Vision: A Survey", arXiv:1904.08405v2, Feb. 2020.

## Keywords :

3D points. Spatio-temporal point pattern representation and analysis. Computer vision.

## Expected collaborations :

Collaborations are expected with both national and international researchers.

In France, with academic researchers of the GDR ISIS (Information, signal, image and vision) and colleagues from the Heudiasyc laboratory.

In China, with Franck Davoine's previous collaborators in Peking university, CASIA (Beijing), Nanjing Nanjing University of Science and Technology or Shanghai university (through out the Sino-French Institute in Engineering - UTSEUS).

## Background required from the applicant :

The candidate must have a Master's degree in computer science, mathematics or physics, a proven record of high achievement, excellent knowledge of English (written and verbal), S/he should have proven skills in some of the following areas: Image Processing and Analysis, Data Sciences, Machine Learning, Statistical Analysis and Graph Theory. S/he should be proficient in programming in C++ and Python languages.

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

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