



12-month Postdoc offer for European citizens
Deadline for application: End of January, 2019



Machine learning control of experimental turbulent shear flows

FLOWCON is an ANR project funded by DGA (French Direction Générale de l'Armement) and devoted to the development and the demonstration of machine learning methods for the closed loop control of turbulent fluid flows such as the one shown in the figure below. This project is lead by a consortium of turbulence control researchers of France at LIMSI, PRISME and PPRIME in collaboration with a world-wide network of leading scholars in machine learning, nonlinear dynamics, control theory, simulations and experiments [1].

Applications of flow control are ubiquitous: aerodynamic drag reduction, lift increase, jet vectorization, mitigation of noise emission, to name only a few examples. In contrast with most current control strategies, this project aims to develop control methods applicable to operational configurations, in the *strongly nonlinear realm*. Since 2013, we have demonstrated that machine learning discovers and exploits optimal control laws in an automated manner and has outperformed other optimized literature approaches in numerous dynamical systems, direct numerical simulations and experiments [2].

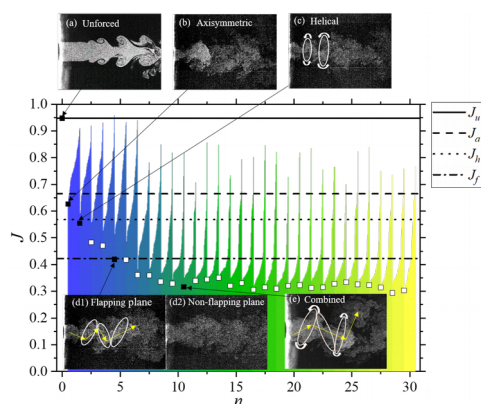


Figure: Example of Machine Learning Control of a jet mixing optimization with the group of Prof. Yu Zhou (HIT, China). For details, see D. Fan et al. 2018 AFMC.

The Postdoc will be at the heart of the experimental efforts at LIMSI and PRISME. His/her role will be to lead experimental demonstrations of machine learning control in experiments on wake stabilization of the fluidic pinball (LIMSI), open cavity flow stabilization (LIMSI) and separation mitigation of a turbulent boundary layer (PRISME) – in order of increasing dynamical complexity.

The successful candidate should demonstrate a strong background in experimental flow control ideally with experience in feedback laws. Experience in flow velocimetry and visualization is appreciated. Good notions of signal analysis, control theory and machine learning are certainly a plus. The candidate should also have strong skills in communication and excellent writing capabilities.

The position is located at LIMSI (Laboratoire d'Informatique pour la Mécanique et les Sciences de l'Ingénieur) in Orsay (Greater Paris), France, and will be in collaboration with a team in the PRISME Institute (Orleans, France). The experiments will be performed at LIMSI and PRISME. It is a 12-month position for European citizens (due to source of funding).

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Contacts:

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[1] <http://flowcon.cnrs.fr>

[2] Thomas Duriez, Steven L. Brunton & Bernd R. Noack 2016 Machine Learning Control – Taming Nonlinear Dynamics and Turbulence, Springer.