

# Postdoc position at ISAE-SUPAERO

## Development of innovative AI approaches for fluid-structure interactions

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**Deadline for applying:** 11<sup>th</sup> of November 2018

**Location:** ISAE-Supaéro (Toulouse, France)

**Duration:** 2 years

**Keywords:** Fluid mechanics, fluid-structure interaction, deep learning, artificial intelligence

### Context and objectives:

Artificial Intelligence (AI) recently emerges in many engineering fields as a new approach to handle complex systems and elaborate physical models. Based on the training of large neural networks, Deep Learning is one of those methods which has shown outstanding results. In fluid mechanics, breakthrough in numerical methods can be expected by using such a technique to develop complex physical models, or accelerating current numerical solvers. Yet, the small amount of studies dedicated to AI for fluid mechanics suggests that progress is still required to make these methods mature and reliable. The department of Aerodynamics, Energetic and Propulsion (DAEP) at ISAE-Supaero is currently applying deep learning techniques to several problems encountered in fluid mechanics, involving data from experiments or numerical simulations. This postdoc position will complement the current team to apply AI to tackle fluid-structure interaction (FSI) problems. Such phenomena emerge when flow oscillations couple with the vibration of a solid surface, for example the airfoil itself. Numerical simulations of such FSI are usually very expensive. In this context, after a learning phase, deep learning is expected to provide flow predictions without additional computational effort. This innovative approach will be developed during this Postdoc, especially for transonic flows which are still challenging to predict. The selected candidate will also contribute to the other projects related to deep learning and through collaborations with AI experts from Jolibrain.

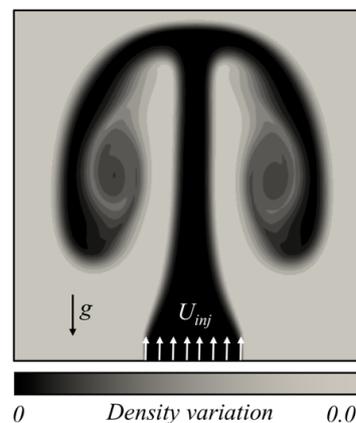
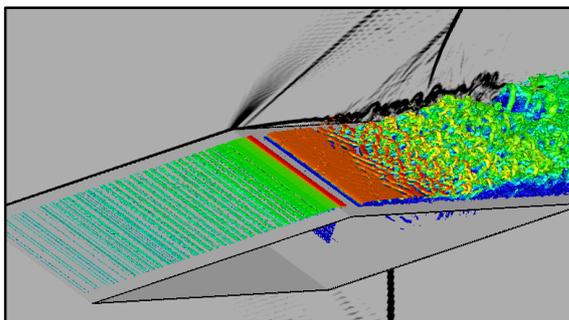


Fig. 1 **Left:** Overview of a shock/boundary layer interaction (Dumon et al., 2018). **Right:** simulation of a plume using a deep network embedded into a CFD solver (Master Thesis A. Alguacil, 2018).

**Requirements:**

The Postdoc candidate has a PhD. with a background in Fluid Mechanics and/or Artificial Intelligence. Coding skills (python, C++, etc.) are required. Analytical modelling skills and a knowledge of fluid/structure interactions is also appreciated. Oral and writing skill in English is mandatory. Please send a cover letter, a CV, a list of relevant publications as well as recommendation letters before November 11<sup>th</sup>, 2018.

**Salary (indication):**

2200 euros/month

