

## **Post-doctoral position (1 year) “Development of machine learning methods for the design of architected materials”**

Post-doctoral position at Mines Paris, CMM (Fontainebleau) and ENSAM, PIMM (Paris)

### **Subject**

Structural defects induced by additive manufacturing usually exhibit sizes similar to that of the architecture mesoscale, and have drastic impacts on the meso and macroscale properties of printed materials. The post-doctoral work centers on developing machine learning methods for image reconstruction and morphology analysis of 3D in-situ or in-operando experiments, and to perform data mining to optimize additive manufacturing process routes. The main goals of this study are two-fold: predict the sensitivity of the printed material quality to the input parameters and its statistical variability of behavior induced by the manufacturing imperfections and control in operando the manufacture and the possibility of certifying the part.

For that purpose, the process simulation will be based on a hybrid modeling of the material (physics-based modeling, enriched by data) and its characterization with the ultimate objective of coupling of the characterization and the monitoring of the manufacturing process, to take into account the optimization of the process parameters.

Experimental data will be augmented by generating a virtual architected materials (with relevant stochastic features deduced from 3D images) and by deforming them with dedicated multiscale simulation codes. This whole set of experimental and numerical data will be utilized to speed up the design of the mesoscale architectures: a numerical method that combines topological and morphological optimization algorithms with the hybrid version of IA will be developed purposely. This strategy will be leveraged as a hybrid framework combining physics, geometry and IA

### **Context:**

The post-doctoral position will be part of the ANR demonstrator project “ADAM” as well as the ANR exploratory program (“PEPR”) “Diadem”, with the collaboration of researchers from different laboratories including INSA Lyon (Simap-Mateis), Polytechnique (CMAP), Univ. Grenoble (3SR, LGP2), CEA (LIST, LITEN).

**Supervision:** the post-doc work will be jointly supervised by François Willot, Paco Chinesta and Jesus Angulo.

**Application:** we are looking for a junior researcher holding a PhD in image analysis and machine learning, especially in domains of applications related to engineering and material science, with excellent scientific background. Please include in your application submitted or published articles whenever possible. Send your full resume and application to [francois.willot@minesparis.psl.eu](mailto:francois.willot@minesparis.psl.eu)

**Location:** CMM laboratory of Mines Paris (in Fontainebleau), regular visits to PIMM laboratory in ENSAM (Paris)