

MECHANICAL ENGINEERING

HPC-Based Domain Decomposition Methods for Turbomachinery Applications

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Context of the research activity	The main subject of the research activity is the definition of numerical methodologies purposely developed for HPC environment for the dynamic analysis of turbomachinery components. The study will account for non-linear behavior of large structures (bladed disks, turbine or compressor rotating modules) assembled by means of friction joints.
Objectives	The PhD student will develop software for the nonlinear forced response of machine components in parallel computing architecture. Trade-off analysis of available programming languages will be performed and the most promising language will be down selected to implement the developed algorithms. The software will be based on domain decomposition techniques customized to deal localized nonlinearities in both time and frequency domain. Interaction with CFD numerical software will be possibile with the final year of activity. Validation of the developed methods will be performed on industrial test cases to challenge the methods against the commonest engine architecture in the civil aviation propulsion.
Skills and competencies for the development of the activity	Structural dynamics, rotordynamics, programming skills, linear algebra, numerical methods, domain decomposition.