

# Structural integrity under extreme loads

Topic: High fidelity models and machine learning

**TITLE: Reduced order models applied to impacts engineering**

## RESEARCH BACKGROUND:

Impact analyses are highly nonlinear and should be solved using explicit algorithms which are time-consuming. In recent years Reduced Order Models (ROMs) techniques are gaining momentum for multi-query simulations to alleviate the computational burden of such numerical problems. This thesis aims to define a ROM workflow that is able to replicate the nonlinear dynamics of impact on helmets as a Full Order Model (FOM).

## RESEARCH ACTIVITIES:

1. Literature review on reduced order models (focus on non-intrusive methods)
2. Numerical implementation of simple benchmark cases
3. Model reduction of blunt impact on helmets (training phase)
4. Numerical assessment of reduced models and error estimation (online phase)

**METHODOLOGY:** Numerical

**DURATION:** 9 months

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