

<p style="text-align: center;">Research program: <i>“Semi supervised system identification methods with application to fault detection”</i></p>

Annex C

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Objects activities:

This research fellowships is in the framework of the EU project REPRISE, whose main aim (for the University of Bergamo) is the to develop a reliable Health Monitoring System for the electromechanical actuator able to detect degradations and predict their progression until failures occur.

The REPRISE project is planned in four steps:

- 1) To test an available EMA/ECU on an available test rig until mechanical failures occur;
- 2) To develop a HMS able to detect degradations of the mechanical components before they will evolve into failures. The HMS will be made of hardware and software to be installed into the Electronic Control Unit (ECU) of the EMA;
- 3) To redesign the EMA of 1) in order to improve reliability and reduce weight and envelope;
- 4) To test the redesigned EMA and ECU, which incorporate the HMS, to demonstrate that the degradation of the mechanical components is detected before it evolves into a failure.

The candidate should be able to give operative contributions to all the four steps, but he/she is expected to give a major contribution in the SW part of step 2. In particular, step 2 will include the design of algorithms to detect degradation in order to prevent failure. The research hypothesis is that advanced system identification methods could be effective in modeling the system both in faulty and in healthy conditions. Among these methods, the focus will be on semisupervised methods that are particularly attractive in practical application with incomplete data sets.

The research project outline is the following:

- 1) State of the art of semi-supervised learning identification methods and analysis of the relation with fault detection methods and health monitoring systems;
- 2) Simulation and performance analysis using Matlab;
- 3) Adaptation of Semisupervised methods to dynamical systems;
- 4) Development, implementation and testing of the adapted method;
- 5) Development of a Condition Assessment method for the REPRISE project.