

Master's Thesis

Task description for Master's Thesis of

Name Surname

Failure Detection and Identification for a Rocket Propulsion System Using Machine Learning Algorithms

Topic

The space sector is currently gaining more and more interest due to the commercialization of Space (OneWeb, SpaceX Starlink) and upcoming human missions such as the return to the lunar surface. Spacecrafts, especially the propulsion systems, are complex machines made up of several systems. Accurate knowledge about the engine's state and fast and reliable action in case of failures is essential for smooth operation and to prevent drastic system failure. An important component of this is the detection and identification of the occurring failures.

Currently failure detection commonly is done by dynamic redlines, which act as an operational envelope that, when exceeded, signals a failure.

Advanced data processing algorithms such as machine learning promise improved performance in failure detection and identification of failure modes. This can increase the reliability of engine testing and operation while providing additional information for data analysis and health monitoring.

The goal of this thesis is to implement a machine learning algorithm for failure detection and identification to improve upon the performance of the conventional approach of redlines and provide insight into the type of failure occurring.

Tasks

1. Subdivision into work packages with sub-tasks and creation of a time plan
2. literature research on propulsion system failure modes and FDI
3. Definition of requirements
4. Implementation of a system model
5. Implementation of failure modes
6. Implementation of a machine learning FDI approach
7. Analysis of the implemented FDI performance
8. Documentation and presentation of results

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