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Machine Learning Algorithms for Rocket Propulsion

Authors : Rômulo Eustáquio Martins de Souza, Paulo Alexandre Rodrigues de Vasconcelos Figueiredo

Abstract : In recent years, there has been a surge in interest in applying artificial intelligence techniques, particularly machine learning algorithms. Machine learning is a data-analysis technique that automates the creation of analytical models, making it especially useful for designing complex situations. As a result, this technology aids in reducing human intervention while producing accurate results. This methodology is also extensively used in aerospace engineering since this is a field that encompasses several high-complexity operations, such as rocket propulsion. Rocket propulsion is a high-risk operation in which engine failure could result in the loss of life. As a result, it is critical to use computational methods capable of precisely representing the spacecraft's analytical model to guarantee its security and operation. Thus, this paper describes the use of machine learning algorithms for rocket propulsion to aid the realization that this technique is an efficient way to deal with challenging and restrictive aerospace engineering activities. The paper focuses on three machine-learning-aided rocket propulsion applications: set-point control of an expander-bleed rocket engine, supersonic retro-propulsion of a small-scale rocket, and leak detection and isolation on rocket engine data. This paper describes the data-driven methods used for each implementation in depth and presents the obtained results.

Keywords : data analysis, modeling, machine learning, aerospace, rocket propulsion
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