Abstract

Cost analysis for complex space systems and space missions

The CEF (Concurrent Engineering Facility) infrastructure of the Italian Space Agency has the objective to perform preliminary and feasibility studies (Phase 0/A studies) of either complex space systems or space missions, using the concurrent engineering design process. This kind of approach improves and speed up the conceptual evaluations and the project planning, and gives the opportunity to develop optimized solutions with reduced costs. A key role in every CEF study is given to the cost analysis expert, who must estimate the cost of the entire space system and of its single elements, and the cost of the whole mission. In this context, the development of a well structured and standardized database, that may include both physical and statistical data, with all the relevant information is an important starting point. From this database, the cost estimation can be performed, identifying a cost correlation between the principal components and their physical parameters (Principal Component Analysis, PCA), through appropriate machine learning algorithms, using deep artificial neural network, clustering methods or other artificial intelligence methods, depending on the structure of available data. The objective of the implementation of such algorithms is to have a novel, versatile and responsive tool that estimates the cost of a new space system during the sessions of a CEF study. The research project will be mainly conducted at the Italian Space Agency headquarter of Rome, with possible collaboration with other Italian entities, which could share their database. A targeted dissemination and communication plan will allow the researcher to share its activities, outcomes and outputs with other researchers, the private sector and the general public sector.