Contribution ID: **247** Type: **Poster**

AI Approaches to the Automatic Optimization of Instrument Acquisition Scheduling in Space Missions

In the context of planetary missions, the optimization of the scheduling of the acquisitions of instruments in the payload is of great importance in order to maximize the scientific return.
To this end, specific acquisition plans are defined, deciding which instruments can operate at different times in order to optimize coverage while respecting both the physical constraints imposed by the target scenario and the mission resources.
Despite some automatic/semi-automatic approaches have been developed for scheduling activities of Earth observation satellites, only few studies have considered the case of space missions focused on other planets, where the usually long temporal length of the schedule and the many constraints make the problem more complex.
Most of these approaches rely on classical constraint-based optimization algorithms, with the most advanced solutions based on genetic programming.
This research work attempts to address the problem of instrument acquisitions optimization through the use of new methodologies based on AI and in particular on deep reinforcement learning.
The study is developed with respect to the operations of radar instruments, even if the methodology is general.
The task is formulated in the form of a multi-dimensional knapsack problem, and several models are currently being tested. Research is still in its early stages, directed towards the development of algorithms capable of exploiting neural networks in order to handle the large dimensionality of the combinatorial problem.
If successful, the optimizers could be used to support space missions such as JUICE and EnVision.

Primary author: VACCARI, Giulio (University of Trento)

Co-author: Prof. BRUZZONE, Lorenzo (University of Trento)