

Call For Papers

Virtual Collection on the Application of Machine Learning and Reinforcement Learning Techniques in Space Systems

A. Synopsis

The field of machine learning (ML) and reinforcement learning (RL) are emerging topics in artificial intelligence (AI) and neuroscience which allow computers to learn from data or from an automated goal-directed activity to make decisions in an uncertain and dynamic environment. Technological companies in Silicon Valley use data science and data-driven techniques such as ML and RL to teach autonomous cars to drive safely and avoid nearby pedestrians and obstacles. Although these techniques may present some risks to be used for future space systems and space missions, they are crucial for system autonomy and autonomous operations that will be needed in order to lift the workload off of human operators. The objective of this virtual collection is to further stimulate interest in this area and to disseminate the latest advances and research work in autonomous space systems and space missions.

The proposed Virtual Collection collects and presents original research papers on the application of data-driven and ruled-based modeling, machine learning (ML), and reinforcement learning (RL) techniques in space systems, mission design, space exploration, ground-support systems, manufacturing, integration and testing, launch control, and recovery and repair.

B. Topics of interest include, but are not limited to:

- Adaptive spacecraft structures
- Autonomous flight tasking or schedule preparation
- Autonomy and autonomous systems in space
- Dynamics and control of large space structures and tethers
- Earth and non-Earth space missions
- Lunar exploration
- Mission architectures
- Space exploration
- Large-scale astrodynamics, design, analysis, and optimization of very large constellations
- Orbit determination and space surveillance and tracking
- Rendezvous, docking, relative motion, proximity missions, formation flying, and re-entry
- Robotic precursor missions and human exploration missions

- Space situational awareness, conjunction analysis, and collision avoidance
- Space structures and materials
- Space robotics and in-orbit assembly and maintenance
- Spacecraft dynamics, flexible multibody dynamics, contact/constraint modeling
- Spacecraft guidance, navigation, and control
- Sensor fusion and system health management
- Fault detection, identification and recovery
- Structural dynamics and computational sciences
- Liquid, hybrid, and electric space propulsion systems
- Trajectory design and optimization
- On-orbit distributed processing and autonomy

C. Submission and Publication Target Dates

Paper submission deadline: April 1st, 2022

Initial review completed by July 29, 2022

Virtual Collection publication date: November 1st, 2022

D. Submission Instructions

<https://mc.manuscriptcentral.com/aiaa-jsr>

select Virtual Collection title from dropdown in Step 1 of submission.

E. Guest Editors

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