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Novelty-guided onboard targeting and tactical planning for Mars rovers

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For planetary missions like the Mars Curiosity and Perseverance rovers that are exploring new environments, novelty detection systems that use machine learning to identify observations that differ from what previously has been seen may be used to aid scientists and accelerate scientific discovery. This can be achieved through onboard systems that autonomously select targets for follow-up analyses to enable targeted observations beyond ground-in-the-loop commanding opportunities as well as through ground-based systems that prioritize observations in downlinked data to accelerate tactical planning. The design of these novelty detection systems is driven by resource availability and other constraints that may differ between the onboard and ground-based settings. In this talk, I will describe two novelty detection capabilities developed for onboard targeting and tactical planning and present results that evaluate these systems for use in the Mars Science Laboratory (Curiosity) rover mission.