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Sky Survey Scheduling using Reinforcement Learning

Modern cosmic sky surveys (e.g., CMB S4, DES, LSST) collect a complex diversity of astronomical objects. Each of class of objects presents different requirements for observation time and sensitivity. For determining the best sequence of exposures for mapping the sky systematically, conventional scheduling methods do not optimize the use of survey time and resources. We present an alternative scheduling method based on reinforcement learning (RL) that aims to optimize use of telescope resources for scheduling sky surveys.
We present an exploration of RL techniques (e.g., Q Learning) in both table-look up and neural network-approximation contexts. We compare our implementation with standard methods like the Greedy agent and standard frameworks, like Astroplan. We show that tabular-based methods are wholly insufficient for large-scale surveys with large numbers of targets and when long-range planning is required. We also demonstrate that approximation methods outperform these traditional tabular methods and may provide a path forward for optimal sky survey scheduling

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