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TRANSFER LEARNING IN SPACE EXPLORATION

Abstract

Transfer Learning offers great potential in solving multitude of challenges related to building an artificial intelligence system in the unique space exploration environment. For instance, deep learning methods may provide effective solutions due to powerful learning ability, however space exploration faces significant challenges such as data availability and potentially high consumption of computing resources. As a result, artificial intelligence models may have to be trained on Earth using distributed computing resources with analogous source data and transformed to the various physical conditions and environments of the targeted extraterrestrial location. Machine learning models developed by scientists may experience collapse in performance and failure due to inability to generalize to the new domain, for example, a constantly changing and unknown space environment and insufficient volume of data. Transfer learning enables overcoming these challenges by leveraging models trained on a related domain or task. This approach may facilitate screening conditions which have not necessarily been tested or ideally trained with the system or model with minimum amounts of available data. This approach will help identify novel threats, situations, and scenarios, leading to critical decision making