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Machine Learning Techniques for Particle Flux Reconstruction applied to the ESA JUICE mission radiation monitor

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The Jovian system comprises a multitude of objects, such as the planet Jupiter and a large number of satellites, with the largest four being the Galilean moons Io, Europa, Callisto, and Ganymede. In April 2023, the European Space Agency (ESA) launched the Jupiter Icy Moons Explorer (JUICE) mission, projected to arrive at Jupiter in July 2031, and it will perform many studies of Jupiter and its icy moons. To monitor the radiation intensity of the spacecraft's surrounding environment and to provide alerts so it can protect itself, JUICE is equipped with the RADiation-hard Electron Monitor (RADEM). RADEM will characterize the Jovian radiation environment and support anomaly identification. The detector will also be operating during the whole trip to Jupiter, which includes three Earth flybys, and a Venus flyby, allowing it to study the Van Allen belts during the Earth flybys, the cosmic ray gradient of the solar system and to characterize Solar Particle Events (SPEs). In this project, I will develop a neural network model that uses the measured count rates and each energy bin's response function to estimate the incident particle flux spectrum.

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