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Development of a Neural-Network-Based Event Reconstruction for the RadMap Telescope

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Detailed knowledge of the radiation environment in space is an indispensable prerequisite of any space mission in low Earth orbit or beyond. The RadMap Telescope is a compact multi-purpose radiation detector that provides near real-time monitoring of the radiation aboard crewed and uncrewed spacecrafts. A first prototype has been deployed on the International Space Station in April 2023 for an in-orbit demonstration of the instrument's capabilities. RadMap's main sensor consists of a stack of scintillating-plastic fibres coupled to silicon photomultipliers. The perpendicular alignment of fibres in the stack allows the three-dimensional tracking of charged particles as well as the identification of cosmic ray ions by reconstruction of their energy-loss profiles. We trained a set of convolutional neural networks on simulated detector data to perform an event-by event reconstruction of track parameter, ion type and energy. In addition to our current offline analysis, we plan to implement the analysis framework on the instrument's flight computer to analyze measurements without requiring the transmission of raw
data to Earth. In this contribution, we will describe our neural-network-based reconstruction methods and present first results.

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