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Extended sources reconstructions by means of Coded mask aperture systems and Deep learning algorithm

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The localization of radioactive sources provides mandatory information for the monitoring and the diagnostic of radiological scenes and it still constitutes a critical challenge. Gamma-ray imaging is performed through coded mask aperture imaging when the energy of the photons is sufficiently low to insure photoelectric interactions into the mask. Then, classically, a deconvolution algorithm is applied to reconstruct the position of the source. However, this deconvolution problem is non-injective and classical methods do not provide any relevant information when the source cannot be associated to a point, with respect to the angular resolution of the imaging system. In this presentation, we introduce a new method based on Deep Learning algorithms and Convolutional Neural Network. We evaluate its performances on extended sources with real measurements acquired with Caliste, a CdTe pixelated detector, and compare them to MLEM, a classical iterative algorithm.

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