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The Spoke 2 of the ICSC National Centre, with a focus on deep learning applications in astroparticle physics and satellite imagery

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The National Research Centre (CN) for High Performance Computing, Big Data and Quantum Computing, managed by the ICSC Foundation, has been founded under the National Recovery and Resilience Plan as part of the Education and Research Mission. The CN includes an Infrastructure Spoke (Spoke 0) plus 10 thematic Spokes and, besides building a world-class supercomputing cloud infrastructure, its purpose is to carry out research in computing and high-performance data analysis, identified as strategic areas for any future scientific and technological development. In particular the Spoke 2, dedicated to "Fundamental Research & Space Economy", addresses the challenges of increasing computational needs in the field of theoretical and experimental collider physics, astroparticle physics and gravitational waves investigation. In this contribution, after a short overview of the CN and of the planned infrastructure, the status and perspectives of the Spoke 2 are presented. Furthermore, two use-cases are illustrated: i) data-driven identification of signals in different experimental apparatuses (in particular a Liquid Argon TPC and a ground array of water-Cherenkov detectors) using autoencoders, i.e. self-supervised neural networks; ii) analysis of satellite imagery for the segmentation of wildfire-affected areas, employing supervised deep learning techniques on the data from the Copernicus Sentinel-2 mission and the Copernicus Emergency Management Service.

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