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The NextLEAP: A novel data processing workflow for the LOFAR EoR science project

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The LOFAR Epoch of Reionization Key Science Project (LOFAR-EoR-KSP) aims to detect the 21 cm signal from the Epoch of Reionisation. Such a detection will require the analysis of multiple terabytes of LOFAR data with precise calibration and careful excision of systematics. We introduce the LOFAR EoR Analysis Pipeline (NextLEAP), a novel data processing pipeline implemented method using Nextflow, an expressive, flexible, scalable pipeline definition language. The pipeline enables end-to-end automation of all EoR data processing stages granulated into modular reusable components for optimal job management, testing, resource allocation and error handling. Furthermore, it allows for an efficient bookkeeping of all processing parameters for results reproducibility. We describe the capabilities and merits of workflows like NextLEAP in comparison with traditional processing methods in the community. We also show why such pipelines will be essential as the EoR community gears closer towards the detection of the 21 cm signal and as data volumes increase with the forthcoming SKA.