

# Applications of high-performance computing in nuclear physics

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Artificial Intelligence (AI) applications are currently hot topic in the field of high-performance computing (HPC) and require significant computing resources. LUMI supercomputer [1], currently positioned 9th on the Top500 list [2], hosts over 3000 scientific projects, and over half of LUMI's computing resources have been utilized for AI-related research and innovation making it one of the world's most powerful AI platforms for science, playing important role in supporting European research community.

Looking into the future of HPC, the EuroHPC Joint Undertaking (JU) has selected the hosting sites of the next EuroHPC supercomputers and AI Factories. One of the chosen hosting sites is Finland, led by CSC – IT Center for Science, together with a LUMI AI Factory consortium of five other countries: the Czech Republic, Denmark, Estonia, Norway and Poland.

An AI Factory is an ecosystem that enables AI researchers and developers to have one-stop access to the high-performance computing (HPC), data sets and skills they need. The aim is to make it as easy as possible for both scientific researchers and industrial innovators to adopt AI methods on a large scale.

In this talk, I will present the architecture of the LUMI infrastructure and its status, together with plans and ambitions for the near future. Then I'll discuss the applications of HPC in nuclear physics in the past, currently and in the future. These include, for example, high-energy physics done at CERN, nuclear structure calculations and fission computations.

[1] <https://www.lumi-supercomputer.eu/>

[2] <https://top500.org/lists/top500/>