Motivational letter - Jean Iaquinta

Tentative idea of a project that can be conducted as part of the Academic Group Project

I work in the INES project (Infrastructure for the Norwegian Earth System modelling) in the Meteorology and Oceanography Section (MetOS) where I am responsible for developing/maintaining the NorESM (Norwegian Earth System Model) which is derived from the CESM (Community Earth System Model), and providing reliable, timely and coordinated technical support for NorESM users.

So far climate simulations exploited the national HPC resources (linux clusters based on Intel processors) but these will soon be replaced by a new machine combining CPUs (AMD Epyc processors) and GPUs (from Nvidia). Therefore, the model will need porting on the new machine and some "optimization" to exploit both CPUs and GPUs, also its performance will have to be assessed.

However, we are not ready to face this challenge because:

i)   we have locally no experience working with GPUs, and
ii)   we have no formal training or practical experience on performance analysis, load balancing and optimization.

I would very much like to be involved in an Academic Group Project on **"Performance analysis"** applied to Earth System Models. It could be NorESM (https://github.com/NorESMhub/NorESM) but also CESM (https://github.com/ESCOMP/CESM), EC-EARTH, IFS, *etc*.

Keywords: *Performance analysis, Earth System Model (ESM), porting, scalability, openACC.*

How will you act as a multiplier of the gathered information?

The training will allow me to understand the basics and methods for performance analysis, including the metrics and the available tools, and to have hands-on-experience with a practical case and the possible solutions to performance issues.

This will place me in a better position to provide up-to-date support and MetOS and in the Geosciences department in general, since I will know more about how to tackle/quantify performance bottlenecks in a code in order to prioritize efforts to address them. That will allow us to better exploit available resources and prepare the NorESM transition to the new HPC and to pre-exascale supercomputers (i.e., LUMI should be operational in the beginning of 2021).

Others at the University of Oslo (and outside, since these are open to all) will also benefit from it through workshops of the Carpentries@UiO (https://carpentries.org/) who's mission is to "*help researchers and engineers get more research done in less time and with less pain by teaching them basic skills for scientific computing*".