Summary of IFF proposal

Steven Calvez

My research activities are focused on advancing long-baseline neutrino oscillation and neutrino-nucleus cross-section analyses, in particular through the use of High Performance Computing (HPC). I am working on improving the HPC implementation of the Feldman-Cousins framework that we used to drastically improve the speed and accuracy with which confidence intervals for oscillation parameters in NOvA's first neutrino and antineutrino oscillation analysis could be computed. I am working in close collaboration with Fermilab's SciDAC collaborators to build a common oscillation analysis framework capable of leveraging very large computing resources. I am also performing the measurement of the muon-neutrino-induced charged pion production in NOvA's near detector. Measuring more accurately such cross-sections is pivotal in improving our understanding of neutrino-nucleus interactions and, therefore, reducing their contributions to the systematic uncertainties impacting many analyses. Segments of these analyses have proven very computationally expensive, which is why I'm also working on porting them on supercomputers. Finally, as NOvA production convener, I'm interested in helping develop the infrastructure that would allow us to carry large production campaign on HPC centers.

With the popularity of increasingly sophisticated simulation, reconstruction and analysis techniques, HEP experiments' needs for computing power keep rising. The only sustainable way to address this issue might be to shift our focus toward HPC centers. The Intensity Frontier Fellowship would help support my work in this direction and would enable a very efficient communication with both the neutrino and computing experts present at Fermilab.