Gordon Bell Prize + Fugaku

• • •

Ian Cloët, Johann Rudi, Mohamed Wahib, and Wu Feng

ACM Gordon Bell Prize [https://awards.acm.org/bell]

The Gordon Bell Prize is awarded each year to recognize outstanding achievement in high-performance computing. The purpose of the award is to track the progress over time of parallel computing, with particular emphasis on rewarding innovation in applying high-performance computing to applications in science, engineering, and large-scale data analytics. Prizes may be awarded for peak performance or **special achievements in scalability and time-to-solution on important science and engineering problems.** *Financial support of the $10,000 award is provided by Gordon Bell, a pioneer in high-performance and parallel computing.*

Gordon Bell Prize Criteria [https://en.wikipedia.org/wiki/Gordon_Bell_Prize]

"The Gordon Bell Prize, commonly referred to as the Nobel Prize of Supercomputing …"

Primarily intended to recognize performance achievements that demonstrate:

- Evidence of important algorithmic and/or implementation innovations

- Clear improvement over the previous state-of-the-art

- Solutions that don't depend on one-of-a-kind architectures

- **Performance measurements that have been characterized in terms of scalability, time to solution, efficiency**, and/or peak performance

- Achievements that are generalizable

Prize can be awarded in one or more of the following categories, depending on the entries received in a given year:

Peak Performance: demonstrates outstanding performance in terms of floating point operations per second on an important science/engineering problem.

Special Achievement in Scalability, Special Achievement in Time to Solution: demonstrates exceptional scalability, in terms of both strong and weak scaling, and/or total time to solve an important science/engineering problem.

Fugaku [https://awards.acm.org/bell]

- Only pathway available to us for computing is Fugaku, number two fastest computer on top500

- Wahib is High Performance Artificial Intelligence Systems Research Team Lead at RIKEN

- To use Fugaku and benefit from Wahib's team need to use PyTorch

- To me, pursuing a Gordon Bell via QuantOm and Fugaku is aspirational and motivation, and even partial success would have many benefits. But we need a realistic path and core team to make this a success

Gordon Bell Prize – Target problem

- Event-level analysis of 1D QCFs called parton distributions functions (PDFs) for the proton + neutron

- Because of the time constraints should likely aim for the minimal semi-realistic/ proof-of-concept version of this problem.

- Need to use the distribution GAN workflow with PyTorch, scalability will be a big challenge

- Need to convert 1D theory code to be PyTorch compatible – pure QCD, no QED, or nucleon spin effect

- Need MCMC

- Detector = 1 or perhaps 1+ε