'PARAM Brahma will allow scientists to address complex scientific problems'

Indian Institute of Science, Education and Research (IISER), Pune, has become the first among seven IISERs and the first institute in the city to set up an advanced supercomputing facility under National Supercomputing Mission (NSM). Once installed, 'PARAM Brahma' will allow scientists to address newer and more complex scientific problems in a range of areas. Excerpts from an interview by **Anjali Marar** with **M S Madhusudhan**, chair, IT Programme and **Goldi Misra**, chief technology officer at IISER, Pune

What is 'PARAM Brahma'?

MADHUSUDHAN: It is a supercomputer offering a computational power of 850 TeraFlop with 1 PetaByte storage capacity. It is one of the supercomputers built in India under NSM, co-funded by Ministry of Electronics and Information Technology and Department of Science and Technology. Centre for Development of Advanced Computing (C-DAC) and Indian Institute of Science, Bengaluru, are steering this mission. 'PARAM Brahma' is supported by a first-of-its-kind cooling system called direct contact liquid available in India. This cooling system makes effective use of thermal conductivity of liquids, namely water, in maintaining the temperature of the system during operations. The outlay for the deployment and maintenance of the facility over a period of three years is about Rs 32.5 crore.

IISER Pune is presently using 19 cluster computers, which will soon be augmented with the installation of 'PARAM Brahma'. *Express*

Which areas of research will 'PARAM Brahma' be used in?

MADHUSUDHAN: With the new supercomputer, the scientific community will be able to scale up and plan on taking up advanced studies in existing research areas, including agriculture, drug discovery and healthcare, computational biology and neurobiology, earth and climate sciences, seismic modelling and earthquake engineering, nano materials and predictive materials modelling, high energy physics, astrophysics, complex network structure and its dynamics, encryption among other areas. There are researchers who are also making use of algorithms that are based on artificial intelligence (AI) and research in AI will also be initiated in the near future.

How will the supercomputing facility benefit researchers at IISER, Pune?

MADHUSUDHAN: IISER, Pune, has been using its existing high performance computing (HPC) facilities, which are an aggregate of 19 cluster systems offering a total computing power of 412 TeraFlop and 1.2 PetaFlop storage. Each of these clusters, available since 2009, is being used by research group comprising faculty, students and collaborators. Due to their limited capacities, it was not possible to undertake large-scale studies in a particular scientific area which will now be possible with 'PARAM Brahma'. Also, the present 412TF facility is being used by about 20 research groups mostly within IISER. But with the new facility adding 850 TF computing and 1 PB storage, more researchers, say for instance, from Savitribai Phule Pune University or any other research laboratory or institution in Pune or elsewhere, can now seek time to use the latest supercomputer.

Does IISER, Pune, have expertise in using and maintaining such a complex supercomputer system?

GOLDI: Since IISER Pune already has HPC systems aggregating 412 TF, we have the necessary expertise to operate and maximise usage of supercomputers. Under NSM, C-DAC will provide maintenance services to the upcoming facility for the first three years after installation. Earlier, this year, a pact was inked between IISER, Pune, and C-DAC in this regard. Besides, we work closely with industry partners like Intel, Nvidia, Persistent System and Ministry of Human Resource Development, as part of various capacity building, skilling and manpower training programmes from time to time. We have been organising and taking part in numerous conferences, workshops, hackathons, seminars and similar tech-based events.

While each of these HPC-centric events sees a participation of 75 to 150 people, the number of people getting trained for AI, deep learning and machine learning ranges between 200 and 500 per event. Additionally, undergraduate students also take have a mandatory course on computing. Thus, manpower training in these areas is an on-going process at the institute and is constantly evolving in terms of advanced content with hands-on examples.