SAMHAR-COVID19 Hackathon

Trace, Discover and Fight COVID19 with HPC-AI Solutions for India

1. Background:

Centre for Development of Advanced Computing **(C-DAC)** under the aegis of the National Supercomputing Mission **(NSM),** a Ministry of Electronics & Information Technology **(MeitY)** and Department of Science & Technology **(DST)** initiative, in association with NVIDIA & OpenACC, announces the **SAMHAR-COVID19 Hackathon**.

Pandemics outbreak such as the Corona virus outbreak can create huge challenges for the Government and Public Health Officials to gather information quickly and coordinate a response. In such a situation, Artificial Intelligence (AI) can play a huge role in predicting, minimizing and stalling the spread of the virus.

C-DAC has embarked on a program **SAMHAR-COVID19** (**S**upercomputing using **A**I, **M**L, **H**ealthcare **A**nalytics based **R**esearch for combating COVID19). This opportunity will provide researchers to find solutions for Identifying, Tracking and Forecasting outbreaks of COVID19 and Facilitating Drug Discovery as well.

The intention behind this hackathon is not just to solve current Covid-19 situation but to prepare the research community to make use of HPC-AI tools and keep ready to predict outbreaks like this. The hackathon is open to Researchers, Academicians, MSMEs, Startups and Industries with an objective to bring out Innovative and Implementable Ideas for Prediction, Forecasting and Building Healthcare Models that could revolutionize the way we interpret science of pandemic outbreaks using AI technology on Supercomputers.

The problems related to COVID19 that will be solved during this Hackathon are as follows:

- **Drug Discovery and Genome Sequencing**: Human Genome is complex and has 3.2 billion base pairs. India became the fifth country in the world to sequence the genome of the novel Coronavirus, or COVID19, and share its data with the international community. Genome data is essential to build tests, find drugs and vaccines.
- **Medical Imaging**: AI has proven accuracy to detect patterns from Images. Healthcare images like CT provide crucial information and can be used to detect Corona Virus.
- **Contactless Monitoring**: To Explore Contactless monitoring of the outbreak, to explore usage of drones to help medical staff to transport medical samples and to conduct thermal imaging.
- **Surveillance and Monitoring**: Use of Computer Vision Techniques to automate monitoring crowd gathering or tracking possible carriers by looking at patterns like sneezing etc.
- **Forecasting**: Predict the cumulative number of confirmed COVID19 cases in various locations across India, as well as the number of resulting fatalities using

various datasets from the states and union territories of India combined with Big-Data information available from Social Media.

- **Data Mining:** There are more than 44000 research articles on COVID19 already published and the numbers are growing. Use of AI and data analytics techniques to come out with solutions to help the medical community to analyze news reports and online content from around the world to recognize anomalies and predict critical events.

To summarize **SAMHAR-COVID19 Hackathon** aims to find solutions with the following priorities (but not limited to these only):

a. To achieve better (More Accurate) and Faster Turnaround time for Testing and results.
b. To identify, track and forecast outbreaks.
c. To develop Drug Re-purposing Simulations leading to New Drug Discovery.
d. To develop Simulations/Solutions using Traditional (AYUSH) Medicines.
e. To create Chat Bots with multiple regional language supporting Conversational AI Techniques.
f. To develop AI based identification of non-complying or infected individuals.
g. To create, Train and Deploy Robots to sterilize, Deliver Food and Supplies.
h. To deploy Drones to monitor sites, announce policy measures and to deliver medical supplies in the infected regions/areas;
i. To enable automation of COVID 19 Health care Claims for Ayushman Bharat Program

2. SAMHAR-COVID19 Hackathon- Innovative Implementable Idea (I^3) Awards:

Participants will not only will contribute to this hackathon for a Noble Cause, but will also have opportunities to win awards. The Hackathon will be conducted in two rounds:

In Round-1, the top **25 Innovative Implementable Ideas** will be selected by an **Eminent Jury** comprising of eminent scientists and domain experts.

The proposers of these selected ideas will move to Round-2 for proving their Ideas by building a prototype for establishing the Proof of Concept. The proposers are required to demonstrate their prototypes and make presentations to the **Eminent Jury** during the prescribed period.

In Round-2, the participants will be provided with:

- **Compute Infrastructure**: Access to PARAM Series of Supercomputing facility established under NSM (PARAM-Shivay, PARAM-Brahma and PARAM-Shrishti including PARAM-Shrestha and PARAM-Sangam) and to the latest NVIDIA Tesla GPU powered systems will be provided through National Knowledge Network (NKN) backbone.
- **Datasets**: Access to India specific datasets or sample data sets (on request).
- **Training**: Participants will be provided training on latest **HPC-AI tools** including C-DAC Tools like: **TANGO:** Small drug like molecular conformation generation and energy optimization to find right postures of small molecules in the database; **HBAT:** Big-data Analytics tool to Find hydrogen bonds in the simulation trajectories and water interactions; **Parabricks:** Genome Sequencing Toolkit; **RAPIDS:** Machine learning Library**; DeepStream SDK:** streaming analytics toolkit; and AI GPU libraries from NVIDIA (wherever applicable).
- **Mentorship**: Mentors from C-DAC, Industry and Research Organization will guide the participants to help achieve optimal results during the course of Hackathon.

3. Awards:

In Round-1, the selected **Innovative Implementable Idea (I^3) Award** entry (irrespective of the number of members in the team) will be rewarded with Cash Award of **Rs. 10,000** (Rs. Ten Thousand) each and a '**Certificate of Appreciation'**.

In Round-2, the **Top 6 Innovative Implementable Idea (I^3) Awards** will be given away by C-DAC under NSM as described below:

- **Outstanding Innovative Implementable Idea (One Award)**:
  Award will consist of a **'Citation'** +
  A Cash award of **Rs. 2,00,000** (Rs. Two Lakhs only) +
  Free 500 Hours* of CPU-GPU **Computing Credits** along with upto 200TB Storage on PARAM Series of Supercomputing facilities established under NSM and the 100 AI PF PARAM Siddhi-AI Supercomputer connected through NKN;

- **Excellent Implementable Idea (Two Awards)**:
  Each award will consist of a **'Citation'**
  A Cash award of **Rs. 1,00,000** (Rs. One Lakh only) +
  Free 300 Hours* of CPU-GPU **Computing Credits** along with upto 100TB of Storage on PARAM Series of Supercomputing facilities established under NSM and the 100 AI PF PARAM Siddhi-AI Supercomputer connected through NKN;

- **Promising Innovative Implementable Idea (Three Awards)**:
  Each award will consist of a **'Citation'** +
  A Cash award of **Rs. 50,000** (Rs. Fifty Thousand only) +
  Free 200 Hours* of CPU-GPU Computing Credits along with upto 50TB of Storage on PARAM Series of Supercomputing facilities established under NSM and the 100 AI PF PARAM Siddhi-AI Supercomputer connected through NKN.

4. Terms of Participation and Awards:

- Participants can submit multiple entries;
- Each entry can be submitted by a Team comprise of a minimum 2 and a maximum of 5 members;
- Participants will have to share the complete work activities with C-DAC. And C-DAC will have right to use the submitted application/solution for SAMHAR-COVID19 programs;
- The Award will be given to the **Selected/Winning Entry** irrespective of the number of members in the Team (members may choose to distribute the amount among themselves);
- The decision of the **Eminent Jury** on the **I^3 Award** will be final and binding;
- Award can be for the Team/Company/Institution, as submitted in the Application and cannot be changed later;
- Submissions will be considered void if they are in whole or part ill-eligible, incomplete, damaged, altered, counterfeit, obtained through fraud or late submission.

5. Timelines:

Round-1: 1st - 25th April, 2020

- **Hackathon Launch/Announcement: 1st April 2020**
- Application registrations start date: 6th April 2020
- Application registrations close date: 20th April 2020
- Shortlist of Applications for Round-2: 25th April 2020

Round-2: 30th April to 15th May 2020 (Data Sets will be provided on request)

- Computing Resources and Mentors allocation: 30th April 2020
- CPU-GPU Bootcamp: May 1st May, 2020
- **Hackathon period: 30th April to 15th May 2020**
- Teams working with mentors: 30th April - 15th May, 2020
- Hackathon Presentations: Teams Demonstrate and Present final projects 16th May to 20th May 2020

Award Winners Announcement: 28th May, 2020 with awards to be given during the '**C-DAC Tech Conclave 2020'** in a grand function.

6. Registration:

For more information and registration visit the link <www.SAMHAR-COVID19Hackathon.cdac.in>

Send your queries to SAMHAR-COVID19Hackathon@cdac.in

7. About C-DAC:

The Centre for Development of Advanced Computing **(C-DAC)** is an autonomous Scientific Society under the Ministry of Communications & Information Technology,

Government of India. Set up in 1988, as India's national initiative for Design, Development and Delivery of High Performance Computing (Supercomputer) Systems and solutions based on parallel processing technology, C-DAC has over the years expanded its activities. It has transferred the expertise acquired to provide Advanced Computing solutions in the state-of-the-art areas of ICT. **More about C-DAC: https://cdac.in**

8. About NSM:

National Supercomputing Mission (NSM) is a proposed plan by Government of India to empower India's National Academic and R&D institutions spread over the country by installing a vast supercomputing grid comprising of High-Performance Computing facilities. Another goal is to develop applications of National Importance. For these applications the entire compute needs are provided through NSM. The Mission also includes development of highly professional HPC-Aware Human Resource for meeting challenges of development of these applications. The Mission implementation would bring supercomputing within the reach of the large Scientific & Technology community in the country and enable the country with a capacity of solving multi-disciplinary grand challenge problems. The Mission is being implemented and steered jointly by the Ministry of Electronics and Information Technology (MeitY) and Department of Science and Technology (DST), Government of India.

More about NSM: https://nsmindia.in .

9. About NVIDIA:

NVIDIA's (NASDAQ:NVDA) invention of the GPU in 1999 sparked the growth of the PC gaming market, redefined modern computer graphics and revolutionized parallel computing. More recently, GPU deep learning ignited modern AI - the next era of computing - with the GPU acting as the brain of computers, robots and self-driving cars that can perceive and understand the world.

More information on NVIDIA: http://nvidianews.nvidia.com/.

10. About OpenACC:

OpenACC.org is a non-profit organization founded to help scientists and researchers do more science and less programming by providing a high-level directives-based programming model for High Performance Computing. The OpenACC Organization is dedicated to helping the research and developer community advance science by expanding their accelerator and parallel computing skills. They have 3 areas of focus: participating in computing ecosystem development, providing training and education on programming models, resources and tools, and developing the OpenACC specification. The organization is run by academic and industry members in collaboration with OpenACC user community.

More information on NVIDIA: https://www.openacc.org