Science and Engineering Research Board (SERB)

IRHPA call for establishing

SERB Centres on AI-based Earth Systems Modeling

About IRHPA: Intensification of Research in High Priority Areas (IRHPA), a legacy scheme of SERB has contributed significantly to augment general R&D capabilities, by setting up of Core Groups, Centre of Excellence (CoEs) and National Facilities in frontline and emerging fields of science & engineering. The scheme has been very effective in supporting disruptive scientific ideas, to establish strong S&T foundations for the nation and at the international scientific landscape.

Background: The field of Earth Sciences and its allied multidiscipline - Geosphere, Biosphere, Hydrosphere, Cryosphere, and especially Atmosphere has undergone phenomenal transformations during last six decades. These changes have occurred on account of new knowledge obtained through modern observation techniques (satellites, radars, etc.), communication, coupled with advances in computer technologies. The advent of high performance computing has enabled scientists to create more realistic and complex Earth System Models (ESM). We have also witnessed the rapid world-wide socio-economics expansion, with anthropogenic forcing pushing the boundaries of sustainable development; and thus the consequent need of integrating research effectively in these multi-disciplines. Globally, the collaborators from these different yet highly connected disciplines are making efforts to do so. However, to be able to do an effective inter-disciplinary science has been really a challenge in this field.

Weather and climate prediction encompasses high dimensionality, variability, interactions on many different spatial and temporal scales and dynamic chaos, especially in tropical region we live. This makes many complex processes unresolvable despite the state-of-the-art numerical operational models, and hence insufficient for many applications. Besides, global weather forecasting uses only less than 5% of currently available satellite data, and the processing time for the traditional approaches is already under stress. Our national weather and climate agencies takes pride in having repository of more than 125 years of data. Besides this meteorological data, we have huge amount of other types of data - geospatial, biological, health, and astronomy which remains underutilised for the want of application of the Artificial Intelligence & Machine Learning (AI & ML), as a supplement or supplant to major components of these operational systems. Notably, there is now a new national policy in place for collection and use of Geospatial Data and Services, including maps, as formulated by DST.

This calls for a major paradigm shift to make cost-effective use of the dramatic increase in volume, diversity, and capabilities of observations (particularly satellite observations). Although a considerable number of isolated Earth System features have been analysed with AI & ML techniques, the holistic approach to understand the entire system has not occurred. For instance, ML may aid pattern recognition, teleconnection identification, ESM diagnostics (including systematic bias errors), data fusion & assimilation, efficient & intelligent signalling and provide enhanced warnings of approaching weather extreme events. Also, geohazards such as landslides, glacier breaks, tsunami etc. require high level of AI & ML intervention. Lastly, the prediction needs have moved beyond routine forecast of temperature, precipitation, or sea state; and now require decision-specific quantities such as energy production, transportation disruptions, agricultural efficacy, and supply chain impacts. This is where AI & ML can play a disruptive game changer for Earth & Atmospheric Sciences (EAS) Community.

Call for Proposals: With this background, SERB solicits proposals to establish three such interdisciplinary and multi-institutional CoEs in the arena of the EAS developed through applications of AI & ML in the country on the following areas of interest:

1. AI & ML for better weather and ocean forecasting, and long-term environmental sustainability.

2. Deep learning models for early warning of extreme geohazards.

3. AI/ML models to predict climate extremities and climate change mitigation, through high-precision analytics.

Vision: To have up to 03 CoEs for developing AI & ML approaches to improve weather, climate & geohazard prediction and capacity building in this area.

Mission: To create a network of the above three CoEs with requisite infrastructure, knowledge base and skills in the field of AI & ML, with an ultimate objective to establish leadership in ESM, and consequent better forecasting skills for weather/climate/geo-hazards, effective environmental impact assessment, and adapt to ever changing climate. These CoEs will also train the next generation of AI/ML-conversant EAS experts.

Eligibility Conditions:

- As is obvious, application for such CoEs should be multi-institutional and interdisciplinary, and having convergent collaborations between PI and Co-PIs from EAS and AI & ML communities. An existing collaboration will be a plus. The CoEs should also attempt for added funding from non-SERB sources such as industry and other partners.

- In addition to the proposal in required format, the following should be provided:

  (a) How is the proposal aligned with the AI & ML road map of the country in research segment of EAS community? A one-page brief to be provided. [*Ministry of Earth Sciences (MoES) had initiated an open call for soliciting proposals in different aspects of AI & ML in Earth Sciences in the year 2019. The proposals are under scrutiny for funding. These MoES funded projects, would be encouraged to work in tandem with the CoEs funded by the SERB*]

  (b) One page action plan on the availability and utilisation of the geospatial data as per the existing policy of the Department of S&T on the subject.

  (c) A robust action plan for CoE's sustainability beyond its tenure (5 years).

- Proposals should be submitted in the prescribed IRHPA format through SERB online portal: www.serbonline.in. Other eligibility conditions as applicable to CRG projects are to be followed. PI should not have any ongoing IRHPA/SUPRA project.

- Last date of submission is June 30, 2021.

How to Apply: Please visit the SERB online portal under IRHPA scheme (www.serbonline.in/SERB/Irhpa_Instruction). In case of any queries, you may contact:

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