Training-based Workforce Development for Advanced Cyberinfrastructure (CyberTraining) NSF 17-507

Submission Deadline: Jan 18, 2017
https://www.nsf.gov/funding/pgm_summ.jsp?pims_id=505342&org=ACI&from=home

Sushil K Prasad

sprasad@nsf.gov

Program Director, CISE/ACI

Overarching Goals

- **Overarching Goal:**
  - To *prepare, nurture* **and** *grow* the national *scientific workforce*
  - for creating, employing and supporting *advanced cyberinfrastrutures (CI)*
  - leading to advancing cutting-edge science and national economic wellbeing and security
- **Relevant Reports:**
  - *National Strategic Computing Initiative* launched in 2015 (NSCI)
    - which enlists NSF for a central role to advance the HPC ecosystem and develop workforce essential for scientific discovery
  - 2016 National Academies report
    - on Future Directions for NSF Advanced Computing Infrastructure to Support U.S. Science and Engineering in 2017-2020
  - The Federal Big Data Research and Development Strategic Plan,
    - which seeks to expand the community of data-empowered domain experts

Solicitation Goals

- *Innovative*, *scalable, informal* training-based programs addressing
  - Emerging needs
  - Unresolved bottlenecks
  - Multidisciplinary communities
  - Undergrads, grad students, instructors, faculty, research CI professionals
- **Short Term Goal**
  - Out-of-class training models and *pilot* activities
- **Long Term Goal**
  - An educational ecosystem enabling *Computational and Data Science for All*

NSF-wide Participation

- CISE/ACI - Divisions of Advanced Cyberinfrastructure **– lead**
  - Sushil K Prasad
- CISE/CCF Computing and Communication Foundation
  - Almadena Chtchelkanova
- MPS* - Directorate for Mathematical & Physical Sciences
  - Bogdan Mihaila
- GEO - Directorate for Geosciences
  - Eva Zanzerkia
- ENG* - Directorates of Engineering
  - Joanne Culbertson, ENG/CMMI
  - Ronald Joslin, ENG/CBET
  - Chengshan Xiao, ENG/EECS
- EHR/DGE* - Division of Graduate Education
  - Victor Piotrowski

* these directorate/divisions have specific priority areas

Community & Strategies

- **Communities of concern:**
  - ✓ *CI professionals:* Research infrastructure and professional staff who develop, deploy, manage and support effective use of research CI
  - ✓ *CI Contributors:* Computational and data scientists and engineers who are researchers and developers of new CI capabilities
  - ✓ *CI Users:* Domain scientists and engineers who effectively exploit the advanced CI capabilities
- **Strategies:**
  - ***Informal training and cross-training*** in CI, computational and data science topics of
    - CI Professionals,
    - Graduate and undergraduate students, Post-docs, Research Scientists and Faculty researchers and educators
      - from both *Contributors* and *Users* communities
      (including training of faculty mentors and course instructors)
  - ***Broadening CI access and adoption*** to
    - Enable increasing use of advanced cyberinfrastructures by *varied institutions* and *scientific communities* with lower-level of CI-adoption, and
    - Harness the capabilities of larger segments of diverse underrepresented groups

Short Term Impacts

Innovative, scalable **informal** training models and pilot activities while challenging PI's for

1. preparing a better scientific workforce for advanced CI;
2. broadening adoption and accessibility of shared computing and data resources by various disciplines, institutions, and groups;
3. complementing and leveraging the state of art in curricular offerings and material in academia, industry and elsewhere;
4. creating alliances and backbones for ***collective impact***;
5. providing on-demand, personalized accessibility;
6. exploring innovative ways of drawing students into computational disciplines (X+Computing and Computing+X);
7. identifying areas of workforce demand and career pathways;
8. innovating in training/certification models, curriculum, educational material and activities, and their sustainability; and
9. leveraging and contributing to NSF cyberinfrastructure and research projects (such as XSEDE, NanoHub, CyVerse, LIGO, and NHERI).

Long Term Impacts

- Training a **vehicle** for achieving long term goals while meeting short term objectives

- ***Long term sustainability and scalability:*** The programs will
  - Lead to an *educational cyberinfrastructure ecosystem* enabling ***"Computational and Data Science for All"***
    - with understanding of *computation as the 3rd pillar* and *data-driven science as the 4th pillar* of scientific discovery
  - Result in an **ubiquitous and scalable educational cloud infrastructure** for online, dynamic, personalized lessons and certifications in CI and other multidisciplinary areas.
  - Establish deeper engagement with and impact on various disciplines, institutions, and groups
  - Develop/update instructional material and curricula which will
    - seep into *college courses,* and
    - be formally adopted by *disciplinary* and *general education curriculum*
    - guide *best practices* in teaching guidelines and standards formulations for *minimum skill sets* in collaborations with key stakeholders
  - Establish clear *career growth pathways for CI professionals and select communities.*

Stakeholders & Training Modes

- **Stakeholders:** Engage all stakeholders and forge alliances and form backbones for **collective impact**
  - Academia (educators, *researchers,* professional staff)
  - Supercomputing centers and related entities
  - Private institutions
  - **Professional/disciplinary/curricular associations/organizations**
  - Government and industry research labs
  - Industry
  - Federal, state, and local agencies
- **Examples of Training modes:**
  - Summer institutes hosting participants for few weeks like REU sites
  - Intensive training workshops for 2-5 days
  - Workshop and conference training/tutorial tracks
  - MOOCs and online self-paced training
  - Collaborative courses with remote and local instruction
  - Programming and other competitions and awards

Solicitation-specific Review Criteria

1. Challenges addressed in training, education, and workforce development
2. Short and <u>long term</u> impacts
3. Challenges addressed in broadening access and adoption with respect to the Nation's scientific workforce and advanced CI
4. Engaging stakeholders, leveraging prior work, and forging partnerships for collective impact
5. Scalability in the long term
6. Sustainability of key activities beyond NSF funding
7. Plans for recruitment and assessment
8. Plans for management and collaboration

FY 17: Award Framework

- Award Budget
  - $300K-$500K per award and 1-3 years in duration
  - 10-15 awards
  - $4.5M

- Tracks:
  1. *CI Professionals (CIP)*
  2. *Domain science and engineering (DSE)*
  3. *Computational & Data Science Literacy (CDL)*
     - at the undergraduate level

FY 17: Submission Logistics

- Submission Deadline: Jan 18, 2017
- Consult ACI + other Cognizant Program Officers
    - At least one month in advance of the submission deadline
    - Mention consultation in the Project Summary
- Based on the community response and needs, the CyberTraining solicitation may be expanded to accommodate larger projects in future

Example Projects

- CI-professionals:
  - Training and certification of CI Professionals in cybersecurity technology and management
  - Working with neuroscientists to effectively use advanced CI to share software and data
- Domain Science and Engineering:
  - Training geoscience students to develop scalable software
  - Cross-training computing and engineering students and faculty in advanced manufacturing
- Computational/data science literacy:
  - Instructor training for computational science literacy across STEM disciplines in minimum core topics
  - Software and data literacy for natural science undergraduates

Thank you!

Questions: sprasad@nsf.gov

These slides, an audio recording, and a script of this webinar will be available at http://www.nsf.gov/events/

Q&A

- Can my proposal address more than 1 track?
  - Yes. The intent is to identify the track that is closely aligned to the main thrust of your project, while allowing overlap with other track(s).

- Is the consultation with a Cognizant Program Officer required?
  - No. But its is strongly encouraged that you consult with me (with ACI leading this solicitation) and any other Cognizant Program Officer at least a month in advance, and mention this in your Project Summary.

Q&A

- Can the duration of my project be fewer than 3 years
  - Yes, the duration can be from 1 to 3 years.
- Can my project primarily train/re-train for jobs in the IT industry?
  - No, the primary goal is scientific workforce development advancing science and engineering research.

Q&A

- Should I plan to organize activities in 2017 summer?
  - Yes, we do intend to expedite review and decisions.

SC-16 - ACI BoF at Salt Lake City

- ACI Birds-of-feathers session (BoF)
  - Tuesday, Nov 15th at 3:30-5pm
  - Room 155-A