Cyberinfrastructure Research, Learning and Workforce Development (LWD)

Office of Advanced Cyberinfrastructure Division (OAC)
Computer and Information Science & Engineering (CISE)
National Science Foundation

Alan Sussman
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MUG Workshop, August 2020

National Science Foundation
WHERE DISCOVERIES BEGIN

NSF Office of Advanced Cyberinfrastructure (OAC)

Directorate for Computer & Information Science & Engineering (CISE)

Foster a cyberinfrastructure ecosystem to transform science and engineering research…

… through Research CI and CI research

$224M FY 2018 research budget

950 proposals

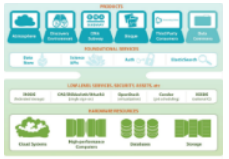
305 awards

32% Success Rate

Source: https://dellweb.bfa.nsf.gov/starth.asp

Computing Resources

Data Infrastructure



Gateways, Hubs, and Services

Pilots, Testbeds

Coordination & User support

Software and Workflow Systems

People, organizations, and communities

Cloud Resources & Services

R&E Networks, Security Layers

CI-Enabled Instrumentation

www.nsf.gov/div/index.jsp?div=OAC

LWD: Communities of Concern

CI Contributors

Cyber Scientists
to develop
new capabilities

CI Professionals

Professional Staff
to deploy & support
new capabilities

CI Users

Area Scientists
to exploit
new capabilities

OAC

Learning and Workforce Development

Student Research Training

- REU SITES

Faculty Early Career Research

- CRII
- CAREER

Training/Workforce Development

- CyberTraining
  NSF 19-524

OAC Core Research Program

- New Solicitation with other CISE divisions
- OAC is only division with deadline for Smalls (Nov. 12)
  NSF 20-591

Program Goals

- Advanced Cyberinfrastructure (CI) research to impact the future capabilities of research CI
  - New knowledge in design, development, and utilization of robust research CI
- Research career paths of cyber scientists/engineers
  - Computer as well as Computational and Data-driven Science and Engineering with advanced CI research thrusts

OAC-Core

Characteristics of OAC-Core

- Translational research
  - Design, development, deployment, experimentation, and application of advanced research CI
  - Spanning design to practice
- Other characteristics (optional):
  - Multi-disciplinary,
  - Extreme-scale,
  - Driven by science and engineering research,
  - End-to-end solution, or
  - Deployable as robust research CI

OAC-Core

Research Areas

- *Architecture & middleware for extreme-scale systems:*
  - Design, benchmarking, and analysis; storage, networks, and I/O; Resource management, monitoring, fault tolerance, and cybersecurity
- *Scalable Algorithms and Applications:*
  - Numerical and high-performance scientific computing methods; Data, software and visualization; and Modeling and simulation
- *Advanced Cyberinfrastructure Ecosystem:*

  Programming languages, libraries, and environments; Tools; Sociotechnical aspects

Faculty Early Career Development Program (CAREER - NSF 20-525)

- Most prestigious award supporting junior faculty as a teacher-scholar
  - Outstanding research, education and the integration of education and research
    - Presidential Early Career Awards …(PECASE – 4 from OAC last year! – out of 20 best from NSF each year)
  - Number of OAC submissions steady, with broad variety of topics
  - >30 active OAC awardees; Deadlines: August 11, 2020 (delayed due to COVID-19), should be July in 2021
- Open to non-tenure track faculty; Sr. personnel allowed
- Min $400K/5 years, typically ~$500K in CISE

Faculty Early Career Development Program (CAREER – contd)

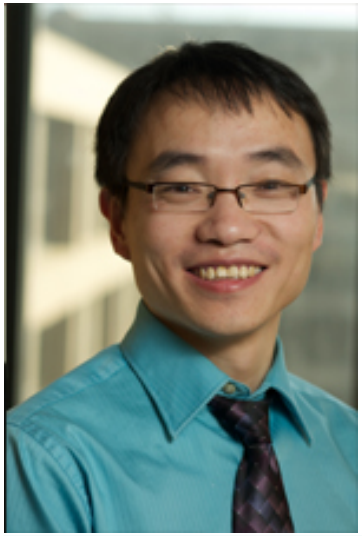
- OAC encourages proposals that are either of
  - primary interest to OAC, or
  - secondary interest to OAC (add OAC in Cover Page)
  - Dear Colleague Letter: ACI & CAREER (NSF 15-072)
    - http://www.nsf.gov/pubs/2015/nsf15072/nsf15072.jsp
- CAREER program page
  - http://www.nsf.gov/career
- CISE CAREER Proposal Writing Workshops
  - March 2017, Arlington: http://workshops.cs.georgetown.edu/CAREER-2017/
  - April 9, 2018, Alexandria: https://cisecareerworkshop.web.unc.edu/
  - April 8, 2019, Alexandria: http://cisecareerworkshop.web.unc.edu
  - April 6, 2020, virtual, http://cisecareerworkshop.web.unc.edu

Sangmi Lee Pallickara

CAREER: A Framework for Ad Hoc Model Construction in Data Streaming Environments

Colorado State University
http://www.cs.colostate.edu/~sangmi/
sangmi@cs.colostate.edu

- Enabling infrastructure to support generation, assessment, and refinement of *ad hoc* models
  - From voluminous, multidimensional, time-series observational data at scale
  - Copes with the combinatorially explosive number of ways in which models can be realized
- Well suited for analytics of data streams generated in Internet-of-Things and Smart Communities
- Outreach: Computer Science STEM Camp for female high school students



Chunlei Liang

Computational Magnetohydrodynamics of the Sun

(1554005 – co-funded: OAC, DMS, GEO/AGS, CBET
PECASE 2019)

Clarkson University

Research areas of this CAREER project: Liang takes novel engineering Computational Fluid Dynamics techniques to study solar convection zone. Research interests of the PI have included (but is not limited to): High-Performance Computing, Computational Mathematics, Fluid Dynamics, Magnetohydrodynamics, Helioseismology, Astrophysics, Marine Hydrodynamics (Liang is also an ONR YIP awardee) and more . . .

Unique Features of this CAREER project:

- **Novel engineering approaches of Computational Fluid Dynamics are being applied to study the Sun**
- **Substantial outreach activities for students to learn at the National Center for Atmospheric Research (including REU) and the George Washington University (including high-school summer programs).**

CISE Research Initiation Initiative (CRII - NSF 20-593)

- Independent research for faculty or *research scientists* in their first three years (Pre-CAREER)
  - May not have any federal grant as PI; 2 chances;
  - New: Chair letter (w/template) certifies lack of essential resources
  - Tenure-track or research science or education position
- OAC research focus:
  - Advanced CI research: Translational, Use-inspired, multidisciplinary, End-to-end
  - Computational and data-intensive scientists in addition to computer scientists
- Award ~$175K/ 2 yrs;
- Deadline: Nov. 2, 2020

Goals of CISE Research Initiation Initiative (CRII - contd.)

- Start a research program and career
  - The PI need not have significant prior research results or maturity
  - Start a path toward research independence
  - Develop collaborations within or across research disciplines
  - Undertake exploratory investigations
  - Acquire and test preliminary data
- Broaden community of researchers
  - Reach underserved sub-communities, under-represented groups, non-traditional institutions

CyberTraining – Training-based Workforce Development for Advanced Cyberinfrastructure (NSF 19-524)

- Twin Goals for *research* workforce preparation
  1. Broad adoption of CI tools/methods, or
  2. Curriculum/Instructional Materials Development and Integration
- Three project classes:
  - *Pilot: E*xploratory activities, $300K, 2 yrs
  - *Implementation:* Broadly accessible to community
    - *Small:* $500K, 4 yrs
    - *Medium:* foster a community, $1M, 4 yrs
  - *Large-scale Project Conceptualization:*
    - Planning grants for potential future institute-like CyberTraining projects, $500k, 2 yrs
- 3 communities of concerns
  - CI Professionals, CI Contributors, and CI Users

- Participation:
  - ENG, GEO, SBE, MPS (AST, DMR, PHY), EHR/DGE, CISE/CCF
  - *OAC – lead*
  - Send 1-page project summary
- Excellent community response
  - ~10-12 awards per year last several years
- Deadline:
  - Jan. 20, 2021

Other LWD Opportunities within OAC

- INTERN DCL (NSF 18-102)
  - Non-academic Graduate Student Research $50K/student
- EAGERs ($300K), Workshops ($50K), RCNs
  - Seed Exploration of Research, Training and Education, Broadening Participation
  - Students, Post-Docs, Faculty, CI Professionals
- Student Travel Grants
- *Discuss with me and other OAC Program Officers*
- To subscribe to *OAC Mailing List:*

  Send an email to:
  OAC-ANNOUNCE-subscribe-request@listserv.nsf.gov

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