Directorate for Computer and Information Science and Engineering (CISE)

Program Overview

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URLs to Remember


and

  – returned as first hit for query “NSF CISE” by at least one popular search engine
Presentation Outline

• CISE Mission, Organization
• CISE Funding Opportunities
  – CISE Core
  – Additional Programs for CISE Community
    • Various combinations of partnerships
    • Cross-Division, Cross-Directorate, and Cross-Agency
• Navigating NSF Information
• Concluding Remarks
CISE Mission

The Directorate for Computer and Information Science and Engineering (CISE) has three goals:

1. To enable the U.S. to uphold a position of world leadership in computing, communications, and information science and engineering.
2. To promote understanding of the principles and uses of advanced computing, communications and information systems in service to society.
3. To contribute to universal, transparent and affordable participation in an information-based society.

To achieve these, CISE supports investigator initiated research in all areas of computer and information science and engineering, helps develop and maintain cutting-edge national computing and information infrastructure for research and education generally, and contributes to the education and training of the next generation of computer scientists and engineers.
CISE Organization

Office of Assistant Director (AD) for CISE
AD:
Farnam Jahanian
Deputy AD:
Cynthia Dion-Schwarz

CCF
Computing and Communications Foundations
Division Director:
Susanne Hambrusch

CNS
Computer and Network Systems
Division Director:
Keith Marzullo

IIS
Information and Intelligent Systems
Division Director:
Howard Wactlar
## CISE Programs

### CCF
- Computing and Communication Foundations
  - Algorithmic Foundations
  - Communications and Information Foundations
  - Software and Hardware Foundations

### CNS
- Computer and Network Systems
  - Computer Systems Research
  - Networking Technology and Systems
  - Education and Workforce

### IIS
- Information and Intelligent Systems
  - Human-Centered Computing
  - Information Integration & Informatics
  - Robust Intelligence

## Cross-Cutting Programs
CISE Core Programs

- Program Solicitations
  - CCF: NSF 11-557  “Coordinated Solicitations”
  - CNS: NSF 11-555
  - IIS: NSF 11-556

- Project Types:
  - Large: $1,200,001 to $3,000,000; up to 5 years duration collaborative team projects
  - Medium: $500,001 to $1,200,000; up to 4 years duration multi-investigator collaborative projects
  - Small: up to $500,000; up to 3 years duration one or two investigator projects

- CISE-wide Submission Windows:
  - Medium: September 15 - 30, annually
  - Large: November 1 - 28, annually
  - Small: December 1 – 19, annually

- PI Limit:
  - participate in no more than 2 core proposals/year

These parameters are for Core only! Others vary; see solicitations.
Computing & Communication Foundations (CCF)

Algorithmic Foundations (AF)
- Algorithms
- Complexity and Cryptography
- Quantum Computing
- Computational Biology
- Computational Geometry
- Numeric, Symbolic and Algebraic Comp.

Communications and Information Foundations (CIF)
- Communication and Information Theory
- Signal Processing
- Network Coding and Information Theory
- Sensor Networks
- Wireless Communication and Signal Processing

Software and Hardware Foundations (SHF)
- Compilers
- Computer Architecture
- High Performance Computing
- Programming Languages
- Software Engineering & Formal Methods
- Design Automation for Micro & Nano Systems
- Bio Computing
- Nano Computing
Algorithmic Foundations

Innovative and transformative research characterized by algorithmic thinking and algorithm design, accompanied by rigorous analysis.

- Intrinsic computational complexity and limitations
- New and emerging models of computation (e.g., quantum)
- Algorithmic foundations for all areas of computer science
- Algorithms for other fields (e.g., biology, physics, social sciences)
Communications & Information Foundations

Transformative research that addresses the theoretical underpinnings and enabling technologies for information acquisition, transmission, and processing.

- Communications, information theory, signal and image processing and bioinformatics
- New algorithmic approaches to data acquisition/fusion, such as compressive sampling
- Algorithms and architectures that significantly reduce energy consumption in information processing systems
Software and Hardware Foundations

Transformative research advancing the science and engineering of software, hardware and computer systems design, including verification, utilization, study and evaluation of the hardware and software.
Computer and Network Systems (CNS)

CNS supports research and education in computer and network systems that:

• Invents new technologies.
• Explores ways to make use of existing technologies.
• Develops better understanding of fundamental properties.
• Creates better abstractions and tools for designing, building, analyzing, and measuring.

In addition:

• CNS supports computing infrastructure that is required for experimental computer science.
• CNS coordinates cross-divisional activities that foster the integration of research, education, and workforce development.
Computer and Network Systems (CNS)

Computer Systems Research (CSR)

Computer and software systems
Hardware platforms
Compute-intensive applications & hardware
Distributed and Internet scale computing
Massively parallel & data intensive computing
Pervasive and ubiquitous computing

Networking Technology and Systems (NeTS)

New networks: closer to autonomy
Resource discovery, naming, addressing, routing & congestion control
Massive numbers of mobile network devices
Scalability, robustness & network extensibility
Network control and management
Scalable, non-intrusive measurement

Education and Workforce (EWF)

Research Experiences for Undergraduates (REU) SITES
Computing education at all levels
CNS Core Programs

Networking Technology and Systems (NeTS)

- Supports transformative research on fundamental scientific and technological advances leading to the development of future generation high performance networks.
- Enables research leading to new network architectures, algorithms, protocols, and technologies that are responsive to the evolving requirements of current and yet to be discovered technologies, services and applications operating in dynamic environments.

Computer Systems Research (CSR)

- Core program for new architectures; distributed real-time embedded control; handheld, wearable and implanted devices; pervasive, ubiquitous and mobile computing; file and storage systems; new programming models, abstraction, languages, compilers, and operating systems; reliable, fault-tolerant and secure hard/middle/software; ...
- Is the breeding ground for new ideas that transcend traditional classification schemes.
Information & Intelligent Systems (IIS)

IIS Projects are Volumes in this Space

People

Computing => Intelligence

Information => Knowledge

Robust Intelligence
- robotics
- computer vision
- human language & commun.
- artificial intelligence
- machine learning
- reasoning & representation
- computational neuroscience

Information Integration & Informatics
- data management
- data mining
- (bio) informatics
- multimedia infor. retrieval
- semantic web

Human-Centered Computing
- human-computer interaction
- social informatics
- assistive technology
- virtual human interaction
- learning technology
- digital humanities & the arts
Human Centered Computing (HCC)

- Understanding of new human-computer and human-human interactions, collaboration, and competition
- Role of computing in how humans communicate, work, learn, and play, dramatically transcending traditional boundaries.
- Systems that interact with people using various and possibly modalities

Scope: human-computer interaction; social informatics; assistive technology; virtual human interaction; learning technology; digital humanities & the arts

Information Integration & Informatics (III)

- Processes and technologies involved in creating, managing, visualizing, and understanding diverse digital content in a wide range of circumstances
- Innovative IT research that can transform all stages of the “knowledge life cycle”
- Advances driven by information-technology challenges.
- Multidisciplinary collaborations where fundamental III research is advanced

Scope: databases, information retrieval, multimedia information systems, Web search, social network & media, data mining, workflows, information provenance, preservation
Robust Intelligence (RI)

All aspects of the computational understanding and modeling of intelligence in complex, realistic contexts.

Scope: artificial intelligence, computer vision, human language research, robotics, machine learning, computational neuroscience, cognitive science, and related areas.

Computer Graphics & Visualization (CGI): IIS Cross-cutting area

Proposals are submitted to the most relevant IIS Core Program(s)

Graphics: modeling, rendering, and display pipeline for computer graphics and closely related topics.

Visualization: new visualization methods to facilitate the understanding of wide-ranging types and/or large volumes of information.

NOTE: Computational geometry proposals not tightly coupled to computer graphics should be submitted to the Algorithmic Foundations (AF) program in CCF.
Multi-Divisional and Multi-Directorate Cross Programs (1)

- Science, Engineering, and Education for Sustainability (SEES)
- National Robotics Initiative (NRI)
- Smart Health and Wellbeing (SHB) – new name coming soon
- Trustworthy Computing (TC) – new name coming soon
- Cyber-Physical Systems (CPS)
- Interface between Computer Science and Economics & Social Sciences (ICES)
- Social-Computational Systems (SoCS)
Multi- Divisional and Multi-Directorate Cross Programs (2)

- Computing Education for the 21st Century (CE21)
- Cyberlearning: Transforming Education (CTE)
- Integrated NSF Support Promoting Interdisciplinary Research and Education (INSPIRE)
- Innovation Corps Program (I-Corps)
- Cyberinfrastructure Framework for the 21st Century (CF21)
- Software Infrastructure for Sustained Innovation (SI^2)
- Graduate Research Fellowship Program
- Research Experiences for Undergraduates
Smart Health and Wellbeing (SHB)

• – new solicitation coming soon (with new name)

• Multiple NSF Directorates participating
• Health IT is more than electronic health records or digitizing current data and processes
• What are the computing research challenges such that we can transform the way in which healthcare is delivered in the future?
• Goals: *patient-centered, individualized, and evidence-based*
• Modeling, decision making, automated discovery, visualization, databases, summarization, data fusion, sensor networks, telemetry, robotics, vision, speech & language, security and privacy, …
The National Robotics Initiative (NRI)

**NSF 11-553**

- 2009 Report
  “A Roadmap for US Robotics- From Internet to Robotics”

- A nationally coordinated robotics technology R&D program across multiple government agencies
  - Joint solicitation developed by NSF (CISE, ENG, EHR & SBE), NIH, USDA, NASA

- Serves multiple national priorities including increased productivity in manufacturing, healthcare and security

- Strong coupling with industry and startup

Small Proposals: Letter of Intent : October 1, 2011
Interface Between Computer Science and Economics & Social Science (ICES)

NSF 11-584

- Joint between CISE and Directorate for Social, Behavioral and Economic Sciences (SBE)
- Projects should advance knowledge on both sides of the interface. All areas including theory, networks, machine learning, behavioral studies, etc.

Example topics
- Algorithmic Game Theory
- Economic Foundations of Digital Privacy
- Meme Diffusion through Mass Social Media
- Computationally Protecting Elections from Manipulation
- Socio-technical Design of Crowdfunding Websites

Full Proposal Window: November 21, 2011 - December 6, 2011
Social-Computational Systems (SoCS)

**NSF 10-600**

- Joint between CISE and Directorate for Social, Behavioral and Economic Sciences (SBE)

**GOALS:**

The SoCS program seeks to reveal new understanding about the properties that systems of people and computers together possess, and to develop theoretical and practical understandings of the purposeful design of systems to facilitate *socially intelligent computing*.

**Project Types:**

- Large collaborative, interdisciplinary teams
- Awards for up to $250,000 per year; up to 3 years duration

**Limit on Number of Proposals per PI:**

- participate in no more than 1 SoCS proposal/year

**DUE DATE:** November 11, 2011
Expeditions in Computing

NSF 10-564

GOALS:
• Catalyze far-reaching research explorations motivated by deep scientific questions
• Inspire current and future generations of Americans, especially those from under-represented groups
• Stimulate significant research and education outcomes that promise scientific, economic and/or other societal benefits

Project Types:
• Large collaborative, interdisciplinary teams
• Up to $10,000,000; up to 5 years duration

Limit on Number of Proposals per PI:
• participate in no more than 1 Expeditions proposal/year

Deadlines:
• Preliminary Proposal (required):
  February 10, 2012
  September 10, 2013
• Full Proposal:
  October 10, 2012
  April 10, 2014
Trustworthy Computing (TC) – new solicitation coming soon (with new name)

Joint with multiple Directorates

TC supports all research approaches:
* theoretical to experimental to human-centric
* theories, models, cryptography, algorithms, methods, architectures, languages, tools, systems and evaluation frameworks

Of particular interest are proposals that address:
* foundations of trustworthy computing (e.g., "science of security" and privacy-preserving algorithms), privacy, and usability

TC welcomes projects that study:
* tradeoffs among trustworthy computing properties, e.g., security and privacy, or usability and privacy
* the tension between security and human values such as openness and transparency
* methods to assess, reason and predict system trustworthiness
* observable metrics, analytical methods, simulation, experimental deployment and, where possible, deployment on live test-beds for experimentation at scale
Cyber-Physical Systems (CPS)

NSF 11-516
Cross-divisional CISE program

• Deeply integrate computation, communication, and control into physical systems.
• Exploit pervasive, networked computation, sensing, and control – “Internet of [controlled] things.”

Three themes:

Foundations – develop new scientific and engineering principles, algorithms, models, and theories for the analysis and design of cyber-physical systems

Methods and Tools – bridge the gaps between approaches to the cyber and physical elements of systems through innovations such as novel support for multiple views, new programming languages, and algorithms for reasoning about and formally verifying properties of complex integrations of cyber and physical resources

Components, Run-time Substrates, and Systems – new hardware and software infrastructure and platforms and engineered systems motivated by grand challenge applications

DUE DATE January 17, 2012
Computing Education for the 21st Century (CE21)

– new solicitation should be coming soon

Joint with Directorate for Education and Human Resources (EHR) and Office of Cyberinfrastructure (OCI)

Goals:

1. Increase the number and diversity of early postsecondary students who are engaged and have the background in computing necessary to successfully pursue degrees in computing-related and computationally-intensive fields of study.

2. Increase the number and diversity of K-14 students and teachers who develop and practice computational competencies in a variety of contexts
Cyberlearning: Transforming Education (CTE)

**NSF 11-587**

- Joint with multiple Directorates
- Using technology to amplify, expand, and transform opportunities people have for learning, and better draw in, motivate, and engage learners
- By integrating advances in technology with advances in what is known about how people learn to help us
  - Better understand how people learn with technology and how technology can help people learn
  - Better use technology for collecting, analyzing, sharing, and managing data for assessment purposes and to shed light on learning
  - Design new technologies for these purposes, and advance understanding of how to use these technologies and integrate them into learning environments
- Complicated scheme of proposal types and deadlines; see solicitation
Science, Engineering, and Education for Sustainability (SEES)

- NSF-wide
- Multiple programs - multi-disciplinary focus is required in all

- **NSF 11-575** SEES Fellows
  - Within 4 years of PhD
  - Limited teaching responsibilities allowed – primary focus must be research
  - DUE DATE December 5, 2011

- **NSF 11-590** Sustainable Energy Pathways
  - “Pathways” are end-to-end solutions
  - DUE DATE February 1, 2012

- **NSF 11-531** Research Coordination Networks and **NSF 11-574** Sustainability Research Networks
  - Support for collaboration between existing projects instead of new research projects
  - See solicitations for deadlines
Additional CISE Programs

Research

**NSF 11-587**

Collaborative Research in Computational Neuroscience (CRCNS)

DUE DATE: November 2, 2011

Infrastructure

**NSF 11-536**

CISE Computing Research Infrastructure (CRI)

- **Institutional Infrastructure (II):** planning for or creation, enhancement or operation of computing research infrastructure for use by multiple investigators and collaborating institutions.
- **Community Infrastructure (CI):** enable world-class research and education opportunities for broadly-based communities of researchers and educators that extend well beyond the awardee institutions.

- DUE DATES: October 25, 2011, 4th Tuesday in October
Office of Cyberinfrastructure programs

- OCI partners with Directorates (including CISE)
- Watch for possible new or renewed solicitations or “Dear Colleague Letters”

**NSF 10-015**
- Cyberinfrastructure Framework for the 21st Century (CF21)

**NSF 11-539**
- Software Infrastructure for Sustained Innovation (SI^2)

- No current due dates but could be in future
New NSF-wide special programs

• Integrated NSF Support Promoting Interdisciplinary Research and Education (INSPIRE)
  • If you have a potential collaboration across disciplines, contact Program Directors for both disciplines

• Innovation Corps Program (I-Corps)
  • Supplements for technology transfer to industry
  • Based on network of experienced transferors
Graduate and Undergraduate Student Support

• Foundation-wide programs; CISE participates substantially

NSF 11-582
• Graduate Research Fellowship Program
• All eligible students should apply!
• Deadlines in mid-Nov.; different for different Directorates

NSF 09-598
• Research Experiences for Undergraduates (REU)
• REU Sites: typically in summer, but not strictly necessary
  • 8-10 students in a cohort environment
  • Deadline in August
• REU supplements
  • Support for 1-2 students to work on existing project
  • Best to get request submitted by March but no strict deadline
EAGER and RAPID Proposals

Grants for Rapid Response Research (RAPID) –
- supports quick-response research on natural or anthropogenic disasters and similar unanticipated events
- Up to $200K and one year duration
- project descriptions are expected to be brief (two to five pages) and include clear statements as to why the proposed research is of an urgent nature

EArly-concept Grants for Exploratory Research (EAGER) –
- supports high-risk, exploratory and potentially transformative research.
- Up to $300K and two years duration.
- project description is expected to be brief (five to eight pages) and include clear statements as to why this project is appropriate for EAGER funding

• These special proposals can be submitted to any program
• More details in Grant Proposal Guide
• Need to contact Program Director before submission
For more information

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CISE has implemented a mail distribution list to notify the Computer and Information Science and Engineering community of items we think may be of interest. The postings will be infrequent and brief and will typically point to further information on our website. This may duplicate some of the items contained in NSF Custom News Service but will also contain items not always available there:

Announcements, vacancy notices, CISE webcasts of interest, meeting notices and news items.

To subscribe: send a message to: join-cise-announce@lists.nsf.gov with no text in the subject or message body.

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Award Search
Your Involvement

- Send your best ideas to NSF: consistent with program focus and goals
- Get to know your Program Directors
- **Volunteer to be a reviewer and panelist**
- Keep us informed of your accomplishments
- Work within your institutions to support collaborative, interdisciplinary research
- Call our attention to things that need improvement
- Participate in NSF-funded events, workshops, etc.
- Organize research direction planning workshops (talk to PDs)
- Consider participating in the Computing Community Consortium: [http://www.cra.org/ccc](http://www.cra.org/ccc)
- **Plan to serve as a Program Director ("rotator") or Division Director**
Thank you!

Questions?

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