

Reissue and Expansion of NIH-NSF Smart and Connected Health (SCH) Initiative

"Smart Health and Biomedical Research in the Era of Artificial Intelligence and Advanced Data Science"

> September 11, 2020 NIH Council of Councils

Overview

Concept Clearance: Reissue of NIH – NSF Interagency Smart and Connected Health Initiative

Objective: Accelerate the development and integration of innovative computer and information science and engineering approaches to support the transformation of health and medicine

Funds Available and Anticipated Number of Awards: Contingent upon NIH appropriations and the submission of meritorious applications

Award Project Period: Up to 4 years

Council Action: Vote for continued support of "Smart and Connected Health" and expand focus to include data science topics

Background of Initiative

- Project Requirements:
 - Integrative projects that make fundamental contributions to 2+ disciplines
 - Address a key health problem
 - Expected to include several students and post-docs
- Budget: \$300k total cost per year, up to 4 years

Current Funding Snapshot

	N (%)
NIH ICs Participating	10
Overall Applications Received (NIH & NSF)	627
NSF Applications Funded	35 (~5.5%)
NIH Applications Funded	32 (~5%)
NIH PIs Funded	98
NIH ESI/New Investigator	64 (65%)

Smartphone Acoustics for Sleep Apnea Detection

Study Design:

- Develop ApneaApp, a smartphone system using sonar to track chest and abdomen movements
- Clinical study evaluating ApneaApp with PSG (n=37, 296 hrs. sleep)

Results:

- 98% sleep apnea events captured as accurately as PSG
- ApneaApp is now licensed by SleepScore Labs





http://apnea.cs.washington.edu/apneaapp.pdf

Smartphone Acoustics for Opioid Overdose Detection

Study Design:

- Modified sleep apnea system to detect opioid overdose
- Tested in Supervised Injection Facility (SIF) (n=209) and Operating Room (n=20)

Results:

- SIF: Detected opioid-induced central apnea
 - 96% sensitivity, 98% specificity
 - respiratory depression detected with 87% sensitivity, 89% specificity
- OR: detected 19 of 20 simulated events



Smartphone Acoustics for Ear Infection Detection



J Chan et al. Sci Trans Med. 2019 May 15, 11(492).



Expanding the NIH's Capabilities in Data Science and AI through the NIH-NSF Smart and Connected Health solicitation

Promoting the Goals of the NIH's Strategic Plan for Data Science:

- Support the Development and Dissemination of Advanced Data Management, Analytics, and Visualization Tools
- Enhance Workforce Development for Biomedical Data Science, recruit new investigators in computer science and engineering to biomedical fields



THE NATIONAL ARTIFICIAL INTELLIGENCE RESEARCH AND DEVELOPMENT STRATEGIC PLAN: 2019 UPDATE

> A Report by the SELECT COMMITTEE ON ARTIFICIAL INTELLIGENCE of the NATIONAL SCIENCE & TECHNOLOGY COUNCIL

> > JUNE 2019

AMERICAN ARTIFICIAL INTELLIGENCE INITIATIVE: YEAR ONE ANNUAL REPORT

PRESIDA

Prepared by THE WHITE HOUSE OFFICE OF SCIENCE AND TECHNOLOGY POLICY

FEBRUARY 2020

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Smart Health & Data Science Research Areas

Information Infrastructure	 Tools for interoperable, distributed, federated, & scalable digital infrastructure Novel ontological systems and knowledge representation approaches Methods for data integrity, provenance, security, privacy and reliability
Transformative Data Science	 Computational tools for fusion and analysis of multi-level and -scale data Knowledge representations, visualizations and reasoning algorithms Approaches for combining AI learning with mechanistic modeling
Novel Multimodal Sensor System Hardware	 Design & fabrication of novel multimodal sensor systems Synthesis of new biorecognition elements
Effective Usability	 New approaches to support individuals to effectively participate in their own health User-tailored and context-aware interfaces to reduce burden and increase autonomy Develop new methods for context-dependent selection, presentation and use of data
Automating Health	 Closed-loop or Human-in-the loop systems Technology platforms for optimizing delivery of health interventions Simulation and modeling methods and software tools
Medical Image Interpretation	 Modeling on-visual context information and perception of complex images. Methods to exploit experts' implicit knowledge to improve perceptual decision making Develop models of how experts respond to changes in cognitive factors

Engage Computer Scientists and Engineers with NIH

Researchers from quantitative fields and computer science can contribute to major leaps in biomedical research:

- There is a shortage of data scientists, engineers, and computer scientists in biomedical research field
- Multi-disciplinary projects are incubators for cross-training students and postdoctoral fellows
 - Program requirement: Funded work must make fundamental contributions to two or more disciplines, such as computer or information sciences, engineering, social, behavioral, biomedical, cognitive and/or economic sciences.
 - This joint interagency program will provide opportunities to recruit computer scientists and engineers to biomedical research

Benefits of the Initiative

- Expanded pool of applicants including computer scientists and bioengineers who have not previously applied for NIH funding
- Multidisciplinary in nature with ~3 PIs per award (not accounting for key personnel)
- Low administrative Burden for NIH staff
- NIH ICs select applications after NSF review. No prior commitment of money

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 NIH SRO prepares summary statement utilizing comments from NSF summary statement for applications selected by NIH ICs

NIH IC Participation

NCCIH* NCI NIAMS* NICHD* NIDA* NIDCR* NIDDK* NIGMS* NIMHD* NINR* NLM* OBSSR ODSS*



Concept Clearance

Continue support for NIH-NSF Smart and Connected Health Solicitation