

Institute for Connected-Sensors Systems (IConS)



Request for Proposals (RFP)
for
Collaborative Seed Research Projects in Sensors, Sensing, and Analytical Systems
(last updated: 02.27.2025)

Release Date: February 28, 2025

Submission Deadline: April 28, 2025

Contact Information: icons_contact@ncsu.edu

I. Introduction

The Institute for Connected-Sensor Systems (IConS) invites proposals for collaborative seed research projects in the field of design, manufacturing and deployment of connected sensors, sensing, and analytical systems. This RFP seeks to foster interdisciplinary collaboration between a minimum of two different NC State colleges to collaboratively advance knowledge and innovation in this important area.

II. Background

Sensors and analytics play a crucial role in various fields such as healthcare, environmental monitoring, agriculture, manufacturing, and beyond. Collaborative research efforts in this domain can lead to breakthroughs with significant societal and economic impact. This RFP aims to encourage cross-college collaboration to explore new ideas, methodologies, and technologies in sensors, sensing, and analytical systems in application areas with societal impact and future external funding potential.

III. Objectives

The objectives of this RFP are to:

1. Promote collaboration between different colleges within NC State,
2. Cultivate innovative research in sensors, sensing, and analytical systems
3. Support the development of new interdisciplinary research teams,
4. Provide graduate students with an opportunity to collaborate with researchers from other fields,
5. Generate preliminary results to enhance the potential for securing future external funding.

IConS looks forward to receiving innovative and collaborative proposals. These seed research projects are anticipated to lead to exciting discoveries and foster ongoing interdisciplinary partnerships within NC State University. This funding mechanism has a goal to advance the knowledge and innovation in design, manufacturing and deployment of connected sensors, sensing, and analytical systems within the NC State ecosystem.

IV. Eligibility

Proposals must involve researchers from at least two different colleges within NC State. IConS encourages proposals from teams of junior faculty or those highlighting the synergies between junior and established faculty. The collaborating colleges may include, but are not limited to, the following:

College of Agriculture and Life Sciences
College of Design
College of Education
College of Engineering
College of Humanities and Social Sciences
College of Natural Resources
Poole College of Management (through MBA and STEM student engagement)
Wilson College of Textiles
College of Veterinary Medicine (through CBS program and F awards)

V. Funding & Cost Share Support

Each researcher will receive seed funding from their individual college for one graduate research assistant, including stipend, fringe, and tuition costs per project for the durations of August 15, 2024 and June 30, 2025. *For example, if a proposal involves two Colleges, two students (2×0.5 FTE) will be available for the project regardless of the number of co-PIs.* Materials and supplies up to \$3,000 maximum per project will be supported by IConS via support from the Office of Research and Innovation.

It is anticipated that 2 to 4 projects will be funded through this RFP. The next RFP will be released 12 months later, where researchers can apply for the next stage of project support or propose new sets of research topics. Every year the call will be accessible to the entire NC State research community.

VI. Proposal Topics

Connected Sensor-Systems are multi-node and multi-modal technologies, in which information from multiple sources can be combined and correlated to infer conclusions about manifest and latent problems, via real connection between nodes in a distributed network or combined in software to create a soft network. The predictive and actionable power of Connected Sensor-Systems will be realized by integrating novel sensors, advanced materials, low-power electronics, engineering, biochemistry, plant sciences, machine learning/artificial intelligence, design, and textiles, networking technologies and demonstration of performance at individual to global scale.

The future potential of external funding depends on the strength of the synergy emerging from an effective interdisciplinary collaboration and broadness of the societal impact the project is targeting. All NC State colleges contribute to excelling the knowledge to drive the next generation sensor development and its widespread connected deployment.

The cross-college collaboration is expected to bring an interdisciplinary synergistic perspective to advance not only the design, development, and deployment of connected sensor systems but its societal, educational and economic impact. The following provides some example interdisciplinary themes to help set up cross-college teams:

- Agriculture and Life Sciences: Using sensors to monitor plants, farms, animals, soil, and environmental conditions to improve crop yield.
- Design: Applying robust and sustainable design techniques to sensor systems to improve human factors, adoption, and impact
- Education: Training students in STEM for system design and data analytics through multimodal sensors and teaching the connected and quantified world to the next generations

- **Engineering:** Developing new sensors and algorithms through electrical, mechanical, chemical, optical, and acoustic engineering principles to enable intelligent sensing to action
- **Humanities and Social Sciences:** Using sensors to understand human behavior, social interactions and mental health, and the interaction in-between.
- **Management:** Supporting entrepreneurial activities involving smart sensor systems and data analytics based on these through the support of startups, case studies and business canvassing
- **Natural Resources:** Enabling sensor-driven quantitative understanding of our forests, coastal regions, soil, climate, and air quality and improving human interaction with parks/recreation.
- **Sciences:** Exploring the fundamental physical, chemical and biological sensing mechanisms at the macro, micro, and nano levels for enabling new sensor technologies
- **Textiles:** Transforming the textile industry through designing and manufacturing smart, sustainable, and active textiles that can help transform human conditions and the environment
- **Veterinary Medicine:** Using sensor data to help in maintaining animal health, achieve early detection of health problems, and assist in epidemiologic management of diseases in animals

Year 3 Seed Funding will focus on the following topics:

- **Veterinary/Biomedical Applications:** Connected sensor systems in veterinary research span a broad spectrum of applications from livestock to companion animal health. For instance, engineers and veterinarians might collaborate to develop wearable biosensors for livestock that monitor vital signs, stress levels, reproductive status, or early indicators of disease, enabling real-time decision-making for herd health management. Similarly, in companion animal care, projects could focus on creating smart wearable or implantable sensors that track heart rate, activity levels, hydration, or behavioral changes in pets, aiding in the early detection of chronic conditions or post-surgical recovery monitoring. Another opportunity for collaboration could involve integrating environmental sensors with animal health data to assess how factors like air quality, temperature, or barn conditions impact animal welfare and productivity. By bringing together sensor developers and veterinary experts, these partnerships ensure that technologies are both innovative and aligned with real-world needs, ultimately enhancing research, animal care, and management practices across species. IConS especially encourages proposals that create scalable, user-friendly solutions with the potential for broad application in veterinary science.
- **Textiles:** Textile-integrated sensors offer the capability to track environmental conditions like pollution levels, UV exposure, and humidity, delivering real-time insights to users. These sensors can also be embedded into air filtration systems to assess filter longevity while aiding in air quality management. IConS aims to promote interdisciplinary approaches to overcome key challenges in the field, such as ensuring durability and reliability, simplifying integration processes, improving scalability, reducing costs, and minimizing environmental impact.
- **Quantum:** Quantum sensing uses the fundamentals of quantum mechanics to enable ultra-sensitive detection of physico-chemical properties. This technology has shown significant potential in identifying subtle variations in disease-related biomarkers at the molecular scale. The goal of IConS is to translate quantum sensing into practical medical applications, such as the early diagnosis of conditions like cancer or Alzheimer's disease. Achieving this requires a multidisciplinary approach to tackle critical challenges, including enhancing sensitivity and specificity, developing effective biochemical interfaces, optimizing signal processing and data analysis, advancing miniaturization and system integration, and addressing ethical concerns, regulatory requirements, validation processes, and socio-economic implications.
- **Augmented/Virtual Reality:** Augmented Reality (AR) and Virtual Reality (VR) technologies offer transformative potential for education by creating immersive and interactive learning experiences. When combined with sensors in physical spaces, these technologies can greatly improve engagement and interactivity, benefiting both in-person and remote learning environments. IConS invites interdisciplinary teams to design cohesive and impactful AR/VR-driven educational systems enhanced by sensor integration. Critical challenges to address include designing multi-modal interactions, ensuring seamless real-time data integration, achieving hardware compatibility, aligning with educational methodologies, enhancing user experience,

focusing on accessibility, safeguarding security and privacy, and navigating ethical and policy-related considerations.

- **Smart Cities:** The integration of advanced sensor technologies is essential for creating smart infrastructure in both urban and natural environments. In smart cities, sensors help optimize traffic flow, waste management, and energy use in buildings, improving urban efficiency and sustainability. In industrial IoT, sensors are vital for predictive maintenance, hazardous condition monitoring, and real-time supply chain tracking, and driving operational excellence. Smart sensors also enhance home automation and security, managing climate control, lighting, appliances, and providing early detection for leaks and intrusions. In transportation and logistics, fleet management, cold chain monitoring, and autonomous vehicle sensors ensure efficient movement of goods. The energy sector relies on smart grid and renewable energy monitoring sensors, while disaster management benefits from early warning systems and search-and-rescue sensors, protecting lives and property. IConS invites sensor designers and users to collaborate on overcoming key challenges such as optimizing real-time data integration, enhancing sensor durability and sensitivity, and developing scalable solutions for diverse applications in smart infrastructure, industrial IoT, and disaster management.

VII. Proposal Guidelines

Proposal Format: Proposals should adhere to the following format:

- Title of the Project
- Names and Positions of Principal Investigators
- List of Affiliated Colleges
- Abstract (250 words or less)
- Project Description (not to exceed 2 pages excluding referenced citations)

SECTION HEADERS THAT MUST BE INCLUDED IN PROJECT DESCRIPTION:

“Cross-College Collaboration”: Applicants must include a dedicated section outlining how researchers from multiple different colleges will collaborate effectively on the proposed project. This section should address the following points:

- Describe the roles and responsibilities of each college in the project.
- Explain how the collaboration will facilitate interdisciplinary research.
- Detail the mechanisms for communication and coordination between the colleges.
- Highlight any existing or planned partnerships, joint initiatives, or shared resources that will support the collaboration.
- Outline the contribution of each researcher to the sensors field, whether they target design, development, manufacturing, deployment or use of sensors with a brief background about their expertise.
- The Colleges of the applying PIs will provide one graduate student researcher to support the proposal. One graduate support will be provided from each College. Provide a description of the allocation of these students between the PIs and explain co-mentorship strategy.

“Targeted Funding Opportunities”: Applicants should also discuss how the seed research project aligns with and may lead to potential external funding opportunities. Some potential opportunities are provided in the “Appendix”. Please provide information on:

- Relevant funding agencies, grants, or programs that the project aligns with.
- A brief strategy for pursuing external funding based on the outcomes of the seed project.
- Any preliminary discussions or plans for grant applications or partnerships that may arise from the project.

These sections should be integrated into the Proposal Description and should not exceed the page limit.

Supplementary materials

- Deliverables and Timeline (not to exceed 1 page)
- References and bibliography
- Budget and budget justification
- Letter of support or an email confirmation from all the PI's and co-PI's Deans or Associate Dean of Research's awareness and support of this proposal. The confirmation email or the letter should include the title of the proposal and mention the cross-college and interdisciplinary aspect of this effort. A short confirmation reply to an email sent by the PIs would fulfill this requirement. The point of contacts for each college is provided in the Appendix.

No Project Information and Navigation System (PINS) entry is required for this effort.

Review Criteria: Proposals will be evaluated based on the following criteria:

- Cross-college interdisciplinary collaboration
- Scientific merit and innovation
- Feasibility of the project
- Expected outcomes and impact
- Potential for future external funding

Submission Deadline: Proposals must be emailed to Cara Rebackoff (icons_contact@ncsu.edu) by **April 28, 2024 Monday 11:59pm EST**. Late submissions will not be considered.

VIII. Evaluation and Decision Timeline

- RFP Release Date: February 28, 2025
- Proposal Submission Deadline: April 28, 2025
- Expected Review and Selection: May 30, 2025
- Award Notification: June 2, 2025
- Project Duration: July 1, 2025 to June 30, 2026 (NC State Fiscal Year)

IX. Contact Information

Questions regarding this RFP should be directed to Dr. Michael Daniele (mdaniel6@ncsu.edu) and Dr. Alper Bozkurt (aybozkur@ncsu.edu) by April 25, 2025.

Appendix

College Point of Contacts for Letter of Support or Confirmation Email

College of Agriculture and Life Sciences	
Dean Garey Fox	gafox2@ncsu.edu
Associate Dean Steven Lommel	slommel@ncsu.edu
College of Design	
Dean Mark Hoversten	mehovers@ncsu.edu
Interim Associate Dean Soolyeon Cho	soolyeon_cho@ncsu.edu
College of Education	
Dean Paola Sztajn	psztajn@ncsu.edu
Associate Dean Hector Junco	hjunco@ncsu.edu
Associate Dean Karen Hollebrands	kfholleb@ncsu.edu
College of Engineering	
Dean Jim Pfaendtner	wjpfand@ncsu.edu
Associate Dean Chris Fey	frey@ncsu.edu
College of Humanities and Social Sciences	
Dean Deanna Dannels	dpdannel@ncsu.edu
Associate Dean Sarah Bowen	skbowen@ncsu.edu
Associate Dean Denis Provencher	dmproven@ncsu.edu
Pooler COM	
Dean Frank Buckless	buckless@ncsu.edu
Associate Dean Richard Warr	rswarr@ncsu.edu
Wilson College of Textiles	
Dean David Hinks	dhinks@ncsu.edu
Associate Dean Xiangwu Zhang	xzhang13@ncsu.edu
College of Veterinary Medicine	
Dean Kathryn Meurs	kate_meurs@ncsu.edu
Associate Dean Joshua Stern	jastern@ncsu.edu

Selected Examples of Future Potential Opportunities to Follow this Seed Grant Opportunity

- DOE Energy Frontier Research Centers (EFRCs) [DOE EFRC](#)
- NSF Growing Convergence Research (GCR) [NSF 24-527](#)
- NSF Biosensing Unsolicited [NSF Biosensing](#)
- NSF CNS: Computer Systems Research (CSR) [NSF 24-589](#)
- NSF Communications, Circuits, and Sensing-Systems (CCSS) [NSF CCSS](#)
- NSF Networking Technology and Systems (NeTS) [NSF 24-589](#)
- NSF Expeditions in Computing (Expeditions) [NSF 20-544](#)
- NSF Electronic and Photonic Materials [NSF 23-612](#)
- NSF Research Traineeship Program [NSF 24-566](#)
- NSF Experiential Learning for Emerging and Novel Technologies (ExLENT) [NSF 25-511](#)
- NSF Research on Innovative Technologies for Enhanced Learning (RITEL) [NSF 23-624](#)
- NSF Smart Health and Biomedical Research in the Era of Artificial Intelligence (SCH) [NSF23-614](#)
- NSF Smart and Connected Communities (S&CC) [NSF 25-527](#)
- NSF Infrastructure Innovation for Biological Research (Innovation) [NSF 23-578](#)
- NSF Cyber-Physical Systems (CPS) [NSF 24-581](#)
- NSF-NIH Pathfinder Supplements on Quantum Sensors for Biomedical Science [NSF 24-086](#)
- USDA Agriculture and Food Research Initiative [USDA AFRI](#)
- DARPA Microsystems Technology Office (MTO) Office-wide BAA [HR001124S0028](#)
- DARPA Biological Technologies Office (BTO) Office-wide BAA [HR001124S0034](#)
- DARPA Advanced Research Concepts ([ARC](#))
- DARPA Expedited Research Implementation Series ([ERIS](#))
- NIH Grants and Contracts ([Active Opportunities](#))
- ARPA-H [Open Funding Opportunities](#)