Institute for Connected-Sensors Systems (IConS)

Request for Proposals (RFP)

for

Collaborative Seed Research Projects in Sensors, Sensing, and Analytical Systems

Release Date: September 28, 2023

Submission Deadline: October 31, 2023

Contact Information: Dr. Michael Daniele (mdaniel6@ncsu.edu), Dr. Alper Bozkurt (aybozkur@ncsu.edu) and Dr. Veena Misra (vmisra@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. Foster collaboration between different colleges within NC State,

2. Promote innovative research in sensors, sensing, and analytical systems
3. Support the development of new interdisciplinary research teams,
4. Provide graduate students 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 is 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 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
College of Sciences
Wilson College of Textiles
College of Veterinary Medicine

V. Funding & Cost Share Support

Each researcher's individual college will provide seed funding for up to 12 months of one graduate research assistantship, including stipend, fringe, and tuition costs per project. Materials and supplies up to $3,000 will be supported by IConS via support from the Office of Research and Innovation.

It is anticipated that 6 projects will be funded through this RFP. The next RFP will be released 12 months later where researchers can apply for 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 plant, 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 improve 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

Example potential topics include but limited to:

• Sensors for biotechnology will require monitoring of manufacturing processes through real-time analysis of novel targets in reactors consisting of biological and living systems.
• Sensors in agricultural applications will require novel energy management to enable continuous operation.
• Needs in fundamental plant mechanisms can catalyze new semiconductor-based sensor arrays to measure plant-to-plant chemical communication.
    • Sensors for environmental monitoring will need to be specific and selective and identify target gasses from a collection of a wide variety of gasses.
    • Next-generation sensors in smart cities and infrastructure will need to collect data intelligently based on context to diminish the data deluge that is being experienced today. These could lead to innovation in reconfigurable sensors that can change what they sense and how often they sense based on the context.
• Health-related use cases will need real-time, low-latency algorithms, to enable rapid interventions.

VII. Proposal Guidelines

Proposal Format: Proposals should adhere to the following format:

- Title of the Project
    - Names and affiliations of Principal Investigators from each college

- Abstract (250 words or less)
- Project Description (not to exceed 2 pages excluding reference citations)

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.
Potential Funding Opportunities: Applicants should also discuss how the seed research project aligns with and may lead to potential external funding opportunities. 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.

- Timeline & Deliverables (not to exceed 1 page)

- Letter of support or email confirmation of the PI's Deans support of this proposal.
- References

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

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

- Budget justification

Submission Deadline: Proposals must be submitted electronically to Ren Shore (klshore@ncsu.edu) by October 31, 2023 11:59pm EST. Late submissions will not be considered.

VIII. Timeline

- RFP Release Date: September 28, 2023
- Proposal Submission Deadline: October 31, 2023
- Review and Selection: November 30, 2023
- Award Notification: December 15, 2023
- Project Start Date: January 1, 2024

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 October 31, 2023.