



Scientific Advocate Network (SAN) Program Solicitation

SC EPSCoR Solicitation Number 8-2024

A. Scientific Advocate Network (SAN) Program Information

The Scientific Advocate Network (SAN) program aims to increase diversity in STEM research and education with a goal of increasing diversity of the pipeline of Underrepresented Minority (URM), women, and persons with disabilities pursuing and completing STEM degrees. SAN proposals can focus on either ADAPT in SC research priorities or the Vision 2030 SC Science and Technology Plan.

- The vision of “*AI-Enabled Devices for the Advancement for Personalized and Transformative Health Care in South Carolina*” is to build research capacity at the nexus of Artificial Intelligence (AI), life and social sciences, and bioengineering through fundamental research, education, workforce development, and industry engagement.
- The Vision 2030 SC Science and Technology Plan states “*Future growth of science – and technology-intensive companies and industries in South Carolina requires workers with S&E (Science and Engineering) degrees (Associate through Doctoral level), especially computer science, engineering, and data science, in addition to physical and life science degrees. This requires strong K-20 STEM education, including applied experiences, for all South Carolinians to ensure a robust workforce talent pipeline*”.

ADAPT in SC Research Priorities

Proposals may address one or more of research themes of ADAPT in SC:

- **Biomedical AI** - Biomedical AI is an emerging interdisciplinary field where innovations sprout new theories, models, and algorithms in AI and data science and in synergistic integration of AI with targeted biomedical devices and their downstream applications in complex biomedical settings. Proposals on this topic will conduct research related to the development of theoretical foundations of biomedical AI, AI-ready data acquisition and preprocessing, multimodal data fusion technologies, deep learning algorithms, physics-informed ML models, and software tools to facilitate the use of mechanistic and AI models, sometimes with limited amounts of data.
- **XAI-enabled Biomedical Devices for Diagnostic and Planning Applications.** Explainability is crucial to rationalizing and cross-checking model outcomes to ensure that the AI-informed decisions made are reliable and trustworthy. The major challenge to implementing AI in biomedical devices is a tradeoff between the explainability and accuracy of the AI models. Highly accurate, complex models like deep neural networks (DNNs) trained by significant amounts of data tend to be less explainable, but explainable algorithms like decision trees usually lead to low accuracy for complex tasks. As an

emerging field in trustworthy AI, XAI (Explainable AI) endeavors to find explanations for complex models using ante hoc or post hoc methods. Ante hoc methods address explainability from the beginning, whereas post hoc methods rely on an external explainer of an already trained model. Proposals on this topic will use XAI to improve the explainability of the diagnostic or treatment decisions made from multimodal clinical data to provide insights into important causal factors and to obtain domain experts' trust, high prediction accuracy, and safe, continuous workflows from initial diagnosis to treatment end.

- **DL-Imaging Model-Enabled Biomedical Devices for Personalized Prognostic and Treatment Applications.** Novel DL (Deep Learning) techniques are needed to actualize high-performance biomedical devices for prognosis and/or treatment. Current devices for these purposes depend on multiple data sources to make the final treatment decision, directly guide the treatment, or implement the treatment. Constructing a model that can effectively integrate multimodal data remains a challenge. Moreover, in many applications, there are limited human samples (e.g., patients) from whom the data can be collected, not to mention the limited number of samples that clinical experts can effectively annotate. Building high-performance DL models from a limited amount of data is critical for the successful development of AI-enabled biomedical devices. Furthermore, the data collected by different investigators, labs, and instruments have an inherent bias. The ability to generalize DL models constructed from limited data sources to many application scenarios determines whether the AI-enabled medical devices can be effectively applied to a general group. Additionally, current clinical practice seeks to leverage big data repositories collected over many years while still tailoring treatment for individual patients. Therefore, developing DL models for medical devices is different from training DL models in general image or text classification, where a large amount of training data is available. The ADAPT in SC will focus on innovation in the DL models and training data processing. Proposals in this area will conduct fundamental research on creating DL models for AI-enabled biomedical devices for prognosis and/or treatment from limited data. Currently, there is a lack of expertise in foundational DL research in CRUs in SC. Thrust 2 aims to advance the field of AI-enabled medical devices for prognosis and/or treatment. The primary outcome of this thrust will be fundamental knowledge that governs generating high-performance, generalizable DL algorithms from limited data.
- **DT-Enabled Biomedical Devices for Rehabilitation and Therapy.** Rehabilitation is an important process for patients to optimize recovery following medical treatment. Today, for a given medical problem, there is a host of rehabilitation procedures and methods. However, determining the best or most suitable rehabilitation method for a given patient is difficult. Likewise, medical treatment of chronic diseases such as diabetes and cancer or rapidly developing ones such as sepsis requires physicians and patients to navigate through a sea of treatment pathways to identify the one suitable for the individual patient. An overarching scientific challenge is developing a system for an individual patient so that various available rehabilitation treatment regimens or active medical treatment pathways can be monitored and analyzed, and the outcome inferred. The use of AI-enabled digital twins (DTs) can be a viable solution. A DT is a virtual representation of an object or system that spans its lifecycle; it synced with the real system in real-time and uses simulation to analyze and forecast the future state, ML, and causal analysis to aid decision-making and design of the patient-specific treatment pathway. An AI-enabled rehabilitation DT would

be an ideal platform for clinicians to design an optimal rehabilitation strategy for a specific patient to realize a personalized treatment pathway. For diabetes, cancer, or septic patients, a DT can provide an intelligent assistant for the physician and patient to develop and optimize the treatment pathway dynamically. For the elderly and less serviced communities, DTs would provide additional AI-enabled, user-friendly instructional materials and devices.

Vision 2030 South Carolina Science and Technology Plan

Proposals may address one or more of the high-priority research areas and target industry sectors identified in [*Vision 2030 South Carolina Science and Technology Plan*](#). In this document, four high-priority research areas were identified: AI, Machine Learning, and Data Science; Advanced Materials; Systems Engineering; and Precision Biology.

- **Data science** is the collection, preparation, and analysis of data for visualization, decision making, and prediction. **AI** is a field that combines computer science and data science to interpret historical data, recognize patterns, and make predictions the way humans do. **Machine learning** is a subdiscipline of AI that draws on statistics and algorithms to provide models for learning and processing data autonomously without human intervention.
- **Advanced materials** are materials that are specifically engineered to exhibit novel or enhanced properties that confer superior performance relative to conventional materials.
- **Systems engineering** is an interdisciplinary field of research which takes a holistic view in the design, integration, and management of complex systems.
- On the human health side, **precision biology** is focused on tailoring disease prevention, diagnosis, and treatment to differences in genes, environment, and lifestyle. On the agricultural and environmental side, **precision biology** is focused on collecting and analyzing data about the soil, water, air, and microorganisms to inform decisions about crops, forestry, and water management.

The four high-priority research areas build on existing competitive advantages or will hold other research areas back if not further developed, align with federal agency funding priorities, and align with global technology trends. Vision 2030 identified four target industry sectors: Advanced Manufacturing; Human Health Life Sciences; Information Technology; and Clean Tech, Sustainability, and Resiliency.

- **Advanced manufacturing** refers to those industry segments with high R&D intensity (e.g., computer, electronics, optics, aerospace, pharmaceutical manufacturing) and medium-high R&D intensity (e.g., automotive, chemical manufacturing).
- **Human health life sciences** spans drugs, pharmaceuticals, biologics, medtech, testing and medical labs, and healthtech.
- **Information technology** includes computers, semiconductors, and related electronics manufacturing and software development, computer systems design, enterprise solutions, and network security.

- **Clean tech, sustainability, and resiliency** spans products and services that reduce emissions, improves energy efficiency, generate clean and renewable energy, improve management of waste and waste by farms, homes, offices, and industry; and engineer more resilient and environmentally friendly buildings, transportation, and agricultural systems.

B. SAN Program Funding Priorities

Funding priority will be given to proposals that show significant promise to positively impact the diversity of the pipeline of underrepresented minorities including women and persons with disabilities in the research areas listed above. To achieve this, the SAN program provides funding for the following priorities:

- Engaging URM Undergraduate Students in Research
- Supporting Scientific Conferences, Symposia, and Meetings
- Other Specific Approaches to Broadening Participation in STEM

Engaging URM Undergraduate Students in Research

The SAN Program aims to increase research participation of underrepresented students including race/ethnicity and gender in STEM during the academic year and/or the summer. Research experiences must be aligned with ADAPT in SC or Vision 2030 SC Science and Technology Plan high-priority research areas listed above. Research experiences can take place either at the students' home institutions or another institution in South Carolina. Student researchers are required to complete Responsible Conduct of Research (RCR) training, and appropriate documentation must be submitted to SC EPSCoR Program State Office. Funding priority is to support student stipends, travel (e.g., to research sites, conferences), and materials and supplies for research. Funding cannot support faculty or staff salaries, and the proposal must impact a group of at least three students.

Proposals should include an implementation and management plan and must include the following:

- Description of the student research project (e.g., significance of research, relationship to ADAPT in SC or Vision 2030 SC Science and Technology Plan, research plan, etc.). Proposals must identify the proposed start and end dates of the research experience, research location, and student responsibilities in the research project.
- Qualifications of research mentor(s) including previous experience with underrepresented student research mentoring
- Students recruiting, selection, and mentoring plan including assessment.
- Opportunities for students to disseminate results (e.g., presentations, publications, undergraduate theses, etc.).

Supporting Scientific Conferences, Symposia, and Meetings

The SAN Program supports hosting scientific conferences, symposia, and workshops that are relevant to its vision and will facilitate broadening participation in STEM (e.g., engaging

individuals from underrepresented groups; diverse institutions including minority serving institutions and predominately undergraduate institutions) in South Carolina. Proposals under this funding priority are envisioned to reach many URM students. Proposals will be considered for funding if they are aligned with ADAPT in SC or the high-priority research areas identified in Vision 2030 SC Science and Technology Plan. Conferences and meetings may provide a platform to present research results, scholarly work, update subject matter information, and engage students and junior faculty. Funding should go towards site rental, speaker fees, equipment rental, publication costs, supplies, and travel support. The proposed conferences, symposia and meetings should occur during the award period but not before February 1, 2025. Promotional/marketing materials **are required** to be submitted to the SC EPSCoR State Office for review before publication. The SC EPSCoR Logo **is required** to be included on promotional, conference materials, and website.

Proposals in this category should address the following:

- The purpose and justification of the event, including the scientific need, how the activity will address the scientific need, and its benefit to the research community.
- Description of the conference, symposium, or meeting plan to include the topic, dates, location, tentative agenda, audience type, projected number of attendees, and exhibits.
- Other sources of funding to support the activity.
- Composition of the conference or meeting planning committee.
- Description of tentative speakers, panel members, and moderators including credentials and previous relevant experience.
- Description of how participants will be selected, including students, junior faculty and others. Student researchers participation is required (attending or presenting).
- Description of marketing plan to promote the conference or meeting.

Other Specific Approaches to Broadening Participation in STEM

The SAN Program aims to develop the URM scientific workforce that may be lying dormant or underutilized in South Carolina and increase other types of educational programs (e.g., experiential education, collaborative work, industrial partnerships, co-ops, internships). Funding can support the following:

- URM Undergraduate Student Travel to STEM Conferences and/or National Laboratories for professional development to strengthen candidacy for graduate school. Funding can be allocated towards conference registration, travel (including lodging and meals based on the SC EPSCoR State Office travel rate policy), and poster printing costs if presenting a poster at a conference. These proposals should address the following:
 - Description of the purpose of student(s) travel, number of students traveling, target conferences or national labs, the student recruiting and selection process, expected outcomes/benefits from the travel, and plans to follow up with the students upon completion of travel.
 - How does the proposed activity increase graduate school readiness?

- STEM Research Experiences for South Carolina High School Students and Teachers. Funding can support materials and supplies, housing, and meals (e.g., for High School Students), and location and/or equipment rental. Proposals should address the following:
 - Description of the research experience, start and end dates, location, estimated number of participants, recruitment and selection process, marketing plan, opportunities to disseminate results, other sources of funding to support the activity, and plans to follow up with participants upon conclusion of research experience.
 - Description of how the proposed research experience is appropriate for the audience.
 - Describe the activities that will be carried out, person(s) responsible and their experience with the proposed activity, and the expected impact and outcomes.
 - Proposals retaining evaluator services in the project should describe the expertise of the evaluator and experience evaluating the proposed activity. Project evaluations should be submitted with the final report.
 - Description of any partnerships or collaborations for the proposed activity and if it contributes to its sustainability.
 - Proposals for research experiences for high school students should describe how the proposed activity will increase college and career readiness.
 - Proposals for research experiences for teachers should address how the proposed activity will improve instructional practices and increase student learning.
 - **NOTE:** Institutional approval (e.g., Pre-College Program Office) is required for research experiences for high school students. Written institutional approval is required to be submitted to the SC EPSCoR State Office prior to award start date.

- STEM Camps for South Carolina High School Students and Middle School Students. Funding can go towards materials and supplies, housing and meals, transportation, stipends for camp counselors, evaluator services, location and/or equipment rental, and portion of insurance coverage for minors. Proposals should address the following:
 - Description of STEM camp plan to include STEM topic area, start and end dates, location, expected number of participants, marketing plan, student recruitment and selection process, opportunities to disseminate results, other sources of funding to support the camp, and plans to follow up with participants upon conclusion of the camp.
 - How does the proposed activity address the challenges in STEM education in K-12 including diversity?
 - Describe the activities that will be carried out, person(s) responsible, experience with proposed activity, and projected impact and outcomes.
 - Proposals retaining evaluator services in the project should describe the expertise of the evaluator and experience evaluating the proposed activity. Project evaluations should be submitted with the final report.
 - Describe any partnerships or collaborations for the proposed activity and if it contributes to the sustainability of the proposed project.
 - **NOTE:** Stipends for camp counselors should not exceed \$1,000.00 per camp counselor at a maximum rate of \$200 per day per counselor.
 - **NOTE:** Institutional approval (e.g., Pre-College Program Office) is required for STEM camps for high school students and middle school students as they are minors.

Institutions must ensure background checks of all persons working with students including paid, volunteer, new, and reoccurring persons; securing driving records for persons transporting minors; and procedures for handling student medications at camp. Written institutional approval must be submitted to the SC EPSCoR State Office prior to award start date.

C. Award Information

Maximum Funding Amount Per Award: \$15,000.00

Award Duration: 18 months

Estimate Number of Awards: Depends on quality of proposals and availability of funds.

Anticipated Project Start Date: Projects can start as early as May 1, 2025.

D. Who May Apply?

- Proposals may be submitted by Investigators from any South Carolina college or university.
- Former SC EPSCoR Program Seed Funding PIs (e.g., GEAR, GEAR CRP, SAN, Phase-0) who did not submit final project reports to the SC EPSCoR State Office are not eligible to apply.

E. Deadline

Full Proposal – Thursday, October 24, 2024, at 5:00 pm EST

F. Full Proposal Content

The sections below represent the body of the proposal. Failure to submit the required sections will result in the proposal not being accepted or being returned without review. *Note: The number of pages for each section below (shown in parentheses) must not be exceeded.*

1. Cover Page (2 Pages)

Use the Cover Page form in Appendix A.

2. Project Description (7 Pages)

The Project Description should provide a clear statement of the work to be undertaken and must address the objectives and the requirements outlined above. Proposals must articulate relevance to ADAPT in SC or Vision 2030 SC Science and Technology Plan priorities, the potential to increase the STEM pipeline and to broaden participation in STEM, the target demographics of student and/or teacher participants, potential outcome and impact, and the method of recruitment and selection. A statement about the merit, the potential impact, timeline for implementing proposal activities chart, and plans to leverage SAN funding to sustain the proposed activities should also be included in this section. Failure to address the requirements listed will result in administratively declining the proposal.

a. Timeline for Implementing Proposal Activities Chart

Include a timeline for implementing proposal activities. Describe each major proposal activity and identify the quarters during which the proposed activity will be conducted. Each activity must list the name(s) of the party responsible for completing the activity. Employ the chart template below. Add or delete rows as needed.

Activity	Year 1				Year 2	
	Q1	Q2	Q3	Q4	Q1	Q2

b. Plans to Leverage SAN Funding

Describe the plans to leverage SAN funding and explicitly address the targets and opportunities for future project funding and the sustainability of the effort. The plan must include the names of potential agencies and funding programs.

3. References Cited

Reference information is required. Each reference must include the name of all authors (in same sequence in which they appear in the publication), article title, journal title, book title, volume number, page numbers, and year of publication.

4. Results from Prior SC EPSCoR Support (1 Page per Award)

Note: If the senior personnel have not received support from SC EPSCoR, include a statement to the effect. The purpose of this section is to assist reviewers in assessing the quality of prior work conducted with current or prior SC EPSCoR funding. If the PI identified on the proposal has received a SC EPSCoR award as a PI since January 1, 2020, the following information must be provided:

- Title of the project, start date, date completed, and award amount.
- A brief summary of the results, including accomplishments.
- Indicate whether publications or other products resulted from the award, and provide a complete list, if any.

If the project was recently awarded and therefore no new results exist, briefly describe the proposed work.

5. Biographical Sketches

A biographical sketch is required for the PI and Co-PI in NSF format. **Please note** the new NSF Biographical Sketch format effective May 20, 2024. For more information on the NSF format, visit <https://new.nsf.gov/funding/senior-personnel-documents#biographical-sketch-0bd>. Biographical Sketch must be created and certified in [SciENCv](#) (Science Experts Network Curriculum Vitae).

6. Synergistic Activities (1 Page)

A one-page Synergistic Activities document is required for the PI and Co-PI in NSF format. **Please note** the new NSF Synergistic Activities format effective May 20, 2024. For more information on the Synergistic Activity format, visit <https://new.nsf.gov/funding/senior-personnel-documents#synergistic-activities-ec2>

7. Budget

Use the Budget form in Appendix B.

8. Budget Justification (2 Pages)

The budget justification must be composed of no more than two pages and must address every budget item requested.

9. Current and Pending Support

The Principal Investigator must submit Current and Pending Support in NSF format. **Please note** the new NSF Current and Pending Support format effective May 20, 2024. Current and Pending Support must be created and certified in [SciENCv](#) (Science Experts Network Curriculum Vitae). For more information, visit <https://new.nsf.gov/funding/senior-personnel-documents#current-and-pending-other-support-5db>

G. Budget Information

- The total budget requested may not exceed \$15,000 per proposal. The SAN program is a cost-reimbursement program and SC EPSCoR Program will reimburse paid expenses **NOT** incurred expenses.
- Awardees should ensure that costs claimed under SC EPSCoR Program grants are allowable, allocable, and reasonable.
- **Indirect costs are not allowed** under this solicitation; however, they may be used to show a non-federal cost-share commitment.

H. Submission Instructions

PIs should submit their proposals via the SC EPSCoR Portal at <https://scepacor.org/Solicitations/portal/>.

I. Proposal Review Process

Proposals that meet the eligibility requirements and the guidelines of this solicitation will be evaluated by external reviewers (outside South Carolina) based upon the extent to which they meet specific criteria including but not limited to:

- Merit, potential of broader impact, and potential to increase diversity.
- Qualifications of the PI and project team (if applicable) to conduct the proposed activity.
- How well the proposal addresses the specific requirements of the SAN Program Solicitation and its potential for success, including budget considerations.

J. Award and Reporting Requirements

- All publications (e.g., research publications, press releases, other publications or documents about the research funded by the SC EPSCoR Program) and presentations resulting from the SAN **are required** to include an acknowledgement of SC EPSCoR Program support and a disclaimer. *“Research reported in this [publication, press release, presentation] was supported in part by the U.S. NSF and SC EPSCoR Program under award number (U.S. NSF Award # OIA-2242812 and specific SC EPSCoR grant number). The views, perspective, and content do not necessarily represent the official views of the SC EPSCoR Program nor those of the U.S. NSF.”*
- All conference and meeting materials **are required** to acknowledge SC EPSCoR Program support and state *“Funding for this conference was made possible (or in part) by SC EPSCoR Program under award number (U.S. NSF Award # OIA-2242812 and specific SC EPSCoR Program number). The views and perspectives expressed in conference materials, publications, speakers, or moderators do not necessarily reflect those of the SC EPSCoR Program and U.S. NSF or infer endorsement by the SC EPSCoR Program and the U.S. NSF.”*
- Students involved in research are encouraged to present their research findings at SC EPSCoR Annual Conference.
- Reassurance of Responsible Conduct of Research (e.g., CITI Certification) are required for student researchers to be submitted to SC EPSCoR Program State Office.
- Principal Investigators will be required to provide email addresses of Undergraduate Students, Graduate Students, and K-12 Teachers supported by the SAN Award to the SC EPSCoR State Office for evaluation purposes.
- The SC EPSCoR Program reserves the right to conduct site visits during the project period for evaluation and reporting purposes. Awardees are expected to provide required information and documentation to the SC EPSCoR Program staff as needed.
- A final report will be due no later than 60 days after the end of the award.

K. Contact Information

General inquiries should be made to:

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