

2024



# MILO CLIMATE ACTION ACADEMY



From left to right: Grace Rendón, Andreica Maldonado & Kamille Morales

## RGP TEAM

### Andreica Maldonado

#### Director

Research Grants Program  
Puerto Rico Science, Technology & Research Trust

### Grace Rendón

#### Grant Specialist

Research Grants Program  
Puerto Rico Science, Technology & Research Trust

### Kamille Morales

#### Outreach & Content Specialist

Research Grants Program  
Puerto Rico Science, Technology & Research Trust

## MILO CLIMATE ACTION ACADEMY

The Milo Climate Action Academy is an innovative educational initiative aimed at empowering university students and recent graduates in Puerto Rico to develop creative solutions for addressing climate change. Over the course of 12 sessions, held from August 19th to December 7th, 2024, participants explored the use of satellite data to devise solutions focused on mitigating climate change impacts. This initiative, a collaboration between the Milo Space Science Institute of the **Arizona State University** and the Research Grants Program of the **Puerto Rico Science, Technology, and Research Trust** brought together 139 participants from 53 municipalities across Puerto Rico.

## THE SHOWCASE

The Milo Climate Action Showcase marked the culmination of the MILO Climate Action Academy, where 102 participants presented 28 innovative solutions to address climate challenges in Puerto Rico to a diverse audience. It also served as a platform for the emerging climate leaders to network with academics, industry leaders, and other professionals passionate about advancing climate action and exploring how their ideas can shape Puerto Rico's future. The event concluded with the awarding of five top projects for their exceptional contributions to creating a sustainable future for Puerto Rico.

## BUILDING A CLIMATE RESILIENT FUTURE FOR PUERTO RICO

We are building a climate resilient future for Puerto Rico by empowering participants with the tools, knowledge, and networks needed to turn their climate solutions into reality. Through the MILO Climate Action Academy, we connected participants with experts across various fields, providing valuable insights and guidance. We also presented additional resources such as funding opportunities and entrepreneurship programs to help bring their innovative ideas to life. By supporting these emerging leaders, we are equipping them to tackle climate change, mitigate its effects, and improve the quality of life of Puerto Rican communities.



FOCUS AREAS IN  
PUERTO RICO



Forest Health & Restoration



Coastal Zone Management



Agricultural Sustainability



Urban Planning & Infrastructure Resilience



Water Resources Management

“ We are proud to have facilitated this opportunity for students and professionals to be trained in the MILO Academy concept. This aligns with our mission to invest in and develop the capabilities to advance Puerto Rico’s economy and the welfare of its citizens through innovation, science, technology, and research. ”

Eng. Luz A. Crespo  
Chief Executive Officer  
Puerto Rico Science Technology & Research Trust

“ Puerto Rico proudly leads the first MILO academy focused on climate change. At the Trust, we take on the responsibility of providing solutions and fostering a commitment to our planet, preparing the next generation of leaders who will make a difference. This pilot academy will not only impact our local community but will also serve as a model for implementation in countries like Australia and Ecuador. This achievement fills us with immense pride and reaffirms our mission to create positive change on a global scale. ”

Andreica Maldonado  
Director, Research Grants Program  
Puerto Rico Science Technology & Research Trust

71

STUDENTS

31

EARLY-CAREER

28

SOLUTIONS

5

AWARDS

Beneath the Surface: Crafting Breakwaters for Guánica’s Strategy to Urban Infrastructure Defense

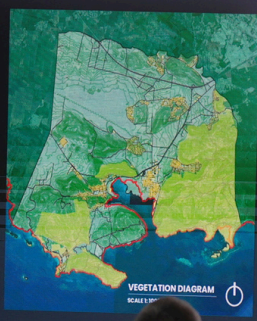


Figure 1. Vegetation Diagram. Information obtained from the GIS Puerto Rico Database.

Christine M. Santana Rivera & Nathaniel Rodríguez

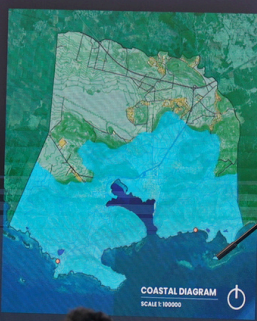


Figure 2. Coastal Diagram. Information obtained from the GIS Puerto Rico Database.

# MEET THE TEAMS

The following pages present the profiles of the sub-teams of the Milo Climate Action Academy, showcasing their innovative project ideas developed over 12 immersive sessions under the guidance of climate action and remote sensing experts.

Organized into five key focus areas—Agricultural Sustainability, Forest Health & Restoration, Water Resources Management, Coastal Zone Management, and Urban Planning & Infrastructure Resilience—teams were divided into sub-teams to create their solutions. This eBook highlights the diverse approaches each team has taken to address climate change in their communities, along with the contact information of their respective team leads. Through their dedicated efforts, these young leaders are shaping a more sustainable future for Puerto Rico and beyond.







## Team Lead

**Laura B. Ramos Serrano**

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**Sub Team:** Jheismar A. Santos Rodríguez, Frances

**Showcase winner:** 2nd place

## Strategies to improve the resiliency of small farmers in Puerto Rico after extreme meteorological events

*Agricultural Sustainability*

This project aims to enhance agricultural resilience in Puerto Rico by offering small farmers a user-friendly, Spanish-language digital app that provides crucial information to help them prepare for and recover from climate events like hurricanes and droughts. Developed by a passionate all-female team, the app seeks to protect the island's fertile lands and assist farmers in adapting to the challenges of climate change.

## Team Lead

**Maria F. Rodriguez Torres**

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**Sub Team:** Solange B. Otero Rivera, Andrea N. Ríos Rolón, and Wadner J. Molina Tavales

**Showcase winner:** 2nd place



## Agricultural Sustainability: Soil Health Management and Monitoring in Santa Isabel

*Agricultural Sustainability*

This project focuses on improving soil health monitoring and management in Santa Isabel, Puerto Rico, by integrating remote sensing technologies, farmer education, and policy reforms to promote sustainable agriculture. The team aims to provide real-time data on soil moisture, nitrogen needs, and crop health, using tools like LiDAR and NDVI to help farmers optimize crop selection, reduce dependency on chemical fertilizers, and increase agricultural productivity while advocating for policy changes to support a more resilient agricultural sector.



## Team Lead

**Axel T. Olivera Martinez**

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**Sub Team:** Andrea Gascot,  
Gilberto Alvarado Santiago

### Urban Agrovoltatics with Hydroponic Systems

*Agricultural Sustainability*

This project seeks to revitalize Puerto Rico's agricultural sector by implementing agrovoltaic systems in urban areas, specifically in Bayamón, to combine food production and solar energy generation on the same land. By leveraging solar panels and urban agriculture, this initiative aims to combat land loss, promote sustainable farming, and reduce the island's reliance on food imports, while benefiting local communities with clean energy and improved food security.

## FOREST HEALTH & RESTORATION

### Team Lead

**Omar Gutiérrez del Arroyo-Santiago**

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**Sub Team:** Christopher E. Orozco González,  
Coral Ortiz, Sebastián D. Aponte



### Assessing Forest Health and Climate Change Impacts in Puerto Rico: A 10-Year Retrospective Analysis

*Forest Health & Restoration*

This project focuses on evaluating the impacts of climate change on forest health in Puerto Rico by conducting a 10-year retrospective analysis across three key forest ecosystems: El Yunque National Forest, Planadas-Yeyesa Nature Reserve, and Guánica Dry Forest. The study aims to deepen our understanding of how climate change and human activity, such as deforestation, are affecting Puerto Rico's diverse forests and their ecosystems.



**Team Lead**  
**Luis Fernández-Negrón**  
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**Sub Team:** Viridis Miranda  
**Showcase winner:** 1st place

## **Enhancing Forest Resilience in Puerto Rico: A Remote Sensing Approach to Invasive Species**

*Forest Health & Restoration*

This project focuses on the impact of the invasive species *Megathyrus maximus* on the health of Bosque de Susúa in Puerto Rico, aiming to enhance forest restoration efforts through remote sensing technology and fieldwork. By combining advanced tools like ArcGIS Pro with field surveys, the team seeks to improve invasive species monitoring, support biodiversity, and develop effective restoration strategies to combat climate change and deforestation in this under-studied forest.

## **Team Lead**

**Natalia Gonzales Cruz**  
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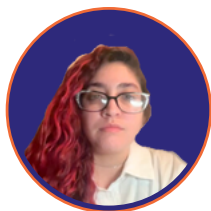
**Sub Team:** Nestor G. Irizarry Calderón  
Adriana Pacheco



## **Roots of Resilience: Mangrove Protection**

*Forest Health & Restoration*

This project focuses on mangrove restoration in Puerto Rico, aiming to mitigate soil erosion and reduce the impact of hurricanes by using satellite data to identify vulnerable coastal areas for targeted reforestation. By involving local communities through workshops and educational outreach, the project will foster awareness of mangrove benefits while actively restoring these ecosystems, ultimately enhancing coastal resilience and promoting sustainable environmental practices.



## Team Lead

**Julymar Rodríguez López**

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**Sub Team:** Angel Sebastian Estruche Santos

### **Visualization of Urban Encroachment: Deforestation of Transitional Forests and Implications on Climate Resilience of Puerto Rico**

*Forest Health & Restoration*

The project focuses on how urban development is expanding into forested areas in Puerto Rico, specifically in regions around El Yunque National Forest, which are crucial for climate resilience. By using satellite imagery, GIS, and community engagement, the team aims to monitor land cover changes, assess forest health, and influence policies to promote sustainable land use, protect transitional forests, and improve preparedness for climate impacts.

## **WATER RESOURCE MANAGEMENT**

## Team Lead

**Lluyvymar M. Castro Sepulveda**

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**Sub Team:** Maleidy A. Parrilla Figueroa,  
Eyanie M. Román Varela  
Lorelle López

**Showcase winner:** 3rd place



### **Examining how specific weather patterns influence bacterial growth and distribution in Puerto Rico's Aquatic Environments**

*Water Resources Management*

This project aims to address water pollution in Puerto Rico's beaches, focusing on the impact of bacterial contamination on public health and tourism. By implementing a real-time water quality monitoring system with remote sensors and accessible QR codes, the team seeks to provide timely, reliable data, promoting public safety and environmental protection.





## Team Lead

**Wilanys Ortiz**

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**Sub Team:** Paola Reyes, Jean Carlo Alfaro Gaud,  
Jorge Jiménez, and José Pérez

### Implementing a Managed Aquifer Recharge Using Recycled Water in Santa Isabel, Puerto Rico

*Water Resources Management*

This project focuses on addressing groundwater depletion and saltwater intrusion in the Southern Region of Puerto Rico, particularly in Santa Isabel, through managed aquifer recharge (MAR) and aquifer injection wells. The goal is to increase groundwater levels, reduce salinity, and ensure a sustainable water supply by adapting successful methods from other regions, with a focus on cost-efficiency and community engagement.

## Team Lead

**Amanda González**

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**Sub Team:** John Herrera, Edward Medero, Ariana Negrón



### Long-Term Plans for Safe and Easy Access to Drinking Water in Communities

*Water Resources Management*

This project focuses on ensuring safe and reliable access to drinking water in Puerto Rican communities through sustainable, community-driven solutions. The goal is to improve water quality, reduce contamination, and strengthen infrastructure by implementing innovative monitoring technologies, rainwater harvesting, and local participation in water management.



## Team Lead

**Zaimara Hernández Ramírez**

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**Sub Team:** Angelique T. Pagán Medina

### **Mangrove and Native Plants Wetlands Remediation Strategies for San Juan Estuarine Canal: Martín Peña**

*Water Resources Management*

This project focuses on addressing water quality challenges in the Martín Peña Canal, part of the San Juan Bay Estuary (SJBE), driven by climate change, pollution, and stormwater runoff. By implementing floating wetlands and remote sensing tools, the team aims to improve water quality and provide additional wildlife habitats, supporting the ecological balance and long-term sustainability of this vital estuarine ecosystem.

## Team Lead

**Geilys O. Pérez Ortiz**

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**Sub Team:** José H. Cruz Quiñones, Valeria Hernández Nieves



### **Systematization For Flood Control in Vulnerable Communities in Puerto Rico**

*Water Resources Management*

This project focuses on addressing flooding in vulnerable Puerto Rican communities by creating a flood control system aimed at protecting assets and enhancing preparedness. By leveraging advanced technologies such as LiDAR, drones, and remote sensing, it aims to improve flood risk assessment, optimize resource deployment, and ensure equitable solutions for affected communities, ultimately fostering safety and resilience.



## Team Lead

**Lizmarie Mateo Roubert**

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**Sub Team:** Carlos E. Delgado Vega, Yolivette Castro

## Applications of Remote-Sensing Tools in Monitoring Bioluminescent Bays in Puerto Rico

*Coastal Zone Management*

This project focuses on developing methods to use remote-sensing tools for monitoring critical environmental factors in Puerto Rico's bioluminescent bays, providing valuable data for both scientists and the general public. It will monitor parameters such as water salinity, temperature, turbidity, and oxygen levels, all while keeping costs low and raising awareness about the preservation of these unique ecosystems.

## Team Lead

**Alexis Vega Lozada**

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**Sub Team:** Argelys Monserrate Cid, Gabriel Rivera Rodríguez,  
Beatriz Collazo Rosa, Astrid Vera Torres



## Coastal Erosion and Rehabilitation of Infrastructure in Humacao Puerto Rico

*Coastal Zone Management*

This project addresses the issue of coastal erosion along Puerto Rico's PR-3 highway in Punta Santiago by proposing a hybrid approach combining hard engineering methods (such as breakwaters) with soft engineering solutions (such as beach nourishment). The goal is to protect both infrastructure and natural habitats, while also improving community resilience and safeguarding local biodiversity, all while considering the impacts of climate change and the increased frequency of severe storms.



## Team Lead

**Kemery Núñez**  
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**Sub Team:** Xamyr Guerrero

### **Mangrove Ecosystem Restoration**

*Coastal Zone Management*

This project aims to restore mangrove ecosystems in Puerto Rico to combat coastal erosion, enhance biodiversity, and mitigate the impacts of storm surges worsened by climate change. By utilizing GIS tools for site identification, involving local communities, and using advanced monitoring technologies, we aim to build resilient coastal ecosystems while promoting environmental education and community engagement.

## Team Lead

**Victor Manuel Salcedo Rosero**  
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### **Mathematical modeling of coastal erosion in Ocean Park using partial differential equations**

*Coastal Zone Management*

This project focuses on addressing coastal erosion and sea level rise in Puerto Rico by using mathematical models to predict how these issues will evolve over time and across different locations. The goal is to better understand coastal changes and develop effective solutions by combining advanced mathematical modeling, remote sensing tools, and community involvement to protect ecosystems and local communities.





**Team Lead**  
**Mariamgelis Blanco Ayala**  
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**Sub Team:** Zaira M. Oñativía Berrios, Claudia Renta,  
Angelle M. Torres Bonet

## **On-Shore Constructions Contributing to Coastal Erosion**

### *Coastal Zone Management*

This project aims to address coastal erosion exacerbated by construction activities in Puerto Rico, particularly in Barrio Obrero in Arecibo, by implementing sustainable engineering solutions and promoting environmental regulations. The approach includes integrating natural barriers, using innovative materials, conducting impact assessments, and engaging the local community to develop long-term strategies that balance development with coastal preservation and resilience.

## **Team Lead**

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**Sub Team:** Elix Hernández, Glerisbeth Lorenzo, Kelyaris  
Rodríguez Torres, Sara M. Soto Rivera



## **San Juan Bay Estuary Shoreline Management Model**

### *Coastal Zone Management*

The project focuses on mitigating coastal erosion in Puerto Rico by restoring natural barriers like mangroves and coral reefs, while also implementing engineered solutions such as seawalls in high-risk areas. Using GIS, remote sensing, and shoreline models, it identifies priority zones for intervention, aiming to reduce erosion by 50%, restore key ecosystems, and enhance coastal resilience through collaboration with local and international partners.



**Team Lead**  
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**Sub Team:** Karen Delgado Vega, Astrid N. Romero-Vega, Gloria M. Ortiz Ramírez, Alba L. Guzmán Morales

## Shoreline Changes and their Effect on Coastal Vegetation on the Corredor Ecológico del Noreste Natural Reserve

*Coastal Zone Management*

This project uses the San Miguel shoreline in Puerto Rico's Corredor Ecológico del Noreste Natural Reserve to study how coastal dynamics, biofacies (patterns of plant and animal life), and land use changes impact vegetation resilience and habitat sustainability. By combining advanced methods like shoreline change detection and climate projections, it provides a framework for adaptive coastal management and biodiversity conservation in response to climate change.

**Team Lead**  
**Kevin Colón Rosado**  
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**Sub Team:** Yaimaliz C. Rivera Pérez,  
Yadriamari Rivera Lebrón, Osvaldo Laracuente Briales



## The Restoration of Puerto Rico's Coral Reefs

*Coastal Zone Management*

This project aims to restore coral ecosystems and support coastal economies by establishing land-based and open-water coral reef nurseries on a national scale. It involves creating specialized aquaculture systems, conducting research to develop resilient coral strains, and collaborating with marine biologists, coastal management experts, local governments, and communities to ensure sustainable and effective restoration efforts.



## Team Lead

**Natharelies Ferrer Rodríguez**

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**Sub Team:** Christine M. Santana Rivera

### **Beneath the Surface: Crafting Breakwaters for Guánica's Strategy to Urban Infrastructure Defense**

*Urban Planning & Infrastructure Resilience*

This project addresses Guánica's vulnerability to coastal erosion and seismic activity by evaluating risks to infrastructure and natural assets. It proposes constructing seismic-resistant breakwaters to stabilize the coastline, protect infrastructure, and promote economic growth through tourism, while fostering local collaboration for long-term community resilience.

## Team Lead

**Luis Quiñones Acosta**

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**Sub Team:** Tomás Arroyo Hernández, Isabella Carattini-Alvarez



### **Climate Change Impact on Community Resiliency**

*Urban Planning & Infrastructure Resilience*

This project addresses traffic congestion's impact on air pollution and human health in Puerto Rico by developing a monitoring system to track pollution levels and their correlation with traffic flow. Using machine learning and air quality sensors, the initiative aims to provide real-time data for informed urban planning, improve air quality, and mitigate health risks, fostering sustainable, resilient communities.



## Team Lead

**Dem Joel Santiago**

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**Sub Team:** Katria Colon, Axel Martínez, Desirée Luna,  
Alondra Álvarez

**Showcase winner:** 4th place

### Electrical Oasis in the central region of Puerto Rico.

*Urban Planning & Infrastructure Resilience*

Puerto Rico has endured persistent power outages due to an inefficient electrical grid, worsened by natural disasters like hurricanes and earthquakes, resulting in extended blackouts. This project proposes the implementation of solar-powered microgrids in rural communities such as Barranquitas and Utuado to improve energy independence and resilience, aiming to reduce electrical insecurity and enhance the quality of life for vulnerable populations.

## Team Lead

**Gabriel Castro**

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**Sub Team:** Laura T. Cabrera-Rivera, Alanis D. Pérez-Colón,  
Francisco Monroig



### Mayaguez Stormwater Detention Vault

*Urban Planning & Infrastructure Resilience*

This project proposes a dual-solution approach to mitigate the recurring flooding at the University of Puerto Rico Mayaguez campus, primarily targeting its main student parking area, which is severely impacted by heavy rains. By combining permeable asphalt with a stormwater detention vault, the solution aims to reduce flooding, protect vehicles, and ensure minimal disruption to academic activities, while providing a sustainable long-term infrastructure model for similar flood-prone regions.





## Team Lead

**Timothy Mendez Feliciano**

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**Sub Team:** Diego Rodríguez Moreno, Nabil Perez Acevedo,  
Gilberto García Díaz, Emmanuel J Vargas-Torres

### Mitigating Flooding in Urban Recreational Areas

*Urban Planning & Infrastructure Resilience*

This project focuses on transforming urban recreational areas in Puerto Rico into flood-resistant "sponge spaces," addressing the growing concerns of flooding and public health. By redesigning parks to incorporate natural drainage, green rooftops, and water retention features, the team aims to create safer, healthier public spaces while mitigating the spread of water-borne diseases, offering a sustainable solution to the island's recurring flooding problems.

## Team Lead

**Jeremy Torres Ruiz**

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**Sub Team:** Jaasiel K. Hernandez, Luis Negrón



### Promoting Green Infrastructure for Flood Mitigation in Puerto Rico

*Urban Planning & Infrastructure Resilience*

This project focuses on reducing the adverse impacts of flooding in Puerto Rico, particularly in high-risk urban areas, by incorporating green infrastructure solutions like permeable surfaces and rain gardens to mitigate stormwater runoff and enhance the quality of life for local communities. The plan aims to improve public spaces through the creation of parks and recreational areas, which will serve dual purposes: flood mitigation and providing accessible, safe areas for social interaction and environmental education.



## Team Lead

**Diana Lee Díaz**  
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**Sub Team:** Karla Torres

### **Puerto Rico's Topography: Impact on The Lifestyle**

*Urban Planning & Infrastructure Resilience*

This project examines the intricate relationship between Puerto Rico's topography and its housing, focusing on how geographic features such as coastal regions and mountainous terrains influence residential lifestyles and design. By exploring the evolving dynamics of land use and topographical changes, the study highlights the importance of considering historical shifts, climate projections, and future environmental risks to ensure safe, sustainable, and culturally relevant housing development across the island.

## Team Lead

**Alejandro G. Rodriguez Ramos**  
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**Sub Team:** Kamila V. Sanabria, Jonathan O. Valez, Rafael Y. Rivera,  
Milo H. Soto Perez, Gregory Diaz



### **Renewable Microgrid Implementation Survey**

*Urban Planning & Infrastructure Resilience*

This project focuses on addressing Puerto Rico's energy crisis through sustainable solutions, driven by the team's personal experiences with the island's power struggles post-Hurricane Maria. It aims to implement an offshore wind farm and integrate solar energy with microgrids to diversify the energy grid, reduce dependence on fossil fuels, and enhance energy resilience, ultimately fostering a more sustainable and reliable power system for the entire island.

# Thank you

## CLIMATE ACTION HEROES



**ASU** Milo Space  
Science Institute  
Arizona State University

 **RESEARCH GRANTS**  
funds to grow

 Puerto Rico  
Science, Technology  
& Research Trust