



# The National Center for Secure & Resilient Maritime Commerce

## Protecting Our Nation's Ports through Research and Education

### CSR Education Programs

CSR Programs cover the full range of Science, Technology, Engineering and Math Education:

- ❖ Developing the K-12 Pipeline
- ❖ Undergraduate Courses & Internships
- ❖ Graduate and Postdoctoral Research Fellowships
- ❖ In Service Professional Training
- ❖ Public Programs at Science Centers

### Accomplishments to Date

In its first year, CSR has established:

- ❖ Links to 4H-SET programs for K-12
- ❖ Undergraduate International Externships
- ❖ First CSR Summer Institute for Undergraduates
- ❖ Graduate Research Fellowships
- ❖ Maritime Security Graduate Certificates
- ❖ Summer Programs with Science Centers
- ❖ In-Service Professional & Teacher Training

### Future Plans

Continued Integration across STEM disciplines



### Research Area Alignments

CSR education programs leverage leading-edge research in the field of **Maritime and Port Security** to secure national maritime borders and U.S. maritime interests, support global maritime awareness, defend maritime commerce and global supply chains, minimize damage and expedite recovery from catastrophic events impacting maritime interests, and protect coastal population centers.

### Partners

Stevens Institute of Technology, Rutgers University, University of Puerto Rico, University of Miami, Monmouth University, and MIT.

### Where can I find more information?

<http://www.stevens.edu/csr/education/>

## Maritime Domain Awareness Research

**Nearshore and Harbor** multi-sensor surveillance: The density of commercial and recreational vessel traffic in the nation's estuary and harbor environments presents a significant challenge to the detection, classification and tracking of small vessels and other surface and underwater threats. The goal is to examine the use of systems of sensors that can provide continuous, high resolution, all-weather surveillance of these environments. New and existing sensor technologies will be examined, including underwater acoustic, and video and IR cameras operating at different wavelengths. These sensors will be coupled with advanced data integration, pattern recognition, anomaly detection, and decision-support systems.

**HF Radar** coastal over-the-horizon ship detection and tracking using advanced dual-use RADAR technologies. The goal is to develop robust detection algorithms that can recognize ship-associated HF Radar signals above the background noise (e.g., surface waves). Algorithms will be developed to support vessel detection and tracking capabilities using compact HF Radars, demonstrating that ships can be detected and tracked by multi-static HF Radar in a multi-ship environment while simultaneously mapping ocean currents.

**Satellite-Based** ship detection, classification and identification. This research is developing new understanding and new processes for receiving and analyzing large maritime area data from multi-satellite and multi-frequency sensors such as Synthetic Aperture Radar (SAR) and electro-optical (EO) sensors. Algorithms will be developed to employ these data to detect vessels in harbors, the coastal ocean and the high seas. Algorithms will also be developed to integrate this information with ground-based systems such as AIS.

## Research in Resiliency

- ❖ Resilient Port Infrastructures
- ❖ Collaborative design of resilient extended enterprises
- ❖ MTS Recovery and Continuity of Operations

We examine human and organizational factors that enhance and constrain the effectiveness of existing and future systems and policies related to preparedness, response and recovery of the MTS. We will develop the essential tools and processes necessary to create a capability to "design for resilience". We will also identify opportunities to leverage security and resiliency investments to produce improvements in maritime business and economic performance.

## Education, Training, and Outreach

The goal of CSR is to provide education, training, and outreach in STEM disciplines related to maritime security. This includes K—12, undergraduate, and graduate education, as well as education and training for maritime security professionals and outreach programs for the general public. CSR employs an "end-to-end" philosophy in its approach to this multi-constituency educational enterprise. We employ the CSR leading-edge research as vehicles for learning at every level. CSR academic institutions allow tuition-neutral cross-registration. An intensive Summer Maritime Security Research Institute is conducted each year at one of the partner university campuses on a rotating basis, creating a unique environment for advanced, multi-university examination of issues having particular significance..