

Center of Excellence in Wireless and Information Technology



Center of Excellence
WIRELESS AND INFORMATION TECHNOLOGY
AT STONY BROOK UNIVERSITY



Stony Brook University

Director's Message



To best capitalize on the IT revolution, spur economic growth, advance scientific research, and develop the technologies of tomorrow, CEWIT was created in 2003 at Stony Brook University. The Center is a next-generation research and educational facility whose mission is three-fold: become recognized as

a world leader in interdisciplinary research in emerging, critical technologies of the information age; address the skilled technology worker shortage; and foster new enterprise development. CEWIT has created a powerful intellectual property portfolio resulting in numerous patents.

Since its inception, CEWIT has worked hard to build strategic alliances and business partnerships among the academic, scientific, and business communities. Our partners include some of the world's best known and most sophisticated giants of wireless and information technology. The Center is building on these achievements and is focused to build research and development (R&D) partnerships with industry, and with other internationally known research institutions.

CEWIT technology commercialization activities are designed to help drive economic growth by moving technologies from research labs to the marketplace. Under the guidance of our Industrial advisory board, scientific council, and technology council, CEWIT generates new technology innovations to fuel the formation and expansion of cutting-edge industry clusters. CEWIT's annual technology showcase, at which internally originated technologies are demonstrated at an early stage to a select audience of investors and potential strategic partner companies, has resulted in a number of commercialization ventures.

— Satya Sharma
CEWIT Executive Director

Fast Facts

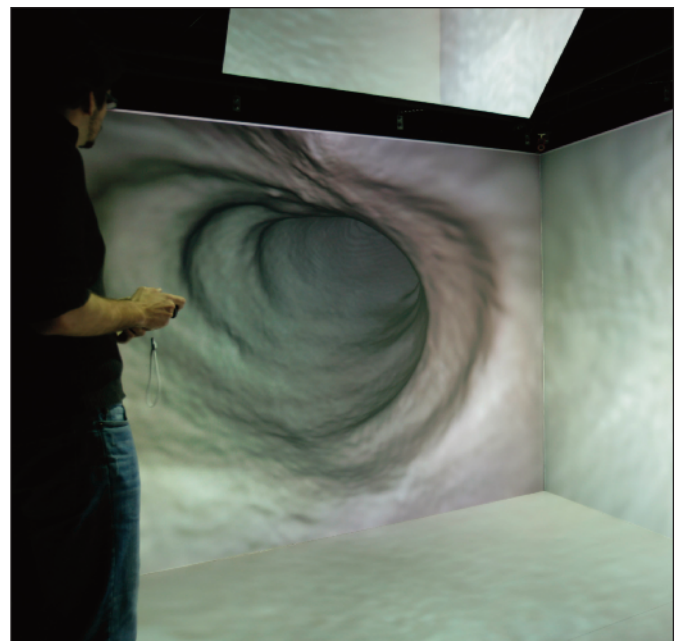
- First building in Stony Brook University Research and Development Park
- 100,000-square-foot, state-of-the-art building
- 40 new research laboratories
- 7,000-square-foot incubator space
- 70 faculty affiliates
- More than 280 graduate students
- More than \$150 million received from federal and industry sponsors
- 123 invention disclosures, 36 US patents issued, and 12 licenses
- More than 680 research publications

Worldwide Partnerships

- Industry: large, medium, and small-scale enterprises
- National research laboratories
- Domestic and foreign academic institutions
- High-tech startups

Accomplishments

- More than 50 industry, academic, and research partners
- More than \$150 million in industry commitments matching \$50 million state capital award
- More than 500 projects completed with industry partners and federal agencies
- More than 1,000 jobs created/saved by CEWIT and industry partners
- Four new startup companies based on CEWIT innovations



CEWIT'S FIVE DIVISIONS

Systems and Infrastructure

The Systems and Infrastructure Division is not only advancing research in related fields, but is also creating solutions and systems for commercialization. Work includes mobile technologies for social impact, image processing, robotics, social networks, data visualization and visual analytics, applications of sensor networks and signal processing, learning, secure storage, service-oriented architectures, fault diagnosis, web information systems, reconfigurable hardware, and regulatory compliance.

Software Systems

The Software Systems Division includes a number of internationally recognized research faculty from the University and hundreds of PhD students working to advance software technologies. The research activities in Software Systems are quite exhaustive and include but are not limited to cybersecurity, testing and verification, computer games, simulation and rendering, 3D visualization, cryptography, data modeling, algorithms, operating systems, geometric modeling, news and blog analysis, quality assurance, secure data management, virtual reality, file systems, augmented reality, bioinformatics, data mining, and computational biology.

Communications and Devices

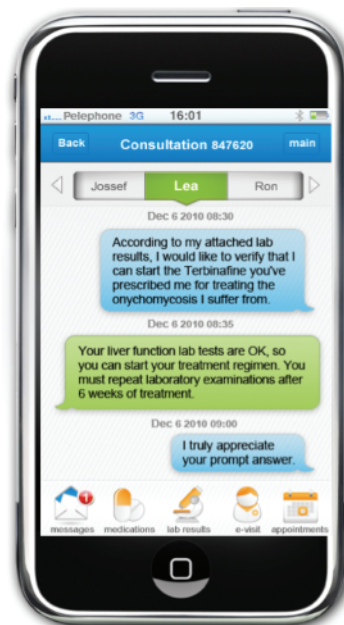
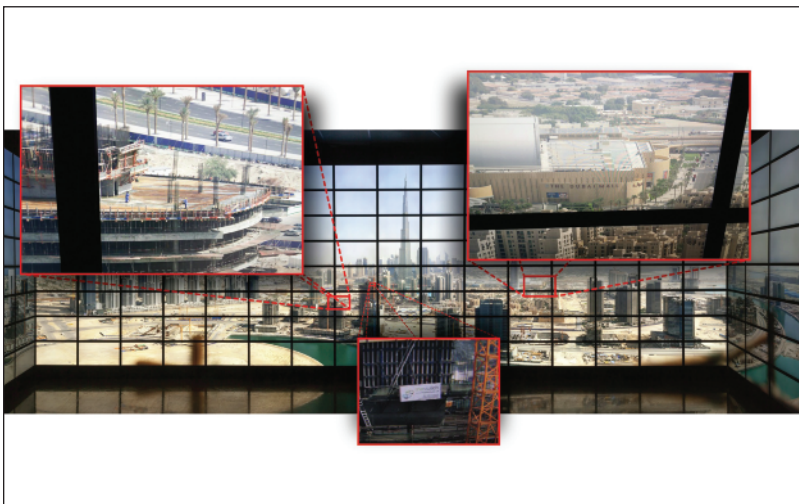
The Communications and Devices Division encompasses research in digital signal processing, new sensor and RFID systems, optical packet interconnects, wireless/mobile communications, image processing, micromachining, superconductorelectronics, trusted hardware devices, and spectrum sharing.

Network Technologies

Research in the Network Technologies Division includes but is not limited to network design, modeling, implementation and testing of various forms of wireless ad hoc, sensor networks and mesh networks, protocol design for wireless and mobile networks, vehicular networks, network planning and management, network security, location management and tracking, and physical layer aspects such as MIMO. The activity in networking technologies focuses on both basic and applied research leading to commercialization.

Medical Devices and Technologies

The Medical Division uses wireless and IT technologies to enhance the productivity and quality of health care. The research in this division includes but is not limited to computer-aided detection of colon cancer, prostate imaging, detection of atrial fibrillation, noninvasive and transcutaneous imaging, brain imaging and modeling, potassium monitoring, robotic biopsy, medical error detection, computer-aided medical diagnosis, virtual colonoscopy, computational biology, wireless health monitoring, 3D computed tomography, and RFID-based medical applications.



*From far left:
A CEWIT Scientist explores a virtual colonoscopy in a 3D immersive environment; the Reality Deck at CEWIT, the world's first immersive gigapixel resolution display, offering more than 1.5 billion pixels; wireless technology has transformed the healthcare industry with the introduction of the real time monitoring of vital signals from mobile patients.*

CEWIT Leadership

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IBM TJ Watson Research Center

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Founding Member, F. Chau & Associates, LLC

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Mr. Masaaki Maeda

President & CEO, NTT DOCOMO USA, Inc.

Mr. Leonard M. Poveromo

Director, Technology Development, AEW&EWS,
Northrop Grumman Corp

Mr. John Quirk

Managing Director, JP Morgan

Mr. Bob Sanders

Sr., Vice President, Motorola Solutions

Partner with CEWIT

If you need R&D and wish to capitalize on your strengths and ideas by engaging the most innovative minds in the world, call CEWIT at (631) 632-4633 or e-mail info@CEWIT.org.
Visit www.cewit.org to view research or project areas, as well as CEWIT's press room and partners.

CEWIT Projects

Systems and Infrastructure Division

- Advanced Documentation of Clinical Encounters and Context-Award Presentation for Next-Generation Electronic Medical Records
- cDB: Strong Regulatory Compliant Databases
- Combining Information from Words and Pictures
- Consensus Protocols: Analysis, Simulations, and Implementation
- Declarative Framework for Learning and Evaluating Probabilistic Models of Events in Sensor Networks
- Deductive Framework for Programming Sensor Networks
- Enclosed Five-Wall Immersive Cabin
- A Framework for Analyzing and Ensuring Trust in Service-Oriented Architectures
- Geometric Algorithms for Air Traffic Management
- G-Pixel Display
- High-Dimensional Data Visualization Made Accessible Using Illustrative Techniques
- High-Performance Intelligent Web Information Systems
- High-Performance Rule Engine for Intelligent Web Information Systems
- The Impact of Storage Software and Aging on Power Consumption
- Intelligent Mobile Technologies for Social Impact
- Model-Driven Visual Analytics
- Multi-Robot Exploration and Deployment
- A Multi-Semantic, Goal-Oriented Programming Paradigm for Dependable Operation of Massively Distributed Reconfigurable Systems
- NS3: Networked Secure Searchable Storage with Privacy and Correctness
- On Networks and Behavior: A Computational Game Theoretic Approach to the Study of Influence
- On New Stochastic Approaches for Solving Forward and Backward Problems of Biochemical Networks
- Performance Analysis and Optimization for Logic Rule Engines
- Plume Modeling Simulation and Visualization
- Scheduling for Parallel and Distributed Systems
- Sensors and Sensor Networks Applications on Complex System Using Intelligent Fault Detection and Diagnosis (iFOD)
- Target Tracking
- Theory of Generalized Particle Filtering
- Visual Simulation of Thermal Fluid Dynamics in a Water Reactor
- Wireless Utility Monitoring and Control for Efficient Energy Utilization

Software Systems Division

- Authenticating Reality
- Clarity and Efficiency in Design
- The Cloud Computing Benchmarking Project
- Computational Modeling and Analysis for Complex Systems
- Computer Games and Virtual Reality Environment for Rehabilitation
- Computing Geometric Structures of 3-Manifolds
- Conformal Geometry Applied to Shape Analysis and Geometric Modeling
- Conformal Lens: Focus+Context Using Conformal Mapping
- Content-Based Access Control for Blogs and Social Networks
- Cooperative Worm Defense
- Cryptanalysis and Cryptographic Design
- Digital Imaging Technology for New Generation Cameras
- Discrete Curvature Flows on Graphics and Visualization
- Energy Efficiency in Wireless Sensor Networks
- Evidence-Based Utilization Management of NYS Medicaid Program
- Feather-Weight Virtual Machine
- File System Tracing, Replaying, Profiling, and Analysis on HEC Systems
- From Rules to Analysis Algorithms with lime and Space Guarantees
- General-Purpose Computation on Graphics Processing Units
- Geometric Algorithms for Wireless Sensor Networks
- Instructional Technologies: The Future of Teaching and Learning
- Intelligent Deformable Models
- Interdependent Security Models for Cyber-Defense
- Invariant Rules for Software Producibility and Assurance
- Lattice Simulation and Rendering
- Micropayment and Digital Cash Systems
- Modified Dendrogram-Based Transfer Function Design
- Multivariate Simplex Splines for Data Modeling and Visualization
- Multi-View Stereo Camera System for 3D Imaging
- News and Slog Analysis
- Novel Interaction Techniques for Virtual Environments
- Operating System Support for Application-Level File-System Transactions
- Parallel Computing Algorithms for Scientific Computing
- A Polymorphic Emulation Approach to Software Obfuscation
- Practical Privacy for Outsourcing Systems
- Representative Image Selection from Web-Based Photo Collections
- Runtime-Monitoring and Model Checking for High-Confidence Systems Software
- Secure Document Management

- Secure Provenance in High-End Computing Systems
- SecureWORM: Strong Regulatory Compliant Storage
- Shape Space and Shape Matching Using Differential and Algebra-Geometric Approaches
- Shift-Variant Image Deblurring
- Survivable Software
- Testing and Verification of Concurrent Software
- Transfer Function Design Using Parallel Coordinates
- An Update-Aware Disk 110 System and Its Applications
- Ultra-Low Latency Optical Packet Interconnects
- Volumetric Mesh Mapping
- Volumetric Shape-DNA

Communications and Devices Division

- Automated Design of Reconfigurable (Programmable) Sensing Frontends
- Development of a New RFID System
- Enabling Interoperable Public Safety Rad10 Communications
- A Flexible Network Infrastructure for Versatile Wireless Communications
- Forward-Scattered Signal-Based System for Detection of Ultra-High Energy Cosmic Rays
- High-Level Synthesis and Optimization of Analog and Mixed-Signal Systems
- Market-Driven Approach to Dynamic Spectrum Sharing
- Miniature Acoustic Arrays for Source Localization and Separation
- Mobile Data Gathering in Wireless Sensor Networks
- Passivation of GaSb-Surface by Micromachining and Formation of a Native Oxide
- Reconfigurable Architecture for DSP Applications
- Smart Radiation Detection Readout IC
- The Stony Brook Trusted Hardware Lab
- Superconductor Electronics Based on Rapid Signal Flux Quantum
- A System Infrastructure for Scalable and Robust Wireless Communications Services

Network Technologies Division

- Accessing Urban WiFi Networks from Moving Vehicles
- Adaptive Exploitation of Multiplexing and Diversity in Heterogeneous MIMO Ad-hoc Networks
- Airborne Video Sensor Networks for Surveillance and Emergency Response
- Applied Cryptography for Networked Contexts
- Cellular and Mobile Networks Security
- Computational Geometry for Network Optimization
- Cooperative Relay Communications In Mesh Networks
- Cooperative Resource Management for IP-Based Radio Access Network
- Data-Driven Mobility Modeling for Wireless Networks

- Desynchronization in Wireless Ad-hoc Sensor Networks
- Hardware-Aware Software Testbed Environment for Target-Specific Cross-Layer Network Design
- Information Dissemination in Mobile Wireless Peer-to-Peer Networks
- A Measurement-Driven Approach for the Design of Wireless Mesh Networks
- A Miniaturized Robotic Testbed for Development, Testing, and Evaluation of Protocols on Multi-Hop Wireless Networks
- Network Planning and Real-time Automated Management System
- Scalable Monitoring and Discovery of Enterprise Networks
- Self-Learning Real-time Location Tracking in Wireless Sensor Networks
- Self-Powered Wireless Sensor Technology for Monitoring the Health of Electric Power Transmission Systems
- Sensor Network Applications and Services

Medical Division

- Augmented Colonoscopy
- Biomedical Contact Interface Diagnosis Based on Nonlinear Viscoelastic Model
- Colon Supine-Prone Registration
- Combined Near and Far Field UHF RFID Based Specimen Inventory and Tracking System
- Computational Methods for Discovering Virulent Proteins and Bioengineered Threats
- Computer-Aided Detection of Colon Cancer
- Computer-Aided Diagnosis System for Fast, Accurate, and Remote Evaluation of Acute Chest Pain
- Conformal Mapping for Medical Imaging
- Development of Laser Scanning Optical Imaging System for Noninvasive and in vivo Transcutaneous Imaging at Subcellular Resolutions
- Emergency Department Error Detection System (EEDS)
- Integrated Modeling and Learning of Multimodality Data Across Subjects for Brain Disorder Study
- Investigation into Insertion of RFID Tag Inside a Pill
- Model-Based Learning, Analysis, and Control of Excitable Tissue
- Potassium Monitoring
- Prostate Imaging
- A Radio Frequency Identification System for Prevention of Denture Loss in Long Term Care Facilities
- Rapid-CT: Real-time 3D Computed Tomographic Reconstruction
- Robotic Needle Biopsy
- Self-Powered Wireless Health Monitoring System
- Virtual Colonoscopy
- Virtual Cystoscopy