



Institute for Intelligent Networked Systems (INSI)

AI-POWERED CONNECTED FUTURE

The future is **wireless**. Researchers and students at the Institute for Intelligent Networked Systems (INSI) envision a future in which people and their environment are wirelessly connected by a continuum of AI-powered devices and networks, from driverless cars and search-and-rescue drone swarms to implantable medical devices and smart cities. The institute is home to world-leading expertise, facilities, and technologies dedicated to making wireless communications exponentially faster, more energy efficient, and more secure.

RESEARCH PRIORITIES

- Artificial intelligence and machine learning for wireless systems
- 5G and 6G wireless systems
- Intelligent Networked Systems business models for tomorrow's industries
- Smart and connected implantable medical devices
- Smart cities and oceans
- Unmanned aerial vehicles for civil and national defense

THE NORTHEASTERN DIFFERENCE

In our quest to create autonomous, networked systems that operate even in challenging, uncertain, and extreme conditions, we innovate by collaborating. To attract the best ideas and perspectives, our institute:

- Forges partnerships with academia, government, and industry
- Attracts distinguished faculty and exceptional students
- Provides world-leading, experience-powered education through the doctoral level

The Institute faculty offer interdisciplinary expertise, with strengths in:

- Communication and networking
- Sensors and energy harvesting
- Data analytics and machine learning
- Security and blockchains

Northeastern
University

CONTACT

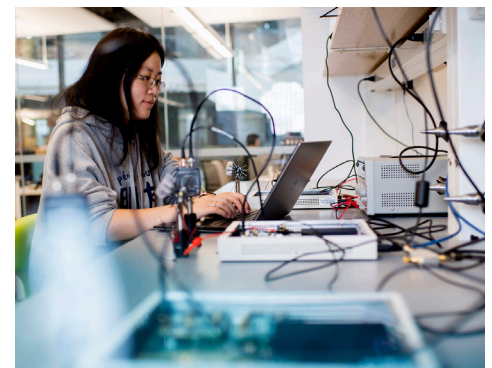
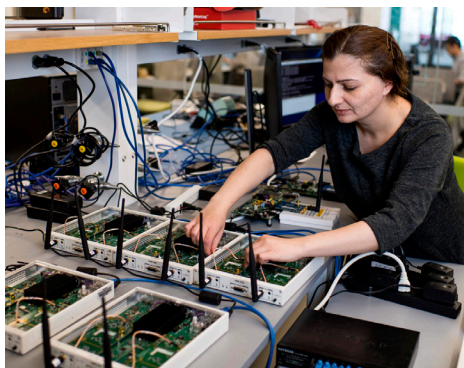
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WORLD-CLASS EXPERIMENTAL FACILITIES

Our institute offers robust experiential facilities that enable the development of cutting-edge ideas and perspectives. These facilities cater to a wide range of research areas, including 5G and 6G wireless systems, artificial intelligence and machine learning for wireless systems, space Internet, smart and connected implantable medical devices, smart cities and oceans, and unmanned aerial vehicles for civil and national defense. These resources serve as research platforms, testbeds, and hubs for innovation, fostering advancements in these diverse fields.

FCC Innovation Zone

The Northeastern University FCC Innovation Zone is a dynamic environment where researchers can leverage a streamlined process to obtain experimental licenses for over-the-air experiments. FCC Innovation Zones provide opportunities for qualified licensees to test new advanced technologies and prototype networks.



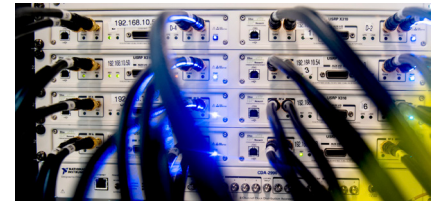
Colosseum Wireless Channel Emulator

The Colosseum, the world's largest radiofrequency channel emulator, developed by the U.S. Defense Advanced Research Projects Agency, enables the testing of intelligent, autonomous, collaborative wireless technologies. This electronic arena mimics tens of thousands of real-time RF channel interactions among wireless devices within a square kilometer. Through AI, it allows radios to optimize the limited capacity of the electromagnetic RF spectrum, even if they weren't originally designed to work together.



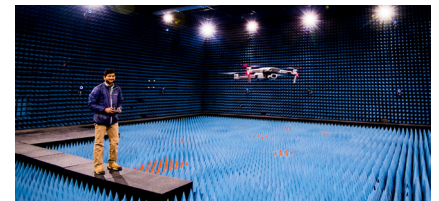
Arena

Arena is an open-access facility designed to support innovation and research. With 32 software-defined radios and 64 ceiling-mounted antennas, Arena provides a powerful infrastructure for exploring new technologies in the sub-6 GHz 5G spectrum bands. Additionally, it serves as a hub for applying artificial intelligence and machine learning to wireless systems. Through this platform, researchers and innovators can develop and test new wireless applications more efficiently and effectively.



Expeditionary Cyber and Unmanned Aerial Systems R&D Facility

Located at Northeastern's Innovation Campus in Burlington, Massachusetts, this comprehensive indoor-outdoor laboratory comprises an anechoic chamber/Faraday cage and a spacious netted area measuring 150' x 200' x 60'. It serves as a dedicated space for testing unmanned aerial and ground technologies, antennas, as well as navigation and communications equipment.



TeraNova: An Integrated Testbed for True Terahertz Communications

The TeraNova platform is the world's first integrated testbed for ultra-broadband communication networks in the terahertz (THz) band. This advanced platform comprises multiple transmit and receive nodes equipped with radio-frequency (RF) front-ends capable of operating at frequencies up to 1.05 THz (true THz). Additionally, it features digital signal processing (DSP) back-ends or engines with the ability to process bandwidths of up to 32 GHz.



X5G: An Open, Programmable, Multi-vendor Private 5G O-RAN Testbed with NVIDIA ARC and OpenAirInterface

X5G is an open, programmable, multi-vendor private 5G testbed at Northeastern University in Boston, MA. It includes an 8-node GPU-accelerated deployment with NVIDIA Aerial RAN CoLab Over-The-Air. X5G leverages the NVIDIA Aerial SDK for the High-PHY layer and OpenAirInterface for the higher layers of the protocol stack, and controls radio units provided by heterogeneous vendors, including Foxconn. This platform servers commercial-off-the-shelf user equipments, and can connect to an O-RAN Software Community Near-RT RIC deployed on an OpenShift cluster and controlled by xApps deployed therein.

