NEW YORK INSTITUTE OF TECHNOLOGY

College of Engineering & Computing Sciences

nyit.edu/engineering

Research Labs

Do.
Make.
Innovate.
Reinvent the Future.

Message from the Dean

Long Island Campus:
Harry Schure Hall, Room 112

New York City Campus:
1855 Broadway, Room 805B

babak.beheshti@nyit.edu

516.686.7931

nyit.edu/bio/babak.beheshti

PROGRESS – it has been our sharp focus since New York Institute of Technology was established in 1955. Our teaching and research have evolved to keep pace with an ever-changing world. Research at New York Institute of Technology's College of Engineering and Computing Sciences (CoECS) is increasingly cross-disciplinary, necessitating bold new thinking and ideas. Our research labs are seeding grounds for the next generation of technologies, algorithms and materials that will push the world forward in the 21st century.

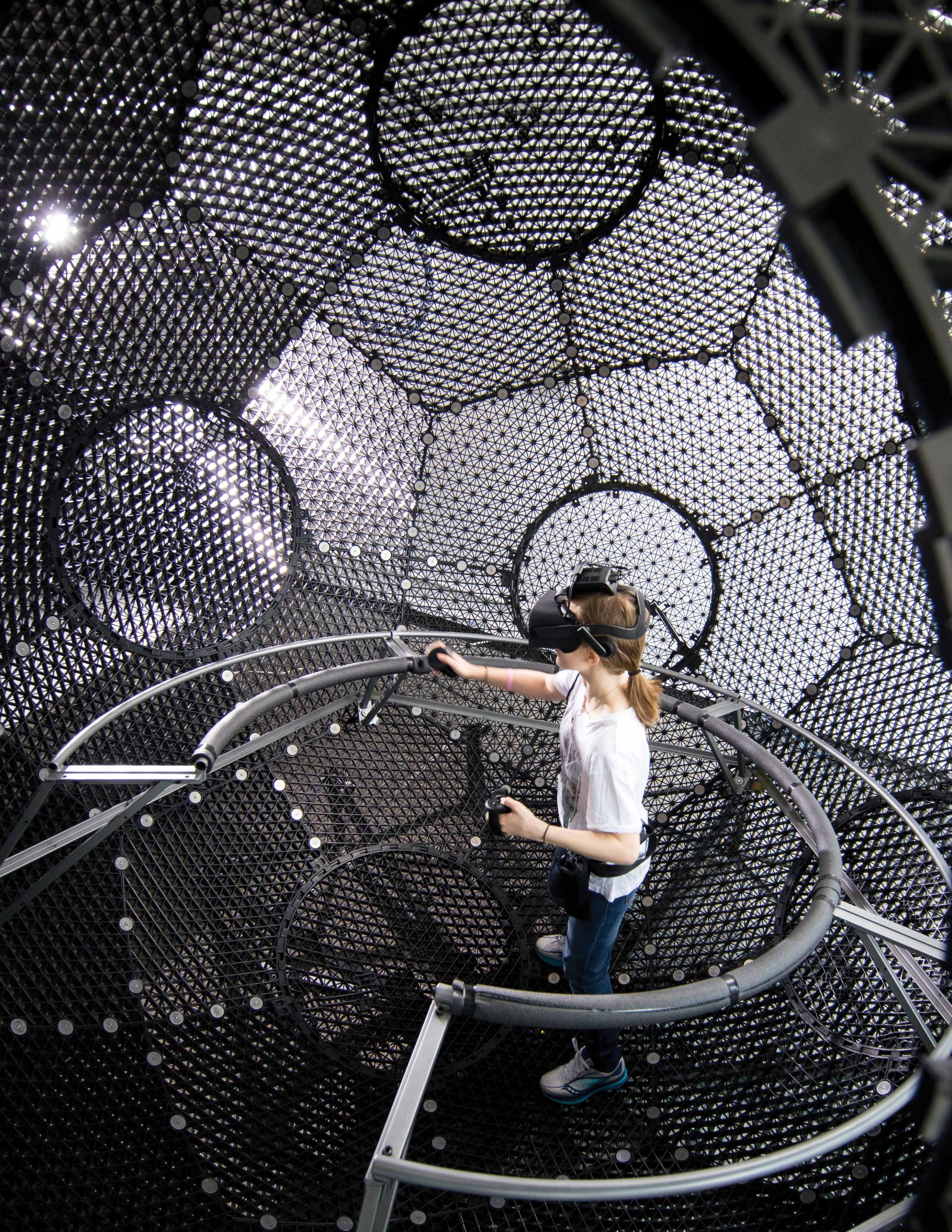
At the College of Engineering and Computing Sciences, you will find a community of learners dedicated to addressing some of the world's most complex engineering challenges. We pride ourselves on the success that comes from our top-notch faculty. Our researchers see the challenge of unlimited problems to solve as an opportunity to develop new and innovative solutions.

This booklet showcases the impressive array of research labs at the college, the exciting projects that are ongoing in these labs, and our star faculty who lead these labs. I am extremely proud of the doers, makers, innovators, and inventors who make up the College of Engineering and Computing Sciences. I am honored to be part of a team of people who aren't just about making something but are about making the world better.

Sincerely,

Babak D. Beheshti, Ph.D.
Dean, College of Engineering and Computing Sciences
New York Institute of Technology

Contents



Applied Signal and Image Processing (ASIP) Laboratory

The ASIP Lab is focused on research and development in various branches of signal and image processing and analysis, with applications in electrical and biomedical engineering.

Ahmadreza Baghaie, Ph.D.
Lab Director

Long Island Campus, HSH 222

abaghaie@nyit.edu

nyit.edu/bio/abaghaie

AREAS OF INTEREST

- Biomedical Image Processing
- Statistical Pattern Recognition
- Computer Vision
- Biomedical Imaging
- Sparse Representations and Compressed Sensing
- Deep Learning and Convolutional Neural Networks
- Graphical Models

ACTIVE PROJECTS

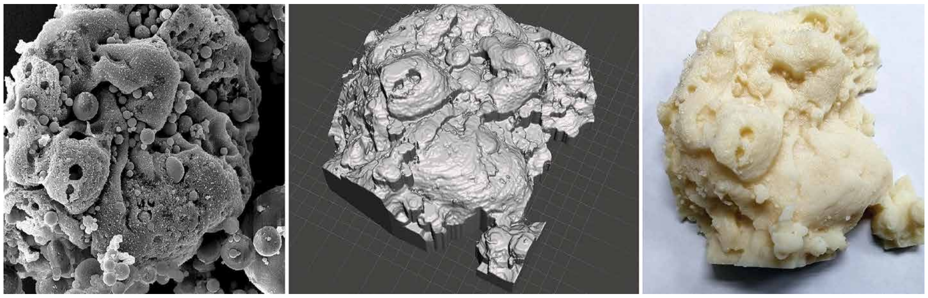
Error Quantification in Particle Image Velocimetry

Particle Image Velocimetry as a standard optical imaging technique for flow velocity measurements has gained extensive interest in biomedical applications. In this technique, patient-specific models are 3-D printed using transparent silicon materials for building flow loops, and then realistic flow boundary conditions are administered for the inlets/outlets of the geometry. The working fluid, which contains micro particles, is imaged using a high-speed multiview camera setup, followed by particle-matching to determine the flow patterns throughout the acquisition. For an accurate replication of the flow patterns, mechanical properties of the fluid need to match that of the blood. Moreover, optical properties of the silicone model and the fluid also play a significant role in the acquisition and processing of the data. In this project the aim is to study various sources of artifacts in PIV data acquisition and analysis and provide computational tools for modeling and correction of such artifacts.

Deep Learning for Scanning Electron Microscope Data Processing

Scanning Electron Microscopy (SEM) imaging is a crucial technique in various fields of biomedical, mechanical and material sciences for observing surface structure of microscopic samples on a variety of micro-/nano-meter scales. In SEM a focused beam of electrons scans the surface of the sample while secondary/back-scattered electrons as a result of the interaction of the beam with the surface are captured, signifying the topographical and compositional properties of the surface at any point. SEM data preprocessing involves noise as well as artifact reduction as a means to improve the quality of the captured images. Among the various sources of artifacts, defocus artifacts, which are caused by the high magnification factors and very narrow field-of-view, need to be reduced. On the other hand, SEM micrographs still remain two-dimensional, lacking the 3-D surface information. The advent of deep learning and Convolutional Neural Networks (CNN)-based techniques has made significant impact in modern computer vision in recent years. The project aims to introduce novel deep learning and CNN-based methods to reduce the adverse effects of artifacts and improve the interpretability of the captured 2-D micrographs by 3-D surface reconstruction of the microscopic samples.

From start to finish, Scanning Electron Microscopy (SEM) of the sample (left), generated 3D computer model (middle), and the 3D printed model (right)



Integrated Medical Systems (IMS) Laboratory

This lab conducts research in various fields of Biomedical Engineering.

Aydin Farajidavar, Ph.D.
Lab Director

Long Island Campus,
HSH 106 (lab)

afarajid@nyit.edu

nyit.edu/bio/afarajid

AREAS OF INTEREST

Implantable/Wearable Medical Devices

Assistive Technologies

Biological Signal Processing

Modeling Biological Phenomena

Medical Cyber Physical Systems

ACTIVE PROJECTS

Reliable Power-Efficient Miniature Bidirectional Telemetric Platforms for Acquiring Biological Signals

The need for implantable/wearable devices for the wireless acquisition of biological signals is emerging in various medical fields. Electrophysiological applications include in-vivo recording of gastric electrical activity (GEA) to study dysmotility, single-unit action potentials (APs) and electrocorticograms (ECoG) to study neuronal activities, and transcranial motor-evoked potentials (TcMEP) for intraoperative neurophysiological monitoring of spinal cord integrity. These require physically miniaturized devices with low power consumption and the capability of implantation. These systems should provide reliable communication in real time with sufficient data rates.

Closed-Loop System for Real-Time Recognition and Inhibition of Nociceptive Signals

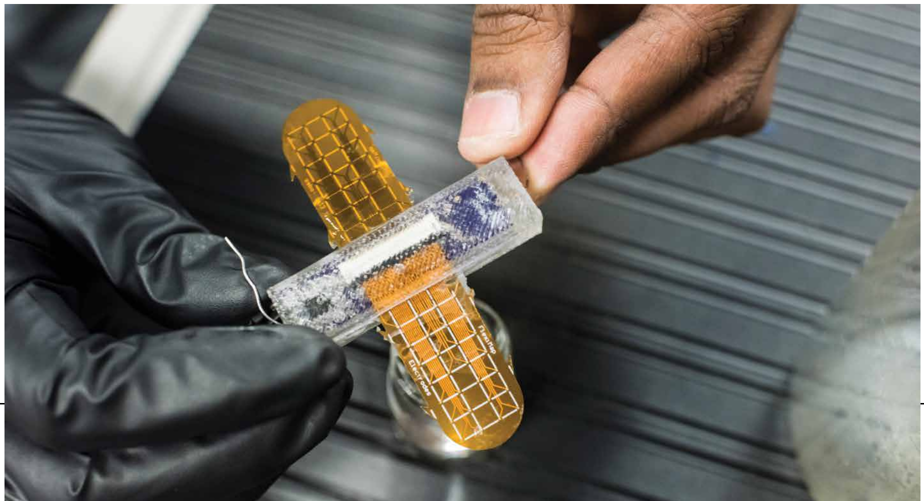
Clinical studies have shown that spinal or cerebral neurostimulation can significantly relieve pain. Current neurostimulators work in an open loop, and thus their efficacy depends on the patient's or physician's comprehension of pain. We are developing a real-time automatic recognition algorithm to detect action potentials and cluster various neuronal activity levels.

Signal Processing for Analyzing APs and ECoG to Detect Nociception

The recent development of neural interfaces has enabled the extraction of a huge amount of information from the nervous system. However, understanding the message of the nervous system requires adequate signal processing. We are conducting signal acquisition (APs and ECoG) and analysis (real-time and off-line) from the nervous system (spinal cord and brain) to better understand and distinguish between various states of mind and pain circumstances.

Modeling Biological Systems: The Process of Long- and Short-Term Potentiation in Chronic Pain-Related Phenomenon

The objective of this work is to understand the mechanisms underlying wind-up generation, a condition related to chronic pain, that might allow clarification of the molecular mechanisms of pain signaling and development of strategies, such as transcutaneous electrical nerve stimulation (TENS) and deep brain stimulation (DBS) for pain treatment. "Wind-up," is a form of plasticity in the spinal dorsal horn that can be observed during electrical stimulation of pain receptors at low frequencies (0.3–3 Hz). We are designing computational models to explain several aspects of wind-up.



Bio-Nanotechnology and Biomaterials (BNB) Laboratory

The BNB laboratory specializes in applying micro- and nano-scale techniques to solve problems in medicine. Researchers focus on the general areas of biomedical engineering, nanoscience and nanotechnology, particularly on two major themes 1) point-of-care disease diagnostics and 2) structural biomaterials for bone-implant systems.

Azhar Ilyas, Ph.D.
Lab Director

Long Island Campus,
Theobald Science Center 411

ailyas@nyit.edu

nyit.edu/bio/ailyas
ilyaslab.com

AREAS OF INTEREST

Microfabrication and 3-D printing

Microfluidics and Cell Sorting

Electrophysical Analysis of Diseased Cells

Bioactive Coatings and Bioinks

Biomaterials and Tissue Engineering

ACTIVE PROJECTS

Microfluidic Devices for Tagless Identification/Quantification of Diseased Cells

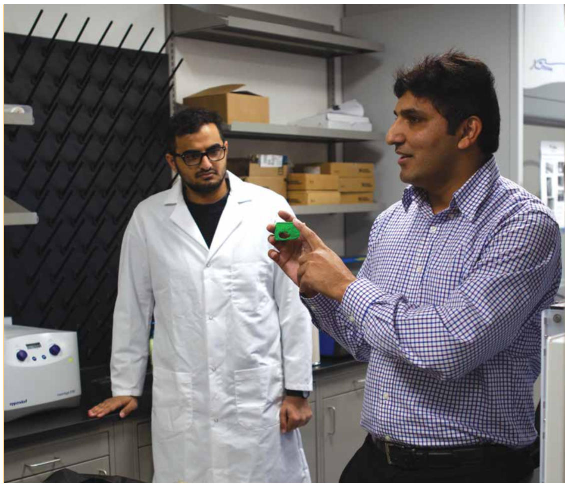
An accurate, quick and inexpensive enumeration of blood cells including lymphocytes is critical for early diagnosis of various physiological disorders and has been the subject of much attention. Nanotechnology empowers us with tools to investigate fetal diseases like cancer and HIV at cellular/molecular scales. Several approaches have been used for cell sorting and identification, but most of these are limited by low throughput, need for fluorescent tags, or lack of quantitative analysis on single cell level. Early stage detection and precise enumeration of cells is crucial for efficient therapeutics and improved survival rate of cancer/HIV patients. There is a great clinical need to develop new inexpensive and portable point-of-care (POC) devices for early-stage diagnosis of these fetal diseases. We are developing a novel, low-cost, stabilized (refrigeration-free storage) microfluidic-based cell monitoring tool for rapid and accurate quantification from unprocessed whole blood at POC settings.

Nanofabricated and 3-D Printed Materials for Rapid Bone Healing

Traumatic fractures, age-related fragility, and disorders cause structurally unstable fracture sites, which require metal fixative devices for mechanical support. Titanium (Ti) is the most widely used material for fixative devices but Ti is bioinert and doesn't promote osteogenesis. Bioactive glass coatings onto Ti implants show promising results by incorporating osteoinductive properties, but macroscale fabrication techniques cause inhomogeneity in the coatings and have thermal expansion mismatch with the underlying Ti, leading to delamination and instability of the coatings. 3-D printing is an additive manufacturing technique that allows fabrication of modular and patient-specific scaffolds with high structural complexity and design flexibility. The major drawback that limits the widespread acceptance of 3-D printing in biomanufacturing is the lack of diversity in "biomaterial inks." We are developing novel bioinks for 3-D-printed structural biomaterials to understand the role of biomaterial surface morphology and chemistry in cellular attachment, surface bioactivity, and gene expressions for rapid fracture healing.

Development of Highly Sensitive Novel Biosensors for Molecular Detection

Nano-biosensors are low-cost, fast and easy to use, have multiple applications including health, food, and environmental changes. They are small-scale transducers that detect the chemical specificity and sensitivity of a system using biological agents. The advent of nanotechnology permitted the development of improved, micro- and nano-scale biosensors, allowing scientists and engineers to monitor the biological and chemical interactions on the sensor surface. Nanoscale biosensors provide more accurate and sensitive measurements of biomolecules/viruses. We are developing nanofabricated, ready-to-use microchips to sense and characterize important biomarkers for various diseases including cancer and HIV.



Biological Sciences and Bioengineering (BSB) Laboratory

The New York Tech Biological Sciences and Bioengineering (BSB) laboratory is a living lab where our faculty train students while pursuing important interdisciplinary research that integrates engineering and biology. This integration offers tremendous opportunities for solving important problems in health sciences and medicine as well as enabling a broad range of applications in diagnostics, sensing, therapeutics, and tissue engineering.

Long Island Campus,
Theobald Science Center

AREAS OF INTEREST

Disease Diagnostics and Structural Biomaterials for Bone Regeneration
Led by Azhar Ilyas, Ph.D., Assistant Professor, College of Engineering & Computing Sciences

Bacteriophages and Viruses' Therapeutic Effect to Treat Bacterial Infections
Led by Bryan Gibb, Ph.D., Assistant Professor, College of Arts & Sciences

Synthetic Biology Approaches: How Nervous Systems Encode Behaviors
Led by Navin PoKala, Ph.D., Assistant Professor, College of Arts & Sciences

Fate Analysis of Emerging Contaminants in Water and Soil
Led by David Nadler, Ph.D., Assistant Professor, College of Engineering & Computing Sciences

Applied Electromagnetics Research Lab

This lab conducts research on various applications of electromagnetic waves.

Reza K. Amineh, Ph.D.
Lab Director

New York City Campus, EGGC, 801A

rkhalaja@nyit.edu

nyit.edu/bio/rkhalaja

AREAS OF INTEREST

- Biomedical Imaging
- Nondestructive Testing of Materials
- Water/Soil Quality Sensing
- RF/Microwave Circuit Design
- Wireless Power Transfer
- Security Screening
- Wireless Communications
- Underground Imaging
- RF/Microwave Component Design

ACTIVE PROJECTS

Fast and Robust Nondestructive Testing of Cylindrical Composite Components Based on Microwave Measurements (Supported by NSF)

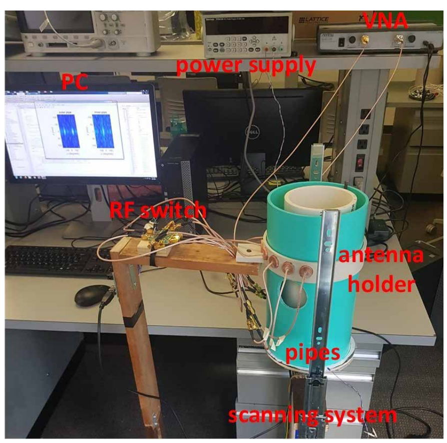
In this project, we use microwave measurements and novel holographic image reconstruction techniques to provide volumetric images of the interior of cylindrical nonmetallic objects. The main application of the developed imaging techniques is in nondestructive testing (NDT) of nonmetallic pipes. These pipes are rapidly growing in various industrial sectors (such as oil and gas field) due to their light weight, resilience to corrosion, and low cost. However, traditional NDT techniques do not suffice to inspect these components for detecting flaws and cracks justifying the use of microwave measurements. Other applications of the developed imaging techniques are biomedical imaging, security screening, etc.

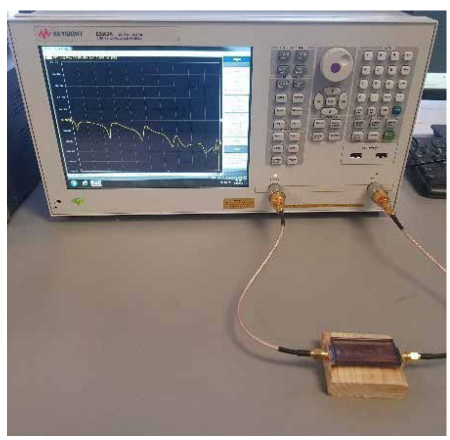
Autonomous Soil Nutrient Sensing System (Supported by NSF)

This project is in collaboration with the faculty in Mechanical Engineering and Life Science Departments. The purpose of the project to develop a wireless sensing system to detect pollutants such as nitrate, phosphate, and heavy metals in the agricultural soil.

Material Characterization With a Microwave Sensor Array: Application to Water Quality Sensing (Supported by New York Tech's ISRC)

In this project, we design, fabricate, and test highly sensitive microwave sensor arrays for material characterization, in particular, for water quality testing. The fabricated sensors are tested with a set of water samples with pollutants including: nitrate (NO3), phosphate (PO4), ammonium (NH4), chromium (Cr+6), lead (Pb), and mercury (Hg). This project is in collaboration with the faculty in the Environmental Technology and Sustainability Department.





Circuits, Networks, and Systems (CNS) Laboratory

The Circuits, Networks, and Systems (CNS) Laboratory specializes in device design for medical and networking/security applications.

Nabi Sertac Artan, Ph.D.
Lab Director

New York Campus,
EGGC, 801

nartan@nyit.edu

iris.nyit.edu/~nartan/

AREAS OF INTEREST

Implantable, Wearable, Point-of-Care and Assistive Devices

Low-Power Circuit and System Design

Wireless Power Transfer

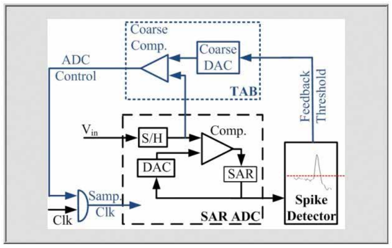
Data Converters

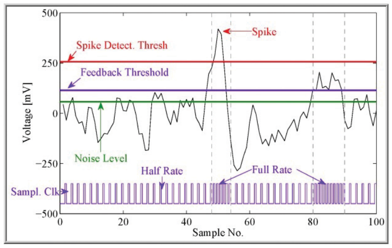
High-Speed Networking and Network Security

ACTIVE PROJECTS

Adaptive Data Converters

The low-power devices such as implantable

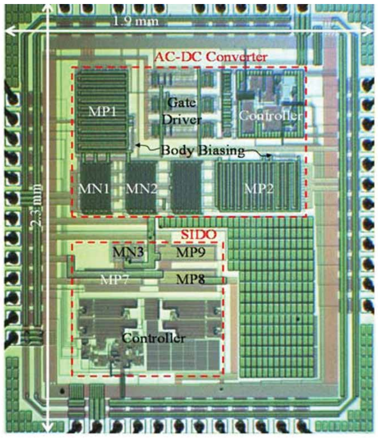




devices or Internet-of-Things (IoT) devices generate a deluge of data that can overwhelm these devices due to their limited capabilities. In this project, we investigate methods to curb the amount of data sensed. The ultimate goal of this project is to develop adaptive data converter circuits that only acquire and process data that is relevant in a given context. This is achieved by running the data converters in a closed-loop with the digital signal processing units and adapting the data converter parameters in real time to the context.

Wireless Power Transfer to Implantable Devices

Wireless Power Transfer (WPT) helps extend the lifespan of medical implants such as retinal implants, deep brain stimulators, and implantable cardioverter defibrillators. WPT can sustain these devices or recharge their batteries by providing power from outside the body directed to the implanted device. The amount of power that can be safely delivered via WPT is limited by its power efficiency. In the CNS lab, we are developing coil structures and WPT circuits for boosting the power efficiency of WPT. Our low-profile multilayer planar coil structures improve coil and power link quality factors allowing higher power transfer without damaging skin tissue. The DC-DC converters we have been developing combine traditional power supply stages, which reduces loss and increases efficiency. Our integrated DC-DC converters incorporate additional functionality on the same chip.



Radar and Communications Laboratory (RADCOM)

The Radar and Communications (RadCom) lab focuses on developing signal processing, optimization, and machine learning techniques for radar and communications. The lab also focuses on developing physical layer security and authentication methods for wireless networks.

Batu Chalise, Ph.D.
Lab Director

Long Island Campus, HSH 212

bchalise@nyit.edu

nyit.edu/bio/bchalise

AREAS OF INTEREST

Joint Radar and Communications Systems

Passive Radar Systems

Physical Layer Security/ Authentication

Signal Processing Techniques for 5G and Beyond 5G Systems

Optimization and Machine Learning

ACTIVE PROJECTS

Joint Radar and Communications Systems

Due to the ever-increasing number of wireless devices and users, there is a need to optimally utilize the available frequency spectrum. The joint radar communication develops the same platform of transmitters/receivers and functions both as radar and communications. The first objective of this project is to develop optimal resource (e.g., bandwidth, power, antennas, time slots) allocation schemes so that the diverse requirements of both radar and communications receivers are simultaneously satisfied. The second objective is to develop signal processing techniques for embedding information into radar waveforms with and without remodulation approach.

Passive Radar Systems

Passive radar systems (PRS) utilize the broadcast signals from noncooperative transmitters that are not an integral part of the radar transmitter-receiver set. These transmitters may include radio, television, and cell phone base stations, which are locally available around the radar receiver. As such, PRS do not need dedicated transmitting components, hence lowering both the cost and size of the radar systems. However, in contrast to active radar systems, which have control over transmitters' parameters, such as bandwidth, power, and transmit waveforms, PRS may need to rely on narrowband and low-powered broadcast signals. Moreover, the transmitted signal is not known *a-priori* at the radar receiver. Due to these reasons, conventional techniques are not directly applicable for PRS. The objective of this research is to develop signal processing, optimization, and machine learning-based techniques for detection and tracking of targets in PRS.

Signal Processing and Security for 5G Systems

5G systems need to support high data rate transmissions under stringent requirements for reliability, coverage, energy consumption, and low latency. The 5G and beyond networks are also expected to support heterogeneous traffic that includes machine-type communications, Internet of Things (IoT), and vehicle to everything. The objective of this research is to develop coding/decoding, channel estimation, beamforming/precoding, scheduling, interference management, and resource allocation methods leveraging concepts on massive multiple-input multiple-output, mmWave, full-duplex, non-orthogonal multiple access (NoMA), and edge computing. The development of deep learning techniques for solving N-P hard resource allocation problems and ensuring secure authentication are also the key objectives of this research.

Network and Innovation Laboratory

The research group at the Network and Innovation Lab focuses on research on communication networking and innovative technologies such as autonomous sensing, unmanned vehicles, blockchain to solve problems in optimizing the sustainable use of resources.

Ziqian Dong, Ph.D.
Lab Director

New York Campus,
EGGC, 402

ziqian.dong@nyit.edu

iris.nyit.edu/~zdong02

AREAS OF INTEREST

High Performance Computer Networks and Wireless Sensor Networks

Network Security and Forensics

Assistive Medical Devices

Innovation For Sustainability and Resilience of Both Natural and Built Environment

ACTIVE PROJECTS

Food, Energy, and Water Nexus

This project investigates interconnection amongst food, energy, and water systems in different scales in an urban environment. The team will develop visualization tool to help stakeholders in decision making process and use case studies to examine best practice for sustainable urban development. This is an international collaborative project with partners from Stuttgart Technology University of Applied Sciences (HFT), Austrian Institute of Technology (AIT), City University of New York, Landkreis Ludwigsburg, Alpen-Adria Universität Klagenfurt, bw-engineers GmbHthree, and the College of Engineering and Computing Sciences and School of Architecture and Design. It is funded by the Belmont Forum, National Science Foundation grant number 1830718.

Signals in the Soil

This project focuses on the development of a passive, low cost, pervasive, maintenance-free sensor that can be interrogated wirelessly and provide measurement of soil water content, temperature, pH, and nutrient concentration for precision agriculture and environmental monitoring. This is a collaborative project with faculty from the College of Engineering and Computing Sciences and College of Arts and Sciences. It is funded by the National Science Foundation grant number 1841558.

Assistive Medical Devices

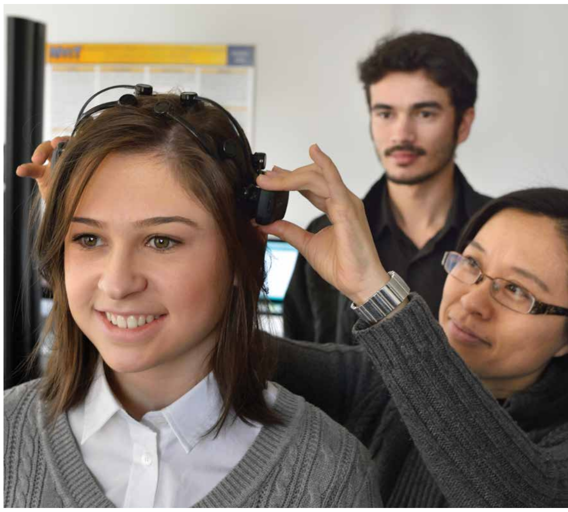
This project investigates innovative devices using sensors and wireless networks to assist rehabilitation for patients with Parkinson's Disease. This is a collaborative project with faculty from three schools, the College of Engineering and Computing Sciences, College of Osteopathic Medicine, and School of Health Professions. It is funded by the ISRC grant.

City-as-Lab Research Coordination Network (RCN)

A project to establish a a research coordination network to study food, energy, and water nexus for sustainable and resilient urban development. media release: https://bit.ly/30lQf65

Geolocation Project

IP geolocation is the process of finding the geographic location of an Internet host that bears a certain IP address. Database based IP geolocation methods have draw back of data not being updated and obsolete. Thus resulting in inaccurate or misleading results. Measurement based IP geolocation is studied to find a fit model for anchor nodes to locate an unknown IP based on RTT measurements. IP geolocation has wide applications such as localized advertising, user location verification to avoid credit fraud. Indoor localization of network devices presents unique challenges for its complex environment induced inter-ferences. We search for novel approaches through ultrawideband systems, machine learning and multilateration of wifi access point signals for accurate localization when GPS is not available.



Biomedical Data Analysis Research Laboratory

This lab performs research in developing signal processing and machine learning algorithms for various mental and neurological disorders, along with brain computer interface systems for assisting individuals who are suffering from the most severe motor disabilities.

Maryam Ravan, Ph.D.
Lab Director

New York Campus, EGGC, 801

mravan@nyit.edu

nyit.edu/bio/mravan

AREAS OF INTEREST

Epilepsy

Schizophrenia

Major Depression Disorder

Autism Spectrum Disorder

Bipolar Disorder

Amyotrophic Lateral Sclerosis

Stroke

Cerebral Palsy

Spinal Cord Injury

ACTIVE PROJECTS

Developing Machine Learning Algorithms to Diagnose Schizophrenia and Predict the Response to Clozapine Therapy

(Supported by New York Tech's ISRC)

In this project, in collaboration with the Department of Psychiatry and Behavioural Neurocience, McMaster University, we propose a novel machine learning approach based on features that are extracted from resting electroencephalography (EEG) data and P300 auditory-evoked potentials. We intend to investigate the change in direction of information flow (i.e., effective connectivity) in the EEG data of schizophrenic patients in comparison with healthy volunteers. We are analyzing these data using the newly developed methods. These features can help in diagnosing schizophrenia. We also examine if the extracted features that differentiate the "most responsive" and 'least responsive" groups can predict the response of patients to Clozapine therapy. We will also explore the treatment prediction potential of other features as well. This novel approach to EEG analysis can assist the clinician in determining treatment efficacy.

Developing a Machine Learning Approach to Investigate the Brain Connectivity in Autistic Children and the Effect of Six Weeks' Physical and Cognitive Therapy

(Supported by New York Tech's ISRC)

In this project, in collaboration with the Department of Occupational Therapy, New York Tech, we develop a novel machine learning approach based on symbolic transfer entropy (STE) measures of resting EEG data to investigate the direction of information flow in the EEG of children with autisum spectrum disorder (ASD) and how it is changing after six weeks of physical and cognitive activities as treatment in comparison to healthy children. This work will help us to understand the concept of ASD as a brain disorder with globally disrupted neuronal networks and abnormal functional connectivity, and how the brain network topology is modulated by treatment.

Developing a Robust Brain Source Localization Technique to Identify Seizure Onset

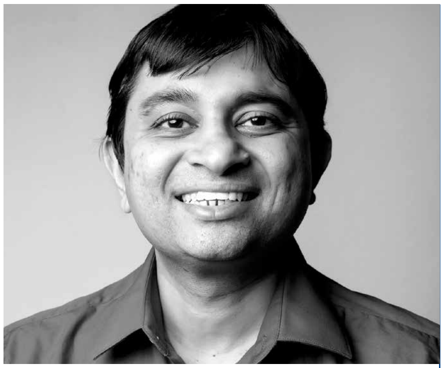
In this project, in collaboration with the Department of Neurology and Neurological Science at Stanford University, we plan to develop a fast and robust brain source localization technique named fast fully adaptive (FFA) algorithm that can handle limited stationary time samples in EEG data and arbitrary mismatch between the assumed and true head model. This new approach will then be evaluated with simulation and measured EEG data and used for localizing the source of spikes and seizures in actual patients with epilepsy. The developed technique will then be employed for localizing the origin of seizure and spikes for patients with refractory epilepsy undergoing presurgical workup.

Developing Brain-Computer Interface Systems to Control Devices

The purpose of these projects is to allow people with disabilities to control a device such as wheelchair or robotic arm on their own without applying physical effort. This would help people who have neuromuscular diseases or injuries. These people are not capable of controlling devices by themselves because their muscles aren't strong enough or their limbs are simply not functional. These projects allow the users to control devices solely by using the brain or face's muscles signals to manipulate actions using EEG headsets. The EEG headset is connected to the user's brain, which sends signals to a PC and ultimately controls a device for a specific purpose.

Network Resource and Security Lab (NRSL)

This lab conducts research in the areas of network services and resource management and associated security vulnerabilities.



Anand Santhanakrishnan, Ph.D.
Lab Director

New York Campus,
EGGC, Room 803

asanthan@nyit.edu

sites.google.com/a/nyit.edu/asanthan/

AREAS OF INTEREST

Blockchains for 5G Spectrum and Power Management

Impact of Net Neutrality Repeal and Its Impacts

Communication Infrastructure for Connected Vehicular Networks

Data Reliability in Internet of Things (IoT)

Rumor Spread in Social Media and Influence on Pandemics

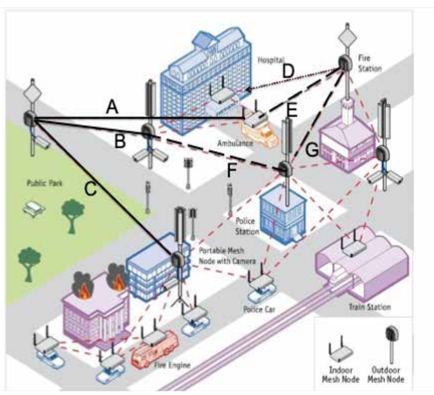
Dynamics of Information Consumption in Internet Media

ACTIVE PROJECTS

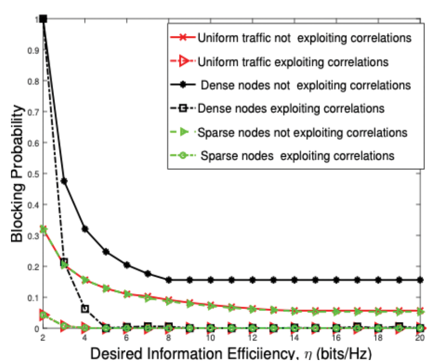
Spectrum Management for Successful Mission Completion in Tactical Networks

(Supported by US Airforce Research Lab)

Mission completion in tactical networks depends on assigning spectrum for different missions so that packets reach the destination without being lost and are error-free. This project develops distributed algorithms for



Correlated videos from multiple cameras



Blocking or Mission Failure Probability

spectrum allocation that exploits correlation in the information transmitted by different sources (e.g., multiple CCTV cameras may transmit the same video content). The proposed algorithms result in almost 100 percent mission success (0 percent mission failure).

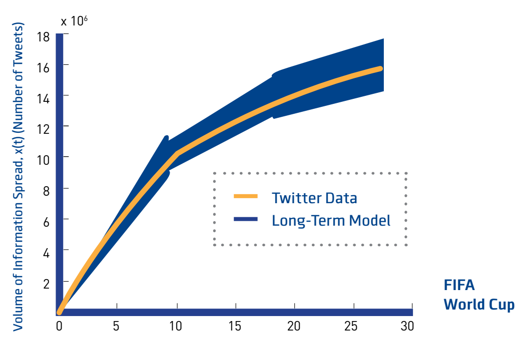
Geolocation of IP Hosts in Large, Congested Computer Networks

(Funded by NSF REU)

Geolocation has found increasing importance to detect malicious activity in the Internet (like suppression of speech, vandalism, cyber-crimes, and localizing and blocking content while managing websites. IP address-based geolocation was found to be erroneous, laden with numerous vulnerabilities. Measurement-based geolocation without accounting for network traffic congestion is equivalent to predicting the estimated arrival time in a GPS navigator without accounting for road traffic congestion. This research proposes geolocation algorithms that yield up to 97 percent accuracy when tested on various nodes in the Internet distributed across the world.

Role of User Interaction in Information Spread in Social Media

More than 67 percent of Americans obtain news from social media. Since many people share information without verifying facts, this leads to wrong public opinions and confusion, with those in the age group of 18 to 34 being most susceptible. This research project develops a tool to collect social media data (from Twitter) to study spread of information on various current topics. Stochastic control theoretic "short-term" and "long-term" models are developed to study the spread of rumors. Results show that rumors mainly spread due to "interactions between users" on a topic and not just the number of users actively spreading the news, particularly for subjective topics, like sports (e.g., FIFA world cup) and policies (e.g., immigration).



Computational Mechanics and Multiphysics Phenomena Laboratory

This lab specializes in the computational mechanics and modeling of nonlinear and multifunctional materials and physics. Researchers employ both open source and commercial algorithmics packages to address multiphysics problems combining magnetoelectric properties and fluid-structure interaction to understand and promote the design of novel systems and devices with application to sensors, memory, and biological systems.

Dorinamaria Carka, Ph.D.
Lab Director

Long Island Campus, HSH 117B

dcarka@nyit.edu

nyit.edu/bio/dcarka

AREAS OF INTEREST

- Solid Mechanics
- Ferroelectrics
- Urban Food Security
- Fracture Mechanics
- Micromagnetics
- Phase-Field Methods
- Fluid-Structure Interaction

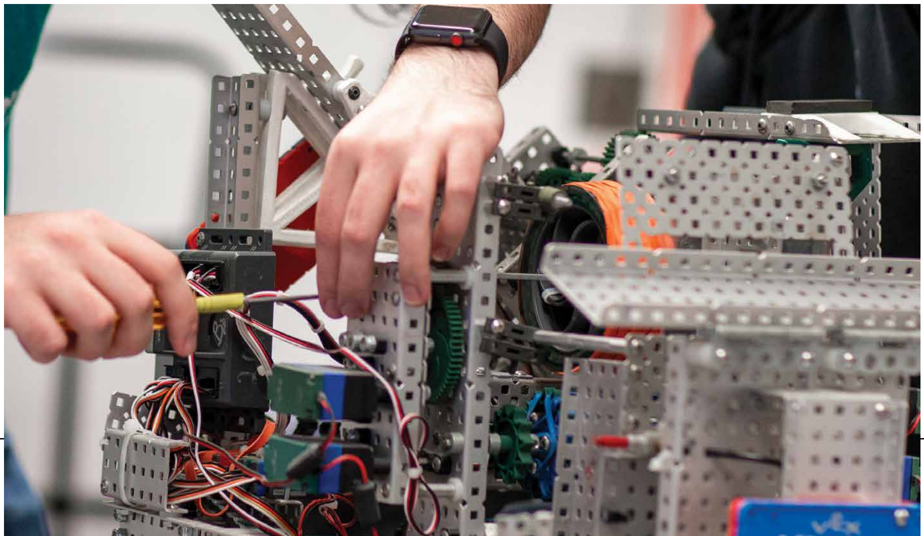
ACTIVE PROJECTS

Phenomenological and Phase-Field Modeling of Multiferroic Nanostructures

Smart materials such as piezo-and ferroelectric and ferromagnetic materials combining mechanical and electric or magnetic coupling have been traditionally used in many technological applications and can serve as the constituent parts in multiferroic composites. Such composite structures enable strong magnetoelectric effects and cross control of the ferroic orders. This phenomenon is promising to revolutionize device applications with increased density and reduced energy dissipation by orders of magnitude. We use phenomenological and phase-field models to study the domain structure interaction of the ferroic phases in multiferroic compounds and their effect on the magnetoelectric coupling and the desired multifunctionality and magnetoelectric properties of these systems. Furthermore, we use these models to study high-frequency response characterization and control of single and multidomain magnetic materials in terms of dynamic susceptibility, number of resonances, resonance frequencies, and intensity of line width. Control and prediction of ferromagnetic resonance is crucial in high-frequency applications.

Vascular Mechanics and Hemodynamics

Mechanical forces modulate cellular functions in many tissues and organs including vasculature. Endothelial cells, composing the inner lining of blood vessels, respond rapidly to the mechanical conditions created by blood flow. Understanding the mechanisms of endothelial cell response to shear stress may provide useful information on normal physiology and risk factors associated with hypertension and atherosclerosis. Medical imaging demonstrates that the innermost layers of the arteries can be affected by micro-calcification, which changes the topology of the surface of the blood vessel in a statistically significant way. We employ a fluid-structure interaction method to understand how mechanical forces at the blood-tissue interface regulate tissue perfusion and inflammation by using vascular scanned data of individual and clusters of nodules and their spatial distribution within the blood vessel to enhance the accuracy of the model and draw quantitative limits that will be crucial for identifying stress-triggered biological mechanisms that affect vascular stiffness.



Thermo-Fluid and Instrumentation Research Lab

The research carried out in this laboratory focuses on the area of experimental thermal fluid science, laser-based diagnostics and microphotonic sensor technology. The work involves mathematical analyses, computations, and experiments to analyze, develop, test, and demonstrate prototype microsensors. The complex nature of these systems encompasses different physical disciplines including thermal fluid science, photonics, and mechanics, and shares a common practical focus on fluid dynamics and its applications.

Tindaro Ioppolo, Ph.D.
Lab Director

Long Island Campus,
Theobald Hall Room 411

tioppolo@nyit.edu

nyit.edu/bio/tioppolo
bit.ly/beLAB

AREAS OF INTEREST

Dynamics of Unsteady Separated Turbulent Boundary Layer

Development of Skin Friction Sensors for Low Speed and Hypersonic Speed

Shock Wave Induced by Laser Pulses for Flow Control

Dynamics of Air Bubble Formation During Water Entry of Objects

Laser-Based Diagnostic

The lab is equipped with a research-grade wind tunnel and with the state-of-the-art equipment to carry out fundamental and applied research in advanced thermo-fluid dynamics.

ACTIVE PROJECTS

Characterization of Turbulent, Unsteady Separation Using Photonic Micro-Skin Friction and Wall Pressure Sensors (Army Research Office)

The goal of the proposed research is to study the structure and dynamics of separated turbulent boundary layers for Reynolds numbers in the range 4x103 < Re_θ < 1.4x104. The uniqueness of this study is the direct measurement of the streamwise and spanwise fluctuating skin friction and wall pressure simultaneously and at the same spatial location. Up-to-date, simultaneous direct measurements of skin friction and wall pressure at the same spatial location have never been carried out due to the lack of instrumentation. At the same time, detailed high fidelity measurements of velocity, and high-order moments will be measured and analyzed. The ultimate goal is to analyze the data in order to understand the physics beyond turbulent flow separation and the prediction of the onset and extent of stall in transient separated turbulent boundary layer.

Fabrication of Skin Friction Sensors Based on the Morphology Department Optical Resonances (Army Research Office)

The main goal of the project it to fabricate and test in a low-speed wind tunnel a photonic sensor for skin friction measurements. The sensing approach is based on the whispering gallery mode (WGM) of dielectric micro-cavities. In optics, the WGM phenomenon arises from total internal reflection of light at the internal surface of a high index of refraction dielectric resonator embedded in a surrounding medium of lower refractive index. The skin friction is measured by tracking the WGM shift. A key factor that makes this phenomenon attractive for sensor applications is the extremely high measurement resolution. For example, for a resonator of radius R ~100 μm, one obtains a “measurable” radius change of R = 10-11 m, which is smaller than the size of an atom.

Gas Leak Detection Using Colored Nano/Micro-Particles Phase 2 (NYSEARCH/NGA)

The goal of this work is to carry out preliminary experiments to investigate the feasibility of gas leak detection using colored nano/micro-particles that are mixed with a gas stream. This allows an easy way to detect gas leaks without the use of complex devices and the requirement of trained personnel.

MicroSensor Laboratory

The MicroSensor Laboratory is dedicated to the development of novel microsensors for biomedical, environmental monitoring, and aerospace applications.

Fang Li, Ph.D.
Lab Director

Long Island Campus,
HSH, B19B

flio8@nyit.edu

nyit.edu/bio/flio8

AREAS OF INTEREST

Acoustic Wave Sensors

Piezoelectric Transducers

Stretchable Electronics

Lab-on-a-Chip Devices

ACTIVE PROJECTS

A Lab-on-Chip Device for Promoting Stem Cell Maturation

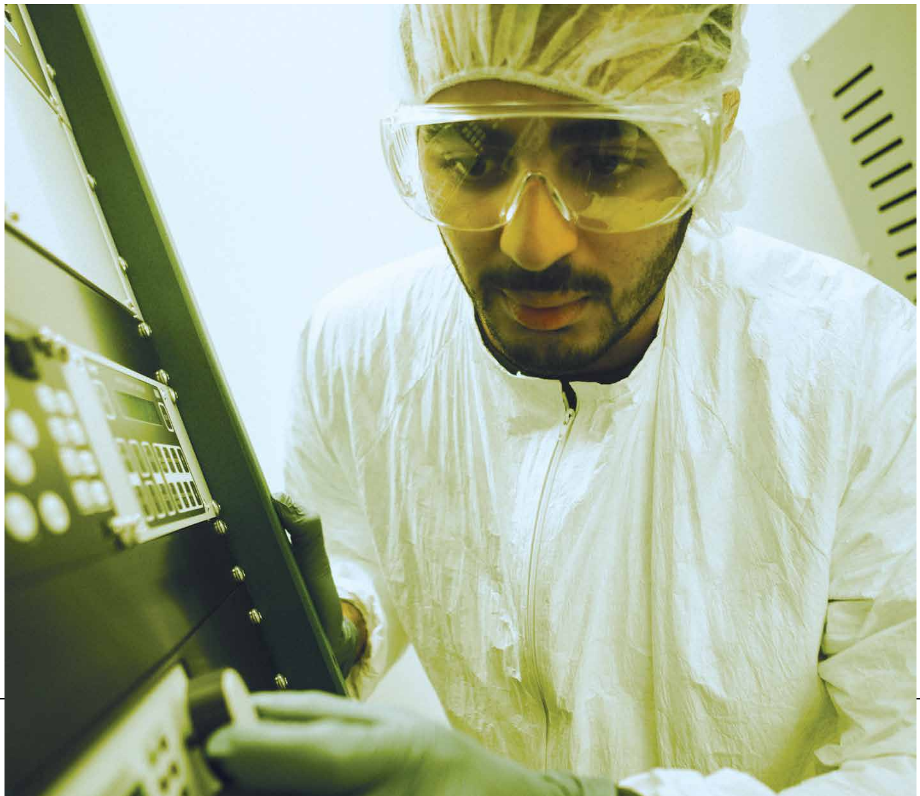
Heart disease is a leading cause of death in Western societies. The capability to direct the differentiation of human pluripotent stem cells (hPSCs) into functional cardiomyocytes provides great opportunities for disease modeling, drug toxicity screening, and novel cell-based cardiac therapies. The objective of this research is to advance the science on the maturation of stem cell-derived cardiomyocyte using an innovative device with stretchable electronics. To achieve this research goal, a lab-on-chip device that integrates real-time electrical cell-substrate impedance sensing (ECIS) with mechanical elongation of the cell and electrical stimulation is developed as a reactor for efficiently maturating hPSC-CMs.

Signals in the Soil

The goal of this project is to develop a passive, low-cost, pervasive, maintenance-free sensor that can be interrogated wirelessly and provide measurement of soil water content, temperature, pH, and nutrient concentration for precision agriculture and environmental monitoring. This is a collaborative project with the faculty in the Electrical Engineering and Life Sciences departments. Our research group focuses on the SAW sensor design and development, and polymer synthesis and testing for nutrient sensing.

Wireless SAW Sensor System for Cryogenic Temperature and Pressure Sensing

The goal of this project is to develop an innovative wireless sensor system that is capable of providing high-bandwidth measurements of cryogenic temperature and pressure inside a pipeline for rocket propulsion test applications. Our approach is based on the Surface Acoustic Wave (SAW) sensor technology, in conjunction with a wireless data communication scheme.



Optical Diagnostics Laboratory

This lab conducts research and development in advanced optical diagnostics.

James Scire, Ph.D.
Lab Director

Long Island Campus,
HSH B14A

jscire@nyit.edu

nyit.edu/bio/jscire

ACTIVE PROJECTS

High-Speed Digital Holography of Acoustic Levitation

Acoustic levitation is a technique for suspending and manipulating objects using sound waves. One application of this technique is the containerless processing of materials, since the suspended objects do not contact solid surfaces. In our lab, we study solid and liquid objects suspended in air. To visualize and measure the acoustic field, we employ pulsed digital holography and measure the high-speed phase variations associated with the field. At the same time, we use the technique to measure the object's shape and position. These data can be used in fundamental studies of liquid droplet behavior and of nonlinear acoustics.

APPLICATIONS OF TECHNIQUES

- **Acoustic Levitation**
- **On-Engine Monitoring of Turbine Blade Temperatures**
- **Optical Gas Temperature Measurements**

OUR EQUIPMENT

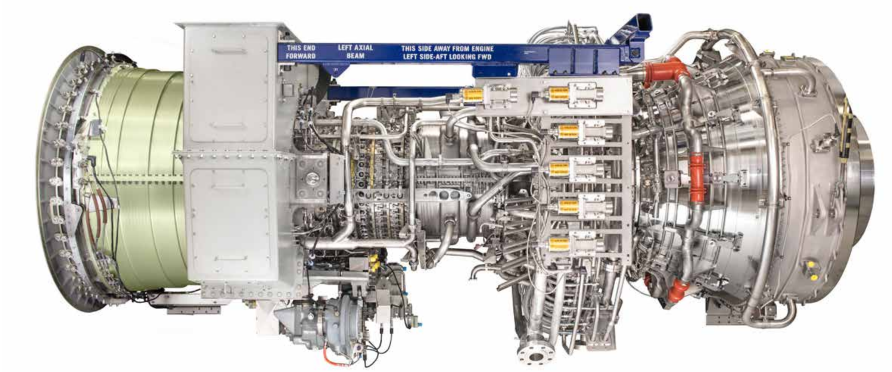
- **Custom-Built Pulsed Digital Holography System**
- **Photron FASTCAM Mini UX100 High-Speed Camera**
- **Sofradir PV640LW Microbolometer Thermal Camera**

AREAS OF INTEREST

Pulsed Digital Holography

Thermal Imaging

Active and Passive Infrared Spectral Measurements



Energy and Green Technologies Laboratory (ENTECH Lab)

This lab, opened in April 2019, which represents a real-world environment, provides students with hands-on experiences, in which they can create new knowledge in the energy and green technology disciplines. Researchers conduct research in different energy generation, storage, and conservation methods.

Ehsan Kamel, Ph.D.
Lab Director

Long Island Campus,
HSH 103

ekamel01@nyit.edu

newyorktech.wixsite.com/entechlab

nyit.edu/bio/ehsan.kamel

AREAS OF INTEREST

Physics-Based Building Energy Modeling (BEM) Using Computer Simulation Tools and Building Information Modeling

Decision-Making Units in Energy-Smart Buildings

Design and Evaluation of Zero-Net-Energy (ZNE) Buildings Through Building Energy Retrofit

Application of Multi-Functional Sensors for Data-Driven Energy Modeling

ACTIVE PROJECTS

Physics-Based Building Energy Model – Anna Rubin Hall

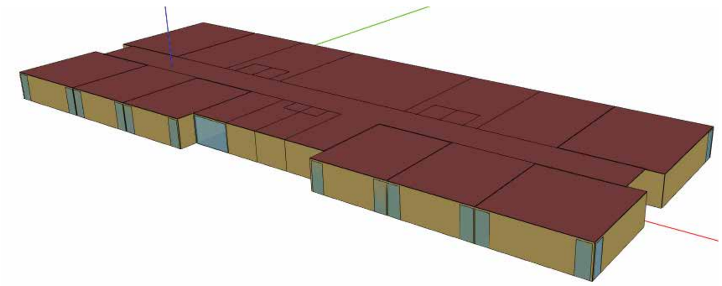
This building is located at New York Tech's Old Westbury campus. We collect different types of building data using wireless sensors and energy audit tools to develop a computer energy mod el. Revit, OpenStudio, and BIM files (gbXML) are used in this project. The goal is to study different data exchange scenarios, calibrate the building energy model, propose a zero-net-energy (ZNE) retrofit package, and provide a hands-on experience opportunity for students.

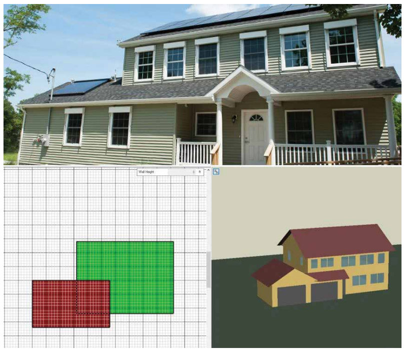
Multifunctional Sensors in Data-Driven Building Energy Modeling Using Machine Learning Techniques

The Integrated Medical Systems (IMS) lab is used to collect multiple environmental data using multifunctional sensors developed. The data include temperature, humidity, heating/cooling system activity, radiations at different wavelengths, and occupancy. Machine learning techniques are applied to predict the occupancy profiles and the indoor air temperature.

Physics-Based Building Energy Model – Smart Energy House

This building is an off-campus building located at Farmingdale State College. The data for energy modeling is collected by energy audit tools and wireless U-value measuring kit. BEopt, EnergyPlus IDF files, OpenStudio, and Parametric Analysis Tool are used in this project. The goals are to calibrate the building model using sensitivity analysis and identify the data exchange issues between different energy simulation tools using BIM.





Bioenvironmental Laboratory

Located in our fully operational wastewater treatment plant as well as in our BSB lab, environmental engineering principles and design are applied to natural resources and environmental protection.

David Nadler, Ph.D.
Lab Director

Long Island Campus,
Wastewater Treatment Plant
and Theobald Hall Room 411

dnadler@nyit.edu

nyit.edu/bio/dnadler
bit.ly/beLAB

AREAS OF INTEREST

Water Quality Management and Pollution Control Technologies to Reduce Receiving Water Impacts

Urban Food Security

Bioremediation & Phytoremediation

Biological Nutrient Removal from Wastewater

Environmental, Health and Safety Management

Safety Engineering Using Virtual Reality

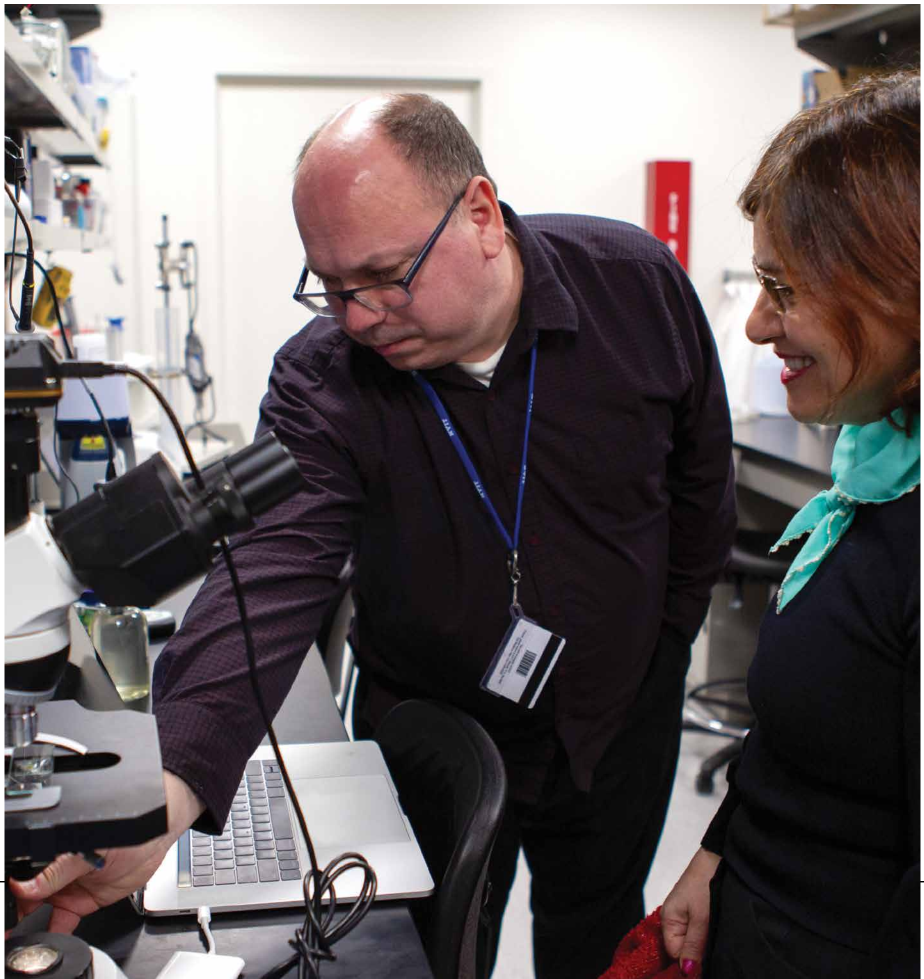
ACTIVE PROJECTS

Fate Analysis of Perfluorooctanoic Acid (PFOA)

PFOA is a persistent chemical that has been identified in water, land and animals. The CDC has found measurable concentrations in nearly all tested humans, demonstrating its widespread impact. Our new laboratory is undertaking the research to compile a database of the fate of PFOA by subjecting it to a number of potential remedial activities. Subjecting this compound to ultraviolet radiation, along with oxidation via varying concentrations of hydrogen peroxide, the absorbance and transmittance of ultraviolet and visible light changes may indicate a breakdown of the chemical structure. A function generator passing sound frequencies ranging from 1 hertz to 20 megahertz is a novel approach to treating impacted water and can be applied to points with water infrastructure. Finally, promising bioremediation via bacteria and fungi can help us develop biofilters that may be used in industrial and municipal applications.

New York City Department of Environmental Protection Wastewater Treatment Study

New York Tech is tasked with identifying technological improvements in wastewater technology that have occurred since treatment plants in the NYC Watershed were upgraded in the 1990s. The emphasis is on ones that would assist DEP in reducing capital replacement and operational costs while reducing greenhouse gas production and energy use. The specific treatment modifications that are identified must not impact the level of treatment achieved for pathogens and other contaminants of concern.



Human-Centric Data Analytics Laboratory

This lab is dedicated to advance technology in the area of human-centered data analysis. The current research interests have revolved around signal processing, machine learning, data mining and its applications in human-centric data analytics, with emphasis on developing computational methods, algorithms, and models for speech recognition, natural language processing, sentiment analysis, multimodal affective computing, social network analysis, and health care information systems.

Houwei Cao, Ph.D.
Lab Director

New York Campus,
EGGC 801A

hcao02@nyit.edu

nyit.edu/bio/hcao02

AREAS OF INTEREST

Data Science

Machine Learning

Speech and Natural Learning Processing

ACTIVE PROJECTS

Multimodal Learning for Real-World Emotion Recognition

Emotions are essential to human life. They directly influence human perception and behaviors and have big impacts on our daily tasks, such as learning, social interaction, and rational decision-making. The emotional states of people vary in the course of conversations and these changes are expressed externally through a variety of channels, including facial expressions, voice, spoken words, body gestures, etc. This project advances automatic recognition of real-world spontaneous emotion by developing a novel progressive multimodal emotion recognition system, which maximally exploits raw and labelled data from all modalities, dynamically tracks the temporal change of the natural spontaneous emotional state in multiple modalities, and adaptively fuses the unimodal decisions to automatically construct accurate emotion profiles.

Data-Driven Approaches to Edge Caching

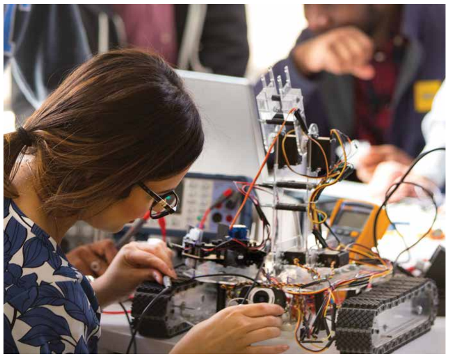
Today's online services, ranging from web hosting, video streaming, social media, gaming, Virtual and Augmented/Mixed reality (VR/AR/MR), etc., are increasingly dependent on the timely delivery of rich media content over the global Internet. Modern content delivery systems are facing unprecedented challenges. On one hand, emerging new content requires orders of magnitude higher bandwidth. On the other hand, some new content also involves live interaction between users. In this collaborative project, we propose research on data-driven caching designs for deep-shallow cache networks. The core idea is to "dig deeper" into content and user data to learn long-term and short-term patterns in content and user interactions using machine learning models. We further develop hybrid dynamic caching polices and cooperative mining and caching designs for hierarchical cache networks. This is a collaborative project with faculty from NYU.

Sentiment Analysis and Opinion Mining in Social Media

Users share lots of personalized information and opinions in social media on a daily basis. Sentiment and opinion analysis of social media data has a wide range of applications. In this project, we are interested in summarization of opinion and attitude from social networks. We propose to combine various text mining techniques, such as topic detection, discourse relation, and semantic analysis to identify and summarize opinions that concern our daily choices related to health, diet, purchases, and the environment, etc.

Urban Air Quality Prediction

Air pollution, causing several million deaths every year, has become an extremely serious problem in many urban areas in the world. Many urban areas have established air quality monitoring stations to measure and collect air quality statistics. Besides monitoring the current air quality, forecasting future air quality has also become crucial to help guide individual activities limiting PM2.5 exposure. In this project, we propose novel deep-learning models to forecast future air quality. The proposed prediction models, based on attention-based sequence-to-sequence learning, can capture trends from multiple locations and automatically learn the effects of the previous samples in time series data from different locations.



LAMP – Laboratory for Behavioral Authentication, Machine Learning, and Privacy

The LAMP is a group of faculty, students, and visitors who enjoy doing research in machine learning and cryptography applied to privacy and authentication.

Paolo Gasti, Ph.D.
Lab Co-Director

Kiran Balagani, Ph.D.
Lab Co-Director

ACTIVE PROJECTS

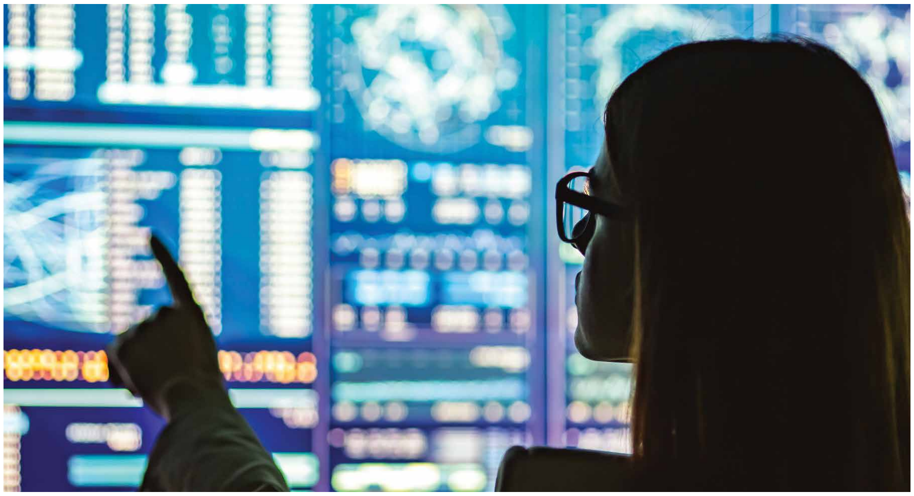
Leveraging Movement, Posture, and Anthropometric Contexts to Strengthen the Security of Mobile Biometrics (Sponsored by NSF)

Active authentication is emerging as a promising way to continuously and unobtrusively authenticate smartphone users post-login. Although research in this area has shown that behavioral traits, such as touchscreen gestures and device movements, can be used to distinguish a legitimate user from an attacker, fundamental questions about these traits still remain unanswered. These include: how, and to what extent, do posture and movement impact behavioral traits; what is the impact of human variability (anthropometric properties, age, gender, and health conditions) on behavioral traits; to what extent can these traits be spoofed using posture and movement observations; and how can we strengthen these traits against spoofing attacks. In this project, an interdisciplinary team of investigators from the Computer Science, Biomedical Sciences, Physical Therapy, and Art and Media Technologies at New York Tech will leverage capabilities in 3-D motion capture, behavioral biometric authentication research, and motor control research to address these questions.

This project is funded by the National Science Foundation.

Toward Energy-Efficient Privacy-Preserving Active Authentication of Smartphone Users (Sponsored by NSF)

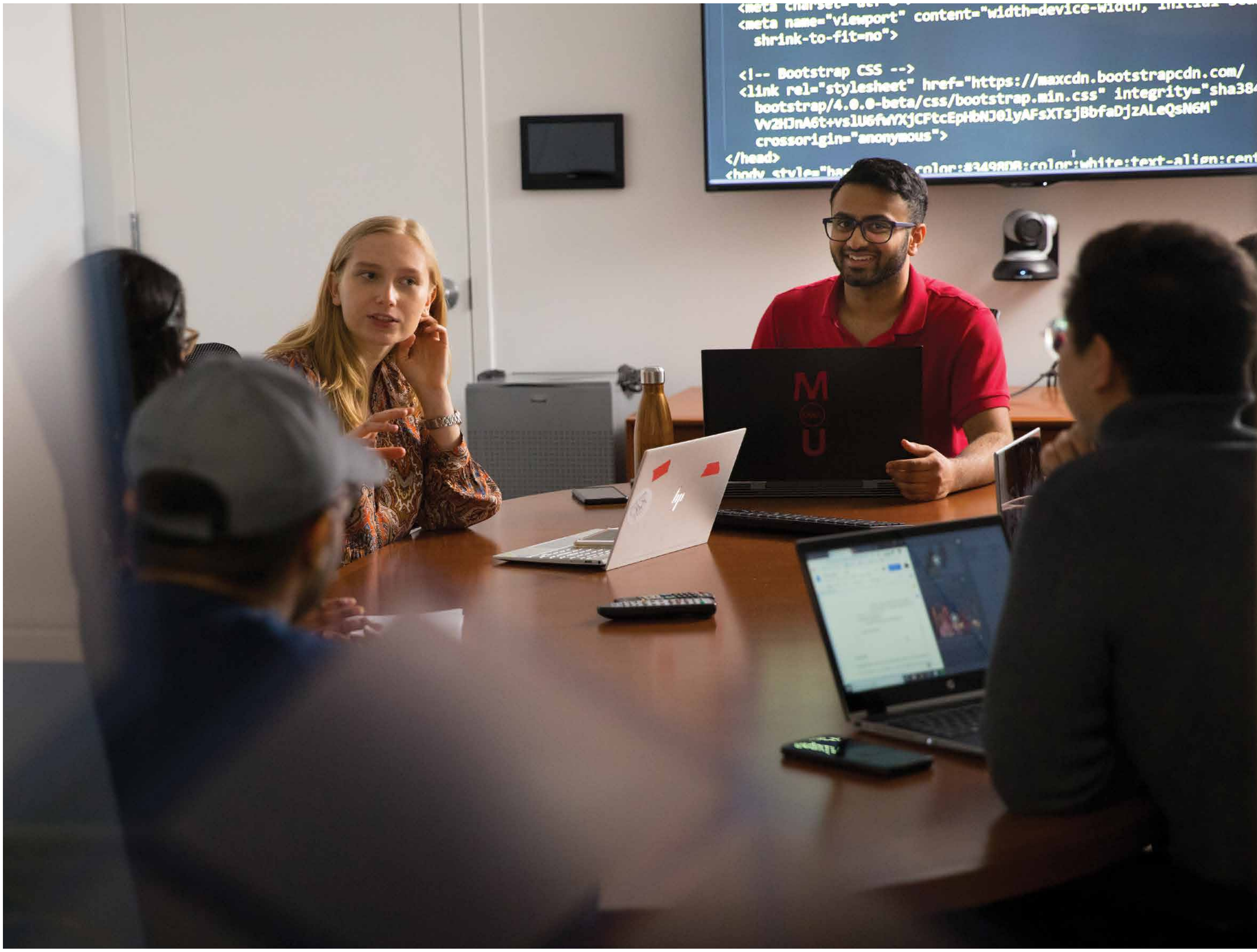
Common smartphone authentication mechanisms such as PINs, graphical passwords, and fingerprint scans offer limited security. They are relatively easy to guess or spoof, and are ineffective when the smartphone is captured after the user has logged in. Multimodal active authentication addresses these challenges by frequently and unobtrusively authenticating the user via behavioral biometric signals, such as touchscreen interaction, hand movements, gait, voice, and phone location. However, these techniques raise significant privacy and security concerns because the behavioral signals used for authentication represents personal identifiable data, and often expose private information such as user activity, health, and location. This research advances the state of the art of privacy-preserving active authentication by devising new techniques that significantly reduce the energy cost of cryptographic authentication



New York Campus, EGGC, 604;
Long Island Campus, HSH 212

pgasti@nyit.edu
kbalagan@nyit.edu

lamp.soecs.nyit.edu



protocols on smartphones. Further, this research takes into account signals that indicate the user has lost possession of the smartphone, in order to trigger user authentication only when necessary. The focus of this project is in sharp contrast with existing techniques and protocols, which have been largely agnostic to energy consumption patterns and to the user's possession of the smartphone post-authentication. Current neurostimulators work in an open loop, and thus their efficacy depends on the patient's or physician's comprehension of pain. We are developing a real-time automatic recognition algorithm to detect action potentials and cluster various neuronal activity levels.

HMOG: Hand Movement, Orientation, and Grasp (Sponsored by DARPA)

Hand Movement, Orientation, and Grasp (HMOG) is a set of behavioral features to continuously authenticate smartphone users. HMOG features unobtrusively capture subtle micromovement and orientation dynamics resulting from how a user grasps, holds, and taps on the smartphone. In this project, we evaluated authentication and biometric key generation (BKG) performance of HMOG features on data collected from 100 subjects typing on a virtual keyboard. Data was collected under two conditions: sitting and walking. We achieved authentication EERs as low as 7.16 percent (walking) and 10.05 percent (sitting) when we combined HMOG, tap, and keystroke features. We performed experiments to investigate why HMOG features perform well during walking. Our results suggest that this is due to the ability of HMOG features to capture distinctive body movements caused by walking, in addition to the hand-movement dynamics from taps. With BKG, we achieved EERs of 15.1 percent using HMOG combined with taps. In comparison, BKG using tap, key hold, and swipe features had EERs between 25.7 percent and 34.2 percent. We also analyzed the energy consumption of HMOG feature extraction and computation. Our analysis shows that HMOG features extracted at 16Hz sensor sampling rate incurred a minor overhead of 7.9 percent without sacrificing authentication accuracy.


4cmX6cm

Medical Informatics and Data Analytics Laboratory

This lab is devoted to research on biomedical ontology extraction and abstraction techniques, biomedical ontology quality assurance methodologies, and data analysis.

Huanying Gu, Ph.D.
Lab Director

New York Campus, EGGC, 811

hguo3@nyit.edu

nyit.edu/bio/hguo3

ACTIVE PROJECTS

Structural and Semantic Methodologies for Enhancing Biomedical Terminologies

Biomedical terminologies have become an essential tool for research and health information systems, such as electronic health records (EHRs). With their expanded use comes the realization that they contain imperfections and deficiencies. Ultimately, these will lead to suboptimal use of such knowledge sources, and the resulting health care will suffer. The goal of this research is to develop structural and semantic methodologies for improving the quality of biomedical terminologies.

Gait Study of Parkinson's Disease Subjects

Gait abnormality is one of the distinguishing symptoms of patients with Parkinson's disease (PD). The goal of this research is to investigate the immediate gait modifications of individuals with PD when they are using devices with sensors and wireless networks to assist rehabilitation. This is a collaborative project with faculty from three schools, the College of Engineering and Computing Sciences, College of Osteopathic Medicine, and School of Health Professions.

AREAS OF INTEREST

- Biomedical Ontology
- Medical Informatics
- Data Analytics and Data Mining
- Object-Oriented Modeling

Intelligent Mobile Edge (IME) Laboratory

This lab focuses on research on the security and efficiency problems at the cloud enhanced wireless mobile edge for the Internet of Things (IoT) applications, such as crowdsourced video generation and medical cyber-physical systems.

Xueqing Huang, Ph.D.
Lab Director

Long Island Campus,
HSH 226A

xhuang25@nyit.edu

AREAS OF INTEREST

- Wireless Networking
- Mobile Edge Computing
- Internet of Things (IoT) Applications
- Mathematical Programming
- Data-Driven Optimization

ACTIVE PROJECTS

Crowdsourced Video Generation and Distribution at Mobile Edge

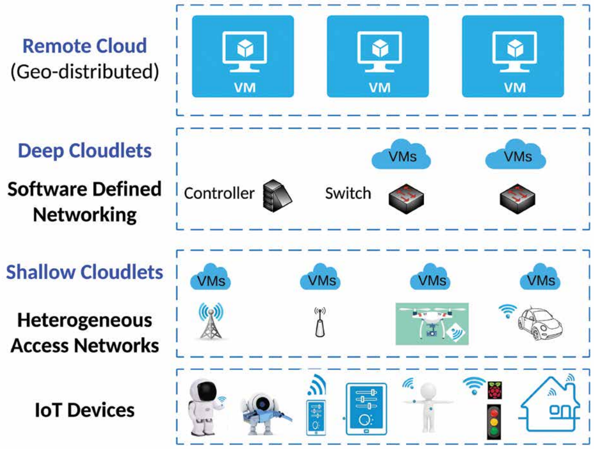
Mobile edge computing can provide computing resources at the wireless access network to efficiently process a high volume of user data. A growing number of content consumers are engaged in the content creation process by leveraging the convenient Internet access, distributed computing resources, and high-quality sensors in end-user devices. The crowdsourcing application will gather user-generated content and collectively distribute it to the viewers of interest. To empower the crowdsourced content delivery at the edge, we investigate how to efficiently transmit data from the content generators to the viewers. The detailed problems include budget-aware server selection and radio/computing/storage resource allocation. The approaches include classical mathematical optimization and data-driven optimization (supervised learning and reinforcement learning).

Physical Layer Security for IoT Networks

Physical layer is linked to autonomous key generation by exploiting the fading properties of physical communication channels between two legitimate nodes. Owing to the difficulty in providing physical protection of devices and initializing and securing key materials during the lifetime of an Internet of Things (IoT) system, the traditional security solutions relying on cryptography have become inadequate for the IoT devices, and the light-weight physical layer key generation pipeline will be a promising solution for secure-sensitive IoT applications. The detailed research problems include how can one rigorously define the security and efficiency metrics for such key generation pipeline? Owing to the information discrepancy between two nodes, the key generation pipeline needs to dissolve the disagreement, but the information leakage caused by error correction is unknown. Is it possible to get secure provable key based on the physical layer attributes? The approach will be the information theory and dynamic Bayes networks.

Intelligent Cell Maturation Monitoring and Promotion System

Heart disease is a leading cause of death in Western societies. The capability to direct the differentiation of human pluripotent stem cells into functional cardio myocytes provides great opportunities for disease modeling, drug toxicity screening, and novel cell-based cardiac therapies. We will study how to quantify the cell maturity level similar to a doctor-defined pregnancy level of a human fetus. Meanwhile, the optimal electrical and mechanical stimulations will be selected and applied to promote the cell maturation. The approach will be the biostatistics analysis, machine learning (regression modeling), and reinforcement learning.



Mobile Systems and Network Security (MOBISEC) Laboratory

This lab focuses on applying machine learning and data analytics techniques to enhance the security and trust of mobile and wireless systems and networks.

Wenjia Li, Ph.D.
Lab Director

New York Campus,
EGGC, 807

wli20@nyit.edu

nyit.edu/bio/wli20

AREAS OF INTEREST

Security, Trust and Policies for Wireless Networks/Applications
Vehicular Networks,
Internet of Things,

Cyber-Physical Systems Security of Mobile Devices/Systems
Malware Detection for Android Systems, Particularly in Presence of Machine Learning Attacks

Security/Trust for Blockchain and Applications

ACTIVE PROJECTS

Secure and Trustworthy Data Management for Intelligent Transportation System

In Intelligent Transportation System (ITS), traffic data is generally exchanged during the inter-vehicle communication. Embedded vehicle sensors can report their observations of abnormal road conditions such as traffic jams, road construction, and accidents to other vehicles as well as infrastructure-based ITS components. This helps not only in individual route planning, but also overall in traffic optimization. However, the sensor data received from other vehicles might be imperfect due to some environmental factors. For instance, two vehicles traveling in opposite directions might have traveled out of communication range before they successfully finish data exchange.

In this case, the received traffic data may be incomplete and meaningless. To make things worse, vehicles controlled by malicious entities may intentionally propagate fake traffic data so as to disturb the whole transport system, and even cause crashes by feeding onboard controllers false information about the speed or movement of the vehicles ahead. Similarly, traffic updates from human sensors (for example smartphone users) such as new Tweets or Facebook status updates for real-time traffic status may also be imperfect due to both environmental factors and malicious intents.

Malware Detection for Mobile System Against Adversarial Machine Learning Attacks

As one of the key components for smart cities and its applications, mobile devices such as smartphones and tablet computers have made our daily lives much more convenient and enjoyable. Among various mobile operating systems, Android has become the leading operating system in terms of the percentage of mobile devices that are based on it. However, at the same time, Android devices are more susceptible to various security threats including mobile malware, because of the large quantity of mobile users as well as diversified mobile applications. In recent years, researchers have explored different means, including various machine learning algorithms to successfully detect malicious applications in Android devices. However, many of the existing malware detection systems have suffered from adversarial machine learning attacks, such as data poisoning attacks and evasion attacks, which are designed by malware authors to ensure that malware remains undetected by the traditional machine learning-based approaches.

Entrepreneurship and Technology Innovation Center (ETIC)

The Entrepreneurship and Technology Innovation Center (ETIC) at the College of Engineering and Computing Sciences is a business accelerator that brings together industry, government, and academia to foster economic development across Long Island and the New York City metropolitan region.

Michael Nizich, Ph.D.
ETIC Director

Long Island Campus, HSH 107

mnizich@nyit.edu

nyit.edu/engineering/etic
nyit.edu/bio/mnizich

The ETIC has been designated as a certified incubator by the Empire State Development Corp. to provide support for start-up businesses, including entrepreneurial and high-tech training, commercialization guidance, networking opportunities, and staff recruitment.

STUDENT OPPORTUNITIES

At the ETIC, students gain practical experience and develop entrepreneurial skills and professional networks that help them grow their careers after graduation. Students learn to apply the theoretical knowledge they gain in the classroom to real-world, open-ended design projects with the guidance of industry experts and advisors.

Technology Skills Workshop

Students require hands-on skills with current technology to be considered for internships and ultimately full-time employment in their chosen field. Students can participate in regularly scheduled ETIC workshops including Cybersecurity, Energy Management, Additive Manufacturing, Data Analytics, Augmented Reality, and Software Design.

Hackathon Series

Design hackathons and competitions provide students with a way to put their classroom and lab training into practice, meet and socialize with like-minded students, win prizes, and earn New York Tech certificates for their participation.

Internship Preparation Program

Students receive training in the areas of cybersecurity, data analytics, additive manufacturing, energy management, software development, augmented reality, and more to prepare them for paid corporate internships offered in partnership with ETIC-affiliated companies.

Technology Design Challenge Series

Students work in teams with faculty mentors to develop new technologies to solve current, technology-based problems. Challenges focus on socially conscious topics including environmental issues, people with disabilities, disaster relief, and more. Student teams compete for prizes and have the opportunity to file provisional patents on their designs when complete.

Student Entrepreneurship Program

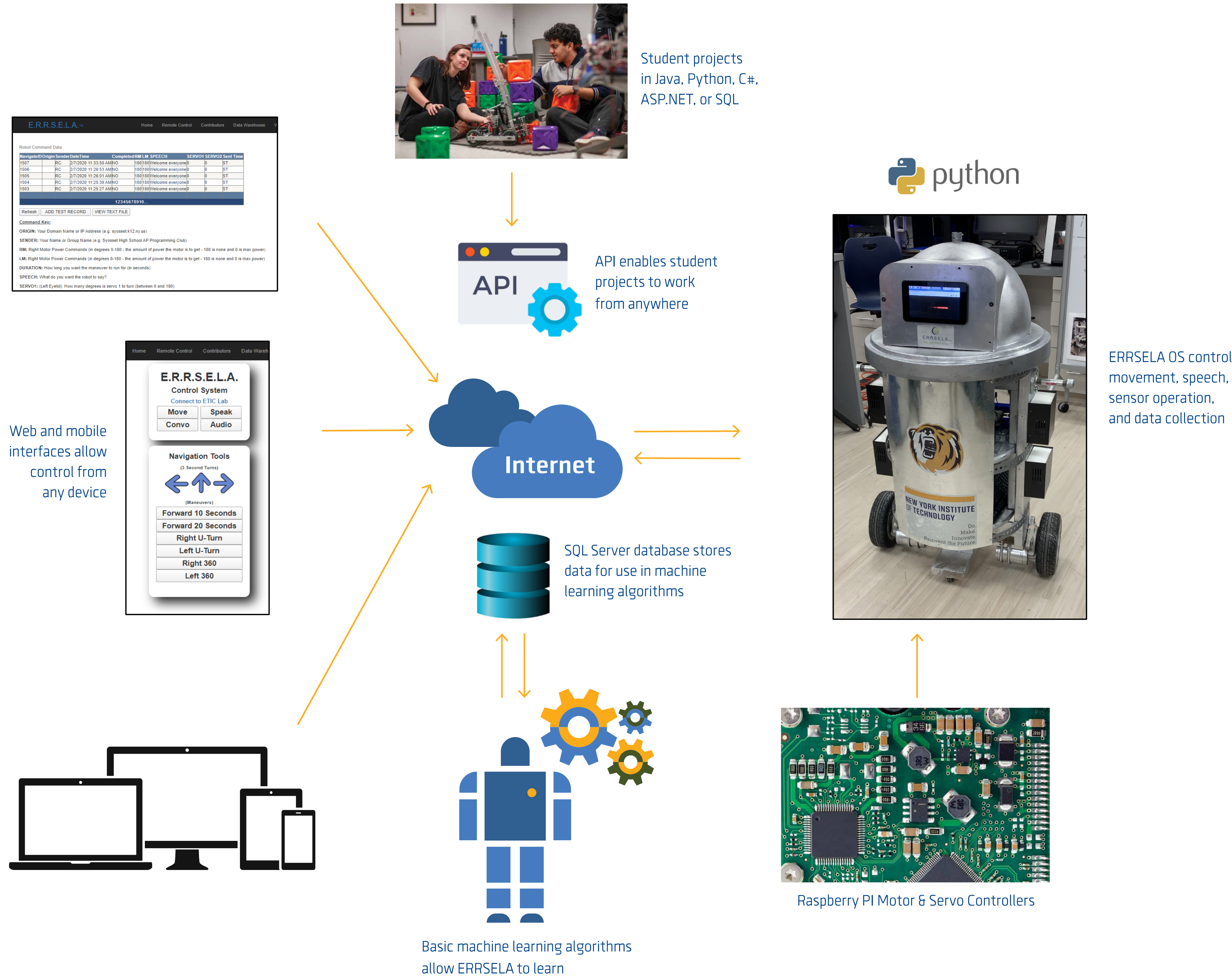
Students learn entrepreneurial concepts and business philosophies through seminars and consulting sessions and are encouraged to explore their technology-based ideas and innovations. At the ETIC, each student's entrepreneurial venture is treated as a real start-up company. The center provides students with entrepreneurial education, business consulting services, business supplies, and prototyping supplies and guidance. Each student in this program has the opportunity and the support of New York Tech to make their entrepreneurial vision a reality!

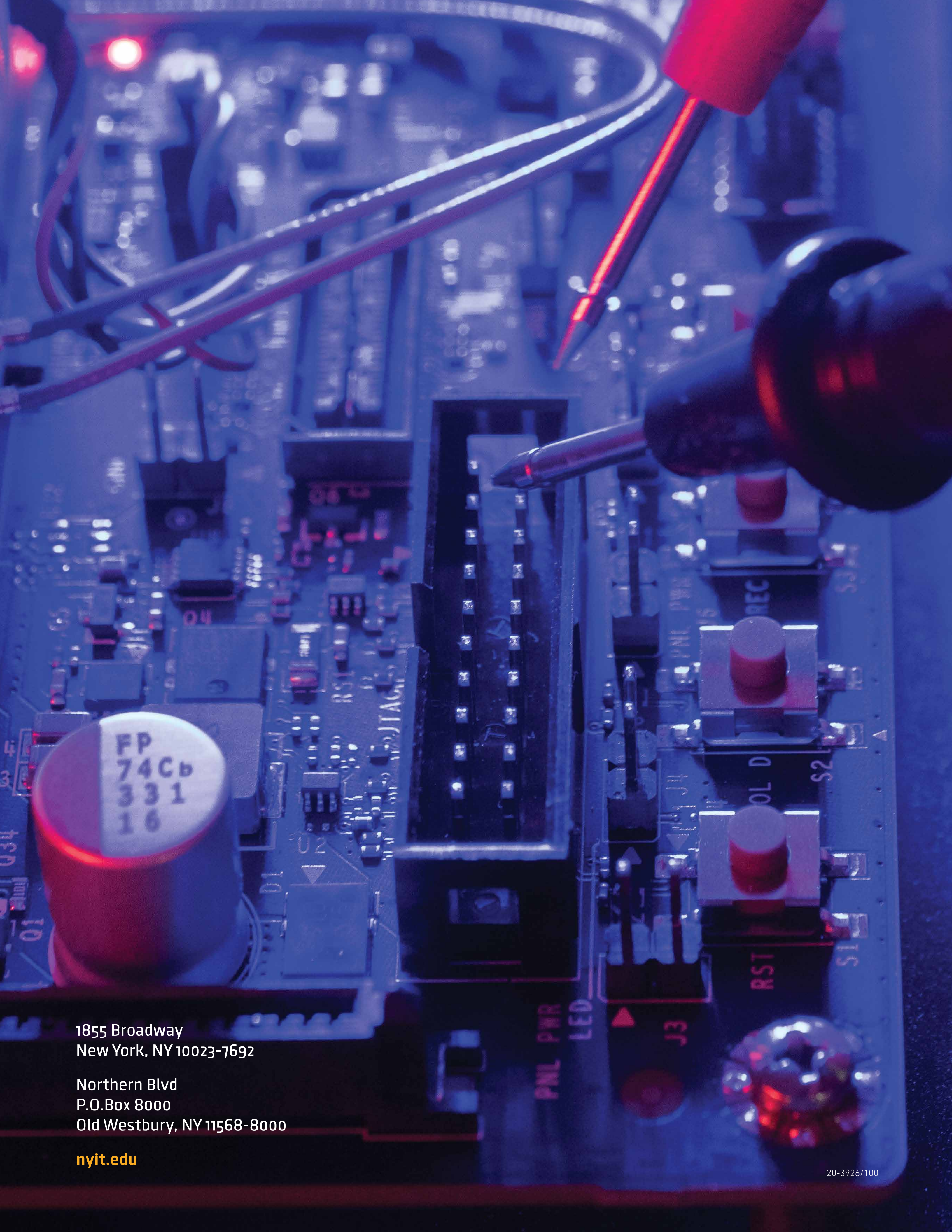
ENTREPRENEURSHIP AND TECHNOLOGY INNOVATION CENTER (ETIC)

ERRSELA

ETIC Research Robot for Student Engagement and Learning Activities

E.R.R.S.E.L.A.™ is a collaborative research and student engagement program founded by Dr. Michael Nizich at New York Tech at the College of Engineering and Computing Sciences. The program enables students from multiple disciplines and with varied skill levels to collaborate and participate in the robot's design and functionality. Students from New York Tech as well as students from various high schools and other regional colleges can all participate in the design project to gain real world experience in various areas of engineering and computer science.





1855 Broadway
New York, NY 10023-7692

Northern Blvd
P.O.Box 8000
Old Westbury, NY 11568-8000

nyit.edu

20-3926/100