

Research Topics for which ECE - NCSU is recruiting PhD students in 2024

Organized alphabetically by faculty name. **Note, not all faculty completed this form. Many who did not enter data or update it for this year still might be recruiting students.** Please check out our research pages (ece.ncsu.edu/research) as well as the web sites of the ASSIST and FREEDM Centers.

A

Dr. Jacob Adams is seeking strong PhD students in the areas of:

- Microwave and millimeter wave antennas
- 3D printed electromagnetic structures
- Reconfigurable antennas
- RF microfluidics
- Characteristic mode theory

More information is available at: <https://ece.ncsu.edu/people/jjadams2/>

Dr. Aydin Aysu anticipates hiring multiple PhD students in the area of hardware security. The topics cover digital hardware design, computer architectures, and applied cryptography:

- Implementation attacks: side-channel and fault attacks
- Machine learning applications for *hardware* security
- FPGA and ASIC design for deep learning applications
- Post-quantum cryptosystem implementations
- Compiler-assisted techniques for security

Please check the group's website for more information: <https://research.ece.ncsu.edu/aaysu/>

B

Dr. Dror Baron is recruiting students in quantum computing and information. In his "classical life," he used to work on topics that combined machine learning, statistical signal processing, and information theory. Because his quantum interests are somewhat new, he is glad to work with students to identify specific quantum directions. For more information, check his webpage: <http://barondror.com/>

Dr. Michela Becchi expects to recruit one Ph.D. student to work in the areas of parallel and heterogeneous computing. Becchi's current research projects cover the design of compiler and runtime techniques for systems that include GPU and FPGA devices, and the design and implementation of a software-hardware stack to support finite state transducers, the computational abstraction at the core of data transformation. You can find more information at <https://people.engr.ncsu.edu/mbecchi>.

Dr. Alper Bozkurt directs the Integrated Bionic MicroSystems Lab which innovate new "interfaces" for bionic cyberphysical systems. The Lab's vision is an internet-of-bionic-things based on machine-human/animal/plant symbiosis. Dr. Bozkurt's research interests are:

- Microfabrication
- Micromachined sensors and actuators
- Biomedical instrumentation
- Microelectronics and embedded system design
- Hardware and system integration for wearables, injectables, implantables
- Neural interfaces
- Noninvasive monitoring of tissue oxygenation
- Applications of machine learning and advanced data analytics to biomedical/biological sensor data

Having some background or willingness to work on the applications of embedded systems for biomedical research is an important plus to be easily integrated into current projects. Feel free to include your CV into his potential RA pool by sending an email to research@ibionics.org .

Dr. Amay J. Bandodkar seeks to recruit PhD students (starting Summer or Fall 2021) in the area of tissue-integrated electronics for various wearable and implantable biomedical applications. Students with a background in the following fields are encouraged to apply.

1. Microfabrication
2. Wireless electronics
3. Low power/ultra-low power circuits
4. Biochemical sensors
5. Energy materials
6. Polymer engineering/functional materials

Students should have interest in working across diverse fields, such as, electronics, materials science, and biology and willing to collaborate with chemists, biologists, physicians, and neuroscientists. For more information, please contact Dr. Bandodkar (ajbandod@ncsu.edu)

Dr. Greg Byrd is recruiting students in the area of quantum computing, specifically in systems and software for the support of error correction and hardware-aware optimization of algorithms.

C

Dr. Aranya Chakraborty is recruiting one PhD student (starting preferably from Fall 2022) and one postdoc (position available immediately) in the area of **control theory and machine**

learning (with applications in multi-agent networks and power systems). Students with strong background and interest in

1. control systems,
2. optimization,
3. machine learning (such as reinforcement learning and deep learning) applied to dynamic systems,
4. data analytics in power systems

should apply. Please contact Dr. Chakraborty directly by email at achakra2@ncsu.edu with your CV.

D

Dr. Huaiyu Dai anticipates recruiting PhD students and exceptional MS students in the following areas:

- Machine learning and artificial intelligence with applications in wireless communications and networking systems
- Wireless security and network security
- Dynamic spectrum access and sharing
- Multilayer and interdependent networks

More details can be found at <https://people.engr.ncsu.edu/hdai/>

Dr. Michael Daniele directs the BioInterface Lab, focused on the systems engineering of biosensors and biomaterials platforms. The Lab is recruiting new student in the following areas:

- electrochemical and optical biosensing
- bioelectronic implants
- sensors and sensor networks
- flexible microelectronics & fabrication
- microfluidics
- soft electronic materials
- 3D Printing
- biomanufacturing
- biotechnology

Feel free to include your CV by sending an email to mdaniel6@ncsu.edu .

Dr. W. Rhett Davis anticipates recruiting one PhD student in the area of hardware-software co-design of vision sensors.

Dr. Alexander Dean is not recruiting new students at this time.

Dr. Alexandra Duel-Hallen anticipates recruiting students in the areas of wireless communications and cyber-physical systems

E

Dr. Do-Young Eun plans to recruit PhD students who can work on research topics in machine learning algorithms, distributed optimization, federated learning, epidemics, stochastic systems, nonlinear systems, with various applications in networking areas in general. Strong math/analytical skills at graduate level (e.g., graduate level study of Markov chains, optimization, stochastic process and probability theory, dynamical systems, are highly preferred. See <https://dyeun.wordpress.ncsu.edu/ra-opportunity-for-phd-students/> for more details.

Dr. Michael Escuti is currently not recruiting new PhD students.

F

Dr. Demitry Farfurnik is recruiting PhD students for studying fundamental quantum science and for developing novel quantum technologies. Farfurnik's research lab is focused on a specific class of promising quantum systems, optically-active spin qubits in the solid-state. The experiments in the lab utilize optics, microwave fields, cryogenics, and nanofabrication techniques to characterize, control, and improve the quantum properties of novel qubits. The qubits can then be used as quantum sensors and to form building blocks of quantum networks and simulators. Farfurnik's research heavily relies on theoretical and computational tools such as FDTD simulations, quantum photonic programming toolbox, protocols for Hamiltonian Engineering, inverse design of photonic structures, and machine learning. You can find more about Farfurnik's current research directions (both experimental and theoretical) at <https://research.ece.ncsu.edu/farfurnik/> or by contacting him directly at dfarfur@ncsu.edu

Dr. Paul Franzon anticipates recruiting students in some of the following areas:

- Electronic Design Automation using machine learning (CAEML center), including a new project focused on employing new optimization techniques on analog and digital chip design. Familiarity with Signal Integrity, Digital Design, and/or Analog and RF Circuit Design, and experience coding machine learning algorithms preferred.
- 3D CMOS architectures and CAD tools
- Low-power high-speed chip to chip interfaces
- Novel RFID and adiabatic computing circuits

You can find more at <https://ece.ncsu.edu/people/paulf/> I can be reached at paulf@ncsu.edu

G

Dr. Qing Gu is recruiting several PhD students. The experimental research in Dr. Gu's nanophotonics group lies at the intersection of electrical engineering, physics and materials sciences. Students will learn optical cavity design and electromagnetic simulation, nanofabrication of optical devices, optical and electrical characterization of fabricated devices, and photonic integration. Specific research projects include

- Micro- and nano-scale semiconductor lasers
- Perovskite light sources

- NanoLEDs for high-speed optical communication
- Neuromorphic photonic computing
- Non-Hermitian topological photonics
- Hyperbolic metamaterials

More information can be found at <https://research.ece.ncsu.edu/gulab/>.

Dr Nuria González-Prelcic is recruiting up to two PhD students for Fall 2023. She is currently working on signal processing and machine learning for MIMO communication at millimeter wave and THz bands, millimeter wave sensing and positioning, joint sensing and communication in vehicular scenarios, WiFi sensing, and PHY/MAC designs for non-terrestrial networks (mainly LEO constellations). Examples of specific working lines include hardware-aware processing for mmWave/THz receivers, positioning based on mmWave signals and automotive sensors, full duplex communication at mmWave and THz, machine learning for sensor aided mmWave beamforming and channel estimation, prototyping integrated sensing and communication solutions in the M3 platform, dictionary learning for managing hardware imperfections, beam management and precoder design in satellite networks, etc. You can contact Dr Nuria González-Prelcic at ngprelcic@ncsu.edu to further discuss research opportunities around these or other potential working lines.

H

Dr. Robert Heath is recruiting up to three PhD students. He works in diverse areas related to wireless communications and machine learning. He is interested in the development of 6G especially involving multiple antenna communications. Collaboration with other faculty is encouraged. Some specific areas include:

- Communication theory with an eye towards antennas and circuits: This includes developing communication and information theory that incorporates practical constraints based on realistic antennas and circuits. The ideal candidates will have a background in circuits or antennas and be willing to learn signal processing and communication theory, or the reverse.
- Advanced MIMO communication. This includes the general investigation of multiple antennas for next generation cellular and WiFi networks. Research includes developing algorithms that can take advantage of large array apertures, for example large intelligent surfaces, or new array technologies, as well as analysis of MIMO systems as might be envisioned for 6G cellular systems, or for tactical ad hoc networks. There is also interest in communication at frequencies both below and above 100 GHz, getting into the THz regime. There are many applications of machine learning here that can be pursued, including deep learning and reinforcement learning techniques to configure such systems.
- Quantum communication, quantum computing, or quantum sensing. Dr. Heath is broadly interested in solving problems with the quantum mathematical framework, for example doing manifold learning with a quantum computer, or devising new algorithms for quantum radar.

Feel free to reach out to Dr. Robert Heath directly at rwheathjr@ncsu.edu.

Dr. Douglas C Hopkins advises PhD students in the research area of high-frequency, high-density, power electronics circuits and packaging as applied to high-performance power supply, pulsed power, propulsion and grid systems. More can be found at <http://www.ece.ncsu.edu/people/dchopki2/> and <http://prees.org> and as a member of the FREEDM Systems Center faculty <https://www.freedm.ncsu.edu/people/doug-hopkins/>

Dr. Helen Huang anticipates recruiting ECE Ph.D. students interested in control of prosthetics and exoskeletons. She will support two Ph.D. students in the areas of control, neural-machine interface, wearable robotics, and machine learning. You may visit her website at <https://nrel.web.unc.edu>

Dr. Iqbal Husain anticipates recruiting one PhD in the area of power electronics based system controls area. Dr. Husain's research areas are Electric Transportation systems, power electronics based power systems, and electric motor drives.

I

Dr. Ismail Guvenc may recruit PhD student(s) contingent on the funding situation. The student may work on millimeter wave and sub-terahertz channel sounding/sensing, drone communications and experimentation, software defined radios, open RAN, and spectrum sharing/coexistence. For more information about the research areas, you can visit the following websites.

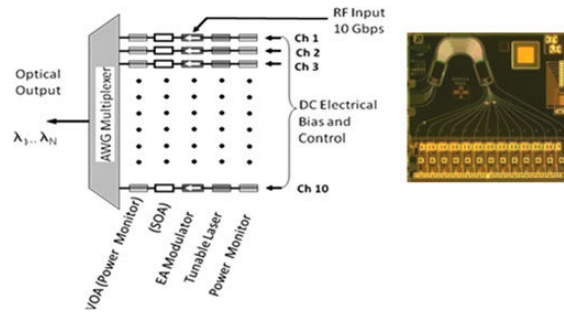
- Group Website: <https://research.ece.ncsu.edu/mpact/>
- Personal Website: <https://sites.google.com/site/iguvenc/>
- NSF AERPAAW: Aerial Experimentation and Research Platform for Advanced Wireless <https://aerpaw.org/>
- NSF BWAC: Broadband Wireless Access and Applications Center: <https://research.ece.ncsu.edu/bwac/>

J

K

Dr. Fred Kish is interested in recruiting two new PhD students in the area of photonics and optoelectronics with a focus on photonic integrated circuits (photonic ICs), especially those based in wide bandgap devices and materials. Our laboratory combines innovations in materials science, device physics, semiconductor processing, photonics, and optoelectronics to realize disruptive innovations.

100 Gb/s Transmitter Photonic IC (OOK)



Dr. Ki Wook Kim is interested in recruiting a new PHD student in the area of semiconductor physics and device modeling including NEGF and DFT calculations, or spintronics.

Dr. Hamid Krim interested in Statistical Machine Learning and Bio-inspired Information Science methodologies with a view to various applications.

<https://ece.ncsu.edu/people/ahk/>

Dr. Michael Kudenov anticipates recruiting students in the following areas:

- Hyperspectral, multispectral, and polarimetric imaging sensors
- Sensor calibration and validation within agricultural applications
- Image processing and machine learning

More information can be found at: <https://research.ece.ncsu.edu/osl/>

L

Dr. Ning Lu anticipates recruiting 2 new PHD students. For more information, please visit [her homepage](#): [Recruitment](#), [MyCV](#), [MyStudents](#), [MyResearch](#), [TARA Offers](#), [Internships&Jobs](#); [GAANN Fellowship in Cyber-Security of Power Systems](#)

Dr. Srdjan Lukic anticipates recruiting new PHD students interested in medium voltage power electronics and control. For more information, please visit FREEDM Center [homepage](#).

Dr. Shih-Chun Lin anticipates recruiting 1-2 new PHD students in the area of wireless networking and communications. The research focus will be

- Wireless Software-Defined Networking Systems
- Mobile Edge Computing Architecture for Connected Autonomous Vehicles
- Radio Frequency Analytics and AI/ML-Native Systems
- AIoT for CPS, NTN, Underground/Underwater Sensor Networks

A good mathematical background is required. Knowledge on wireless communications, machine learning techniques, stochastic optimization, or electromagnetics are most welcome. Having experience of practical implementations is also a plus. For more information, please visit my [homepage](#).

Dr. Edgar Lobaton anticipates recruiting a graduate student in the area of machine learning with applications to cyber-physical systems ranging from human physiological response monitoring to optimization of biosensor materials.

M

Dr. John Muth

N

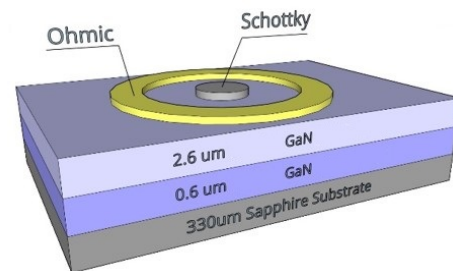
O

P

Dr. Spyridon Pavlidis anticipates recruiting PhD students to the NCSU Laboratory for Electronics in Advanced Devices and Systems ([NCSU LEADS](#)).

Research topics include:

- (Ultra) Wide bandgap semiconductor devices for power and RF applications
- Electrochemical biosensing for point of care applications



Students in the LEADS should be interested in electronic device simulation, micro/nano-fabrication (cleanroom) and device characterization.

Dr. Pantic Zeljko anticipates recruiting **two PHD** students in Fall 2024. Areas of interest include: **Primary:** a) wireless power transfer systems (inductive and capacitive) - analysis, design, testing, b) high-frequency resonant converters operating in MHz range, c) magnetic circuit analysis and design, d) application of GaN devices for high-frequency conversion, e) the non-linear phenomena in inductors and capacitors; **Secondary:** a) all general topics of power electronics; b) all charging concepts, with a particular interest in charging personal transportation vehicles; e) magnetic composites, f) Power and energy challenges of underwater vehicles (AUVs) and drones, g) pressure-tolerant electronics. For more information, please visit FREEDM Systems Center [homepage](#).

Q

R

Dr. Eric Rotenberg is not recruiting new students at this time but is available to chat about his current research projects and future areas of interest:

- “Post-silicon Microarchitecture (PSM)”: A PSM chip couples fixed hardware components of a microprocessor pipeline with reconfigurable hardware components, enabling custom microarchitectural enhancements (e.g., custom branch predictors and data prefetchers) to be synthesized into the reconfigurable hardware as the task at hand changes.
- High-performance processors
- Microarchitectural techniques to mitigate transient execution attacks
- Quantum computing
- Exploiting emerging logic technologies in processor design

Dr. Brad Reaves anticipates recruiting students in the following areas:

- Cellular and telecommunications security
- Data-driven software security
- Software-defined network security

Dr. David Ricketts anticipates recruiting one student in the following areas:

- Electromagnetics & analog circuits (IC)
- Electromagnetics
- Mm-wave circuits & systems

S

Dr. Mihail Sichitiu anticipates recruiting students in the following areas:

- UAVs (drones) communications (channel measurements, integration in the National Airspace via the UTM effort), communication relays
- Wireless networking - emulation as a tool for evaluating wireless networks performance
- Localization and time synchronization of wireless nodes
- Low power wireless sensor networks

T

Dr. James Tuck anticipates recruiting 1 or 2 motivated students in the area of DNA-based Information Processing and Storage.

Dr. Hung-Wei Tseng is interested in recruiting 1-2 students for the following topics.

- Near-data processing/in-storage processing architecture -- Developing processor/system architectures as well as the programming language framework to offload computation near data locations. The candidate should be familiar with C/C++ programming languages and computer architecture.
- Building systems for Virtual/augmented reality -- Developing high-bandwidth/low-latency wireless networked systems to support the demand of VR/AR applications. The candidate should have knowledge on wireless network protocols, network programming with C/C++, OpenGL programming.

Dr. Wenyuan Tang anticipates recruiting students interested in power system operation and control, electricity markets, and data analytics in smart grids. More information can be found at <https://tangwenyuan.github.io/>

U

V

Dr. Suresh Venkatesh anticipates recruiting 2-3 PhD students in the following areas:

- Integrated Circuit design at mm-wave for reconfigurable EM surfaces
- EM-Circuit Co design at mm-wave and THz
- Metasurfaces for computational imaging

Students should have experience and skills in IC design (Cadence, layout) and FDTD/FEM electromagnetic softwares.

Website: <https://sites.google.com/view/sureshpersonal>

Email: suresh.venkatesh@ncsu.edu

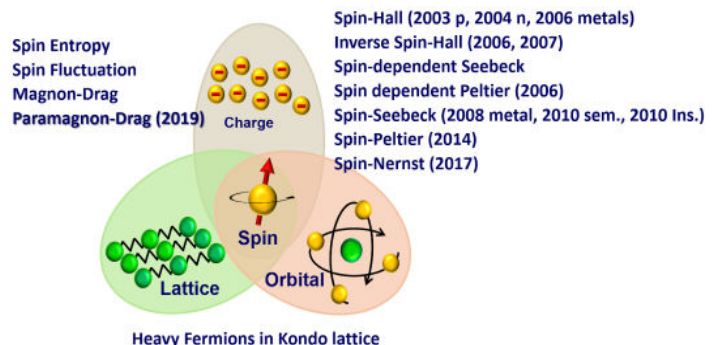
Dr. Yannis Viniotis anticipates recruiting students in the following areas:

- Internet of Things: Design, Architecture and Computing Models
- Service Level Agreements in Cloud and Edge Computing
- Applications of Artificial Intelligence methods in Rare Diseases

Dr. Daryoosh Vashaee anticipates recruiting students in the following areas:

- Spin-caloritronics
- Thermoelectrics
- Quantum Materials

More information can be found at the [Nanoscience and Quantum Engineering Research Group \(NQERG\)](#) website.



Dr. Vazquez-Guardado is recruiting PhD students with interests in biomedical devices at different levels of development, from sensors, electronic systems, to full technology ecosystem integration. Areas of interest are:

- Ultra Low power wireless systems, Bluetooth, NFC, etc.
- Battery-free wireless sensors
- Implantable devices
- Biophotonics
- Photonics devices for biosensing

- Photonics, electronics, optoelectronics microsystems, fabrication, packaging and deployment
- Micro/nano fabrication of photonics and optoelectronic devices (sensors & actuators)
- Machine learning for unsupervised medical devices
- Closed-loop medical devices

Prospective candidates are strongly encouraged to contact Dr. Vázquez-Guardado (e-mail: abraham.vg@ncsu.edu).

W

Dr. Jonathan Wierer anticipates recruiting students interested in optoelectronic and electronic devices in wide bandgap semiconductors such as GaN. His group researches semiconductors' physics, processing, and materials properties to create novel devices. Examples include quantum dot active layers, III-nitride LEDs and lasers, and thermal oxidation of III-nitrides. More information can be found at jwierer.com.

Dr. Cranos Williams, director of the EnBiSys Research Lab (<https://enbisys.ece.ncsu.edu/>), anticipates recruiting 1-2 motivated students in the following areas to work on two funded research projects that are associated with the North Carolina Plant Sciences Initiative (<https://cals.ncsu.edu/psi/>):

- Multiscale Modeling of Microbiome / Plant Interactions: student will assist with the development of mathematical models (e.g. Ordinary Differential Equation, Machine Learning Models) that predict plant growth and plant resilience as a function of plant and microbiome interactions. More info on the project can be found here (<https://mbg.au.dk/en/research/research-centres/inroot/>).
- Integrated Analytics and Machine Learning for Heterogeneous Agricultural Data: student will assist with development a secure data management, integration, and analytics platform that will extract relationships across heterogeneous agricultural data acquired across the sweetpotato supply chain (e.g. imaging, cultural practices, weather, and soil chemistry). Candidates interested in machine learning, computer vision, and data sciences are encouraged to apply. More info on the project can be found here (www.sweetpotatoanalytics.com).

Dr. Tianfu Wu anticipates recruiting one or two students in the following areas:

- *Explainable AI, Deep Learning* (with focus on novel neural architecture design and search, and interpretability-sensitive loss function design)
- *Domain-agnostic learning with less labels* (with focus on self-supervised learning)
- *Deep Consensus Learning for joint structured input synthesis (e.g. layout-to-image) and structured output prediction (e.g., image semantic segmentation)*.

More information can be found at <https://research.ece.ncsu.edu/ivmcl/>

Dr. Chau-Wai Wong anticipates recruiting 1-2 motivated Ph.D. students interested in machine learning, statistical signal processing, and computer vision. Projects are exploratory in nature and have both mathematical and practical flavors. The applicant can be either hands-on or theoretical/mathematical initially, but must be willing and determined to build up a balanced research profile in order to tackle unknown challenges upon graduation. Research topics includes:

- [Deep learning] Empirical and mathematical studies of neural networks with emphases on federated learning and large-language models.
- [Computer vision, statistical signal processing] Novel computer vision and physical modeling for microscopic 3-D surfaces for security and forensics applications.

Publications (with slides and demos) can be found at

<https://ncsu-wong.org/publications.php>

X

Y

Dr. Wensong Yu is currently recruiting PhD students in Power Electronics. He advises PhD students interested in the innovative and impactful technical solutions to soft-switching converters, grid-forming inverters, digitally controlled power circuits, high-voltage power conversion, EV power electronics, and renewable energy power systems. More information can be found at: <https://www.freedom.ncsu.edu/people/wyu2/>. I can be reached at wyu2@ncsu.edu

Z

Dr. Huiyang Zhou is recruiting students in the following areas. More can be found at

<http://people.engr.ncsu.edu/hzhou>

- GPU microarchitecture and code optimization
- Architectural support for computer system security
- Non-volatile memory architectures
- Quantum computing