

MINTernship Program

Transatlantic Energy Research Experiment (TE-REx)

Research opportunities available at UNC Charlotte Summer 2026

General Contact

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Research Opportunities:

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Project Title: Modeling and Simulation of HVDC Grids - Towards a Benchmark	
Energy Field Research Interest	Power Conversion and Power Electronics
Abstract of the project	This six-month research project will focus on developing and implementing dynamic models of key components for High-Voltage Direct Current (HVDC) transmission networks.
Tasks	The primary objective is to create a robust and computationally efficient simulation platform capable of analyzing the steady-state and transient behavior of multi-terminal HVDC (multi-terminal DC - MTDC) grids. The project will include: • Component Modeling: Developing detailed mathematical models for Voltage Source Converters (VSCs), DC cables, and DC circuit breakers. These models will be adapted for real-time or near-real-time simulation environments. • Grid Integration: Integrating the component models into a small-scale, representative MTDC grid topology. • Simulation and Analysis: Conducting simulations to study critical operational scenarios, such as fault events (e.g., DC short circuits), power flow control, and the impact of different converter control strategies (e.g., droop control). The expected outcome is a validated simulation framework that provides insight into the stability, reliability, and control challenges unique to future HVDC meshed grids, laying the groundwork for further large-scale analysis.
Requirements	Electrical or computer engineering student with background in power systems modeling and simulation
Language Skills	Strong English Knowledge (B2-C1 English)
Software Skills	Experience with power system analysis software and with electromagnetic transient (EMT) simulation tools recommended
Other skills	
Duration of the project	up to six months (April – October)
Type of research project	Research Project
Responsible Professor	Valentina Cecchi (UNCC EPIC) and Giovanni De Carne (KIT)
Supervisor/Mentor of the project	Valentina Cecchi (UNCC EPIC) and Giovanni De Carne (KIT)
Supervisor's Telephone Number	+1 704 687 8730
Supervisor's Email	vcecchi@charlotte.edu and giovanni.carne@kit.edu
Faculty, Institute or Company Name	EPIC (UNCC) and Energy Lab (KIT)

Project Title: Agentic AI Cybergym for Integrated Power-Grid and DER Cybersecurity Testing	
Energy Field Research Interest (please select from one of the options below)	- Cybersecurity - Artificial Intelligence - Energy Systems
Abstract of the project	Research on cybersecurity, i.e. cyber-attacks and cyber-defense, requires testbeds (aka. labs, cyber-ranges, cybergyms) to develop and evaluate any approach. These testbeds are hard to construct: As models of complex real-world infrastructure, they have inherent limitations in fidelity, i.e. their explanatory power is capped to a limited number of use cases. The scientific models of cyber-attacks are lacking in particular due to missing technical details and the multi-domain knowledge required to build these systems. The versatility of Agentic AI challenges these model limits in particular so the scientific community is in dire need for more sophisticated representations of cyber-physical systems. The aim of this project is to create cybergyms for the two scenarios “cyberattacks on power system operators” and “cyberattacks on decentralized inverter-based resources”.
Tasks	• Getting familiar with Infrastructure as Code Tools • Getting familiar with the usage of Large Language Models • Design a network architecture for the scenario, pick configuration for nodes • Create images for the nodes • Design and test a simple attack chain manually • Design Capture-the-flag challenges for the AI to complete • Evaluate AI agents on these CTF challenges
Requirements	– Cybersecurity background would be nice, but not mandatory – Reasonable programming / software engineering skills
Language Skills	fluent in English
Software Skills	- nice to have experience in either: - o DevOps or Full Stack Development, or - o Windows administration at scale. - knowing how to navigate using a text console on a POSIX-based system.
Other skills	- willingness to learn about operational technology
Duration of the project	up to six months (April – October)
Type of research project	Research Project
Responsible Professor	UNCC: Prof. Dr. Meera Sridhar UNCC: Prof. Dr. Arun Ravindran

	KIT: Prof. Dr. Veit Hagenmeyer
Supervisor/Mentor of the project	UNCC: Prof. Dr. Meera Sridhar UNCC: Prof. Dr. Arun Ravindran KIT: Dr. Ghada Elbez KIT: Dr. Kaibin Bao
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Faculty, Institute or Company Name	UNCC: Department of Electrical and Computer Engineering KIT: Institute for Automation and applied Informatics