1st Engineering and Science Student Research Symposium and Tech Horizons Summit 2025

Florida Polytechnic University

Organized By

IEEE FWCS Section

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Florida Polytechnic University Student Branch Chapter

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Welcome Address

We are pleased to welcome you to the inaugural Engineering and Science Student Research Symposium (ESSRS) at Florida Polytechnic University, held in conjunction with the Tech Horizons Summit 2025.

The ESSRS was established with the goal of promoting research within the Electrical and Computer Engineering Department at Florida Polytechnic University, providing students a platform to present their work, exchange ideas, and inspire further innovation. The concept of this symposium was proposed by Dr. Ullah, an Associate Professor in the ECE Department, and brought to life by the IEEE Student Branch at Florida Poly and the ECE Department, with close support from Dr. Rashid and Dr. Ullah. Designed to become an annual tradition at our campus, the event aims to expand across multiple majors in the future.

The Tech Horizons Summit, organized by the FWCS Computer Society, is an annual event typically held at the University of South Florida Campus. This year, due to logistical constraints, the IEEE Student Branch at Florida Poly proposed hosting the summit alongside the ESSRS at Florida Polytechnic University. The Tech Horizons Summit is an event that brings together emerging technology innovations from IEEE Region 3.

We wish you a successful and productive experience at this year's symposium and summit.

Symposium Committee at IEEE Student Branch at Florida Poly

April 5th, 2025.

Keynote Speakers

Ramya K. R. Vuyuuru

Ramya K. R. Vuyyuru is a Senior Technical Product Manager with 14+ years of experience in AI, data analytics, and enterprise innovation. She is a Senior Member of IEEE and has served on technical committees for IEEE conferences. Ramya has led AI-driven transformations and built scalable solutions across multiple industries. Her expertise includes AI governance, real-time data systems, and security compliance in enterprise platforms, with a focus on ensuring trust and efficiency in large-scale systems.

Akshay Agarwal

Akshay Agarwal, Cloud Data Analytics and AI Leader, widely recognized for building scalable business solutions and for his unwavering passion for driving technology transformation. With over 14 years of experience in Data Engineering, his expertise spans in Cloud Migration, Data Analytics, Artificial Intelligence, and Data Architecture with a focus on optimizing data workflows and ensuring high data quality. He is dedicated to advancing business data-driven decision-making through innovative approaches and staying abreast of the latest industry trends. His commitment to excellence in Data Engineering continues to drive meaningful change and inspire progress in the field.

Hitali Shah

Hitali Shah is a data analytics professional with a passion for turning data into meaningful insights. She currently works as an Advanced Insights Analyst at Electronic Arts (EA), where she focuses on statistical analysis, predictive modeling, and understanding player behavior. At EA, Hitali helps shape game experiences by analyzing player engagement and monetization strategies. She uses A/B testing, regression modeling, and player segmentation to guide data-driven decisions that enhance both user experience and revenue. Her work ensures that game design choices are backed by solid data, making gameplay more engaging and rewarding.

Outside of EA, Hitali stays involved in the broader tech community by serving as a judge for various industry awards, keeping her connected to emerging trends and innovations. With previous experience at LinkedIn and Oracle, she has a strong background in leveraging data to drive strategic decisions. Skilled in Python, SQL, Tableau, and statistical analysis, Hitali enjoys solving complex problems and finding patterns in data to drive innovation in the gaming industry.

Agenda

Room BARC 2200

09:00 am	Check-In
09:30 am	Opening Ceremony
10:00 am	**Antra Malhotra:** FWCS Computer Society
10:30 am	**Dr. Farhan:** A robust and scalable silicon photonic physical unclonable function
11:00 am	**Akshay Agarwal:** Emerging Technologies in Data Engineering
12:00 pm	Lunch & Networking
01:00 pm	**Lukas Kelk, Jacob Brescia and Andrew Blackwelder:** Optimization of Microgrids in Grid Connected & Island Modes of Operation
01:20 pm	**Joshua Alletto:** Unlocking the Future of Sustainable Energy Storage
01:40 pm	**Maxx Lowy:** Design of a Low-Cost Vector Based Muometric Navigation System
02:00 pm	**Sunim Acharya:** Enhancing Agile Development: A Comparative Analysis of LLMs for User Story Generation
02:20 pm	**Hitali Shah, Data Analyst from Electronic Arts (EA):** How Data Influences Game Development at Every Stage
03:20 pm	**Ramya K. R. Vuyyuru:** Trustworthy AI & Intelligent Data Systems
04:30 pm	Closing Remarks: Certificates and Prizes awards.

Student Competitions

Room:	Time	Competition
BARC 2220	1:30 pm – 3:00 pm	Software
BARC 2241	1:30 pm – 3:00 pm	Soldering Workshop / Competition
BARC 1123	3:00 pm – 4:00 pm	Circuits Competition

Abstracts

Author: Dr. Farhan Bin Tarik

Biography

Dr. Farhan Bin Tarik is an assistant professor in the Department of Electrical, Computer and Cybersecurity Engineering at Florida Polytechnic University. Prior to joining Florida Poly, he was an assistant professor at Clark State College in Springfield, Ohio, where he played a key role in establishing “Regional Fabrication and Certification Training Labs-Laser Material Processing” project under the Air Force ManTech program supported by ARCTOS Technology Solutions LLC. Following his undergraduate degree in 2015, Bin Tarik worked as a core network engineer at Huawei Technologies Bangladesh Limited. He received extensive training in advanced information and communication technologies at Huawei’s headquarters in Shenzhen, China, after being champion in Huawei’s global CSR competition, Seeds for the Future.

Bin Tarik’s research interests revolve around silicon photonics, optoelectronics, disordered and quasicrystalline optics, micro-nano fabrication and advanced manufacturing. Through his dissertation work at Clemson University, Subwavelength Engineering of Silicon

Abstract

Physical unclonable function (PUF) has emerged as a promising and important security primitive for use in modern systems and devices, due to their increasingly embedded, distributed, unsupervised, and physically exposed nature. However, optical PUFs based on speckle patterns, chaos, or ‘strong’ disorder are so far notoriously sensitive to probing and/or environmental variations. Here we report a silicon photonic PUF designed for robustness against fluctuations in optical angular/spatial alignment, polarization, and temperature. This is achieved using an integrated quasicrystal interferometer (QCI) which sensitively probes disorder while: (1) ensuring all modes are engineered to exhibit approximately the same confinement factor in the predominant thermo-optic medium (e. g. silicon), and (2) constraining the transverse spatial-mode and polarization degrees of freedom. This demonstration unveils a new means for amplifying and harnessing the effects of ‘weak’ disorder in photonics and is an important and enabling step toward new generations of optics-enabled hardware and information security devices.

Photonic Waveguides, he has tackled multiple problems in photonics, spanning areas in enhancing light-matter interaction, novel techniques in nanofabrication, and hardware and information security applications.

In 2023, Bin Tarik was one of the first recipients of the OASiS Fellowship, conferred by the Ohio-Southwest Alliance on Semiconductors and Integrated Scalable-Manufacturing (OASiS) and the University of Cincinnati. He is a reviewer for several prestigious journals published by IEEE, Elsevier, Optica, and Royal Society of Chemistry.

Author: Maxx Lowy

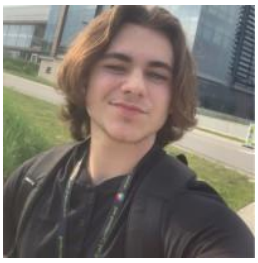
Biography

Maxx Lowy is a senior going to Florida Polytechnic University. He does research with Dr. Ullah about Muometric Navigation and has future plans on doing research on the detectors in the LHC during the summer. His hobbies include reading and hanging out with friends.

Abstract

This paper presents a low-cost vector based Muometric navigation system for precision location finding applications where GPS does not work. The proposed system obtains the amplitude information from a SiPM photodetector pulse, using low-cost techniques. The system then obtains the location of the device using the data from a reference detector.

Author: Joshua Alletto



Biography

Joshua Alletto is an electrical engineering student at Florida Polytechnic University, passionate about advancing sustainable transportation and autonomous systems. Currently interning at Argonne National Laboratory, he focuses on sodium-ion battery research with MXene anodes to optimize EV energy storage. Joshua's expertise spans programming languages like Python, MATLAB, and specialized tools such as SEM and S/TEM, which he applies to battery performance testing. His prior experience includes leading electrical systems design for NASA mission concepts and enhancing AI-driven autonomous systems at Argonne.

Abstract

During my time as a SULI (Science Undergraduate Laboratory Internship) intern at Argonne National Laboratory, I had the privilege of working on research in the field of sodium-ion batteries, focusing on the utilization of CO2- derived carbon as anode materials. This project aimed to develop more efficient and cost-effective alternatives to traditional lithium-ion batteries for electric vehicles (EVs). Under the guidance of my mentor and a few leading scientists in the laboratory, I engaged in the synthesis of CO2-derived carbon, employing Raman Spectroscopy to examine its structural properties, and Electrochemical methods to measure cycle life, internal resistance and fast charging capabilities inside of sodium-ion batteries. The research emphasized optimizing charge-discharge rates and overall battery performance, aligning with the Department of Energy's mission to innovate in energy storage technologies. One of the biggest outcomes of this research was the potential to improve the energy density and charging time of sodium-ion batteries. My most profound result from this work was achieving a 0-100% charge in just under 10 minutes and maintaining a 90% capacity retention rate after 100 cycles. These findings contribute to the field of battery technology and broader energy sustainable goals, posing

these batteries as a potential for fast charging electric vehicles. Professionally this internship has been a transformative experience broadening my skills in battery testing, microscopy, cell chemistry, and overall independency in research. This gave me insight into the career of scientific research and strengthened my skills in adaptability and continuous learning in handling complex scientific challenges. In summary, my SULI internship at Argonne National Laboratory was an unforgettable experience that significantly contributed to my professional growth, provided meaningful research accomplishments, and aligned with my own mission of advancing energy technologies for a sustainable future for generations to come.

Authors: Lukas Kelk, Jacob Brescia, Andrew Blackwelder

Biography (Lukas Kelk)

Lukas Kelk is a senior Computer Engineering student with interest in power system, microgrids, renewable energy, storage devices and smart grid technologies and is working with Andrew Blackwelder and Jacob Brescia

Biography (Jacob Brescia)

Jacob Brescia, Electrical Engineering Junior at Florida Polytechnic University, with a focus of Microgrids, Power Systems, Storage Systems, and Renewable energy, working with Lukas Kelk and Andrew Blackwelder.

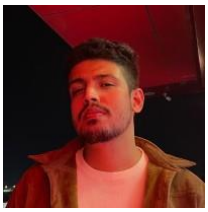
Biography (Andrew Blackwelder)

Andrew Blackwelder is a Junior in Electrical Engineering specializing in power systems. He has been accepted to the 4+1 plan at Florida polytechnic and plans to get his master's in electrical engineering. He is the current Treasurer of the Robotics and Automation Society for IEEE Student Branch. He has obtained an associate in arts degree at South Florida State College and earned a college credit certificate in automation.

Abstract

A DC Microgrid combines Distributed Energy Resources (DERs), energy storage, and controllable loads by operating at a lower voltage and supplying power to critical and non-critical loads. It is connected to the main grid through the point of common coupling (PCC). A microgrid integrated with renewable energy systems like solar PV system and wind turbines, battery energy storage, fuel cell along with a critical load is connected to main grid. The microgrid operates in both grid connected as well as islanded modes of operation. The critical load is an important and mandatory load which requires power to be supplied all the time. The microgrid generates power from DERs and supplies this power to the loads. For flexible operation, microgrid utilizes the power electronic interfaces [1]. In microgrid, the DERs, loads and storage devices are controlled by the Microsource Controller (MC). The optimization of the DC microgrid is performed in PSCAD simulation tool. Highly Efficient power electronic interfaces like 3 phase inverters for each Distributed Energy Source will be modeled. Microgrid optimization is performed with regards to the real power, reactive power, and frequency along with the stability and efficiency in both grids connected as well as islanded modes of operation.

Author: Sunim Acharya



Biography

Sunim Acharya is a Computer Science graduate student at Florida Polytechnic University, where he works as a Graduate Assistant. His current research interests include large language models, multi-agent systems, and human-AI interaction patterns. His thesis focuses on the intersection of artificial intelligence and workflow optimization, particularly exploring how ensemble agent-based swarms can enhance human-AI collaboration.

Abstract

This study presents a systematic evaluation of state-of-the-art Large Language Models (LLMs) in generating user stories and estimating story points for Agile Project Management. Leveraging a dataset comprised of 34 real-world projects, we developed a comprehensive framework combining Retrieval-Augmented Generation (RAG), Declarative Self-improving Python (DSPy) modules, Finetuned Agents, and DSPy optimizers. Our evaluation methodology introduces a novel composite scoring system that weights time efficiency, cost-effectiveness, model stability, and performance metrics, leading to the identification of four superior models. These models demonstrated varying strengths, with ROUGE-L scores ranging from 14.75% to 18.19% for semantic accuracy, and Points scores from 30% to 80% for estimation precision. A subsequent stakeholder survey validated the quantitative findings while revealing that a strategic combination of these models—leveraging Gemini's cost-efficiency, GPT-4o mini's semantic accuracy, and Qwen's point estimation precision—outperforms any single model approach. This research provides actionable insights for organizations seeking to optimize their Agile processes through AI integration, demonstrating that Mixture of Multimodal Interaction Experts can effectively balance performance, cost, and practical applicability in real-world Agile environments.

Symposium Committee

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