INTERNET 2

MS-CC

NSF

Agenda

Workshop at Coppin State University

September 30, 2025 | Baltimore, MD

Join the MS-CC

Wireless info:

SSID: eduroam (your home institution must participate)

OR

SSID: CSU-Guest (follow prompts to create account)

Pre-Workshop Survey

Acknowledgement

This material is based upon work supported by the National Science Foundation under Grant No. 2234326. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.

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EVENT CODE OF CONDUCT

Internet2 and the community are committed to promoting a positive environment at our events and conferences for our members and the research and education community. Our community values fair and equitable treatment of all individuals and expects our attendees to interact professionally and respectfully towards one another. Discrimination or harassment of any type, regardless of age, gender, sexual orientation, disability, physical appearance, race, or religion, is not consistent with our values and will not be tolerated.

Unacceptable behavior includes offensive comments; deliberate intimidation, stalking or unwanted attention; inappropriate physical contact; harassing, derogatory, or demeaning conduct; or other behavior that demonstrates a lack of professionalism or respect for another individual.

Participants are expected to follow these rules at all Internet2-hosted events. Participants violating these rules may be asked to leave an event without warning or a refund, at the discretion of Internet2. In some instances, such behavior may be reported to local or federal law enforcement officers. If you believe that you or someone else has been subject to these behaviors, please contact the Internet2 Ethics Hotline immediately at (877) 842-6829 or send a message via the web at www.reportlineweb.com/internet2.

Pre-Workshop Survey:

https://forms.gle/crH2ECht5kzkPRxU6

Workshop Materials:

https://bit.ly/CoppinMaterials

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Agenda Overview

<u>Day 1</u>	
Now	Welcome, Regional Roll Call & Institutional Framing
Next	Keynote Speaker
Mid AM	Panel: Coppin Technology & Research Readiness Showcase
Lunch + Networking	
Early PM	Strategic CI Panel
Next	AI Readiness and Research Panel
Mid PM	Institutional Roadmap Lab
Late PM	Group Photo, Reflections & Day Close

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Welcome

Dr. Dionne Curbeam, VP of IT, CIO, Coppin State University

Dr. Chanta M. Haywood, Provost, Coppin State University

Attendee Introductions

- Name
- Institution
- Role(s)

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About MS-CC

Amanda Tan
Associate Director for Research Development
MS-CC

THE VISION

MS-CC envisions a transformational partnership to promote advanced cyberinfrastructure (CI) capabilities on HBCU, HSI, TCU, and MSI campuses. We are advancing connections across campuses around data, research computing, teaching, curriculum development, professional development, and capacity-building.

We will learn and grow as a consortium, lifting up all participating institutions by advancing cyberinfrastructure for research and education across diverse fields, disciplines, and communities in ways that reflect the unique voices and interests of our communities.

We will engage as full contributors to the global R&E community.

Photo Credit: North Carolina Central University

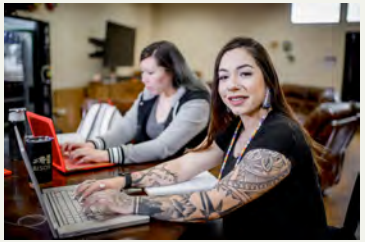

Photo Credit: Salish Kootenai College

Photo Credit: Jackson State University

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MS-CC: Coalescing HBCUs, TCUs, HSIs, and other entities

HBCUs (72)

- Alabama A&M University
- Alabama State University
- Albany State University
- Alcorn State University
- American Baptist College
- Benedict College
- Bennett College
- Bethune-Cookman University
- Bishop State Community College
- Bowie State University
- Cheyney University
- Claflin University
- Clark Atlanta University
- Coppin State University
- Dillard University
- Elizabeth City State University
- Fayetteville State University
- Fisk University
- Florida A&M University
- Florida Memorial University
- Fort Valley State University
- Grambling State University
- Hampton University
- Harris-Stowe State University
- Howard University
- Huston-Tillotson University
- JF Drake State Community & Technical College
- Jackson State University
- Jarvis Christian University
- Johnson C. Smith University
- Kentucky State University
- Knoxville College
- Langston University
- LeMoyne-Owen College
- Livingstone College
- Meharry Medical College
- Miles College
- Morehouse College
- Morehouse School of Medicine
- Morgan State University
- Morris College
- Norfolk State University
- North Carolina A&T State University
- North Carolina Central University
- Oakwood University
- Paul Quinn College
- Prairie View A&M University
- Savannah State University
- Shaw University
- South Carolina State University
- Southern University - New Orleans
- Southern University – Shreveport
- Southern University and A&M College
- Spelman College
- St. Augustine's University
- St. Philip's College
- Stillman College
- Tennessee State University
- Texas College
- Texas Southern University
- Tougaloo College
- Tuskegee University
- University of Arkansas – Pine Bluff
- University of Maryland Eastern Shore
- University of the District of Columbia
- University of the Virgin Islands
- Virginia State University
- Virginia Union University
- Voorhees University
- West Virginia State University
- Winston-Salem State University
- Xavier University

HSIs (27)

- California State University – Dominguez Hills
- California State University – Northridge
- California State University – Sacramento State
- Essex County College
- Florida Atlantic University
- Goshen College
- Housatonic Community College
- Houston Christian University
- InterAmerican University of Puerto Rico
- Los Angeles Harbor College
- Mendocino College
- Merced College
- Northern Arizona University
- Oxnard University
- Taft College
- Texas A&M University
- Texas Tech University
- The University of Arizona
- University of California – Riverside
- University of Illinois – Chicago
- University of Nevada – Las Vegas
- University of New Mexico
- University of Redlands
- University of Texas – El Paso
- University of Texas Health Science Center – San Antonio
- West Texas A&M University
- William Paterson University

TCUs (16)

- Aaniiih Nakoda College
- Bay Mills Community College
- Blackfeet Community College
- Cankdeska Cikana Community College
- College of the Menominee Nation
- College of the Muscogee Nation
- Diné College
- Fond du Lac Tribal and Community College
- Little Big Horn College
- Little Priest Tribal College
- Navajo Technical University
- Nebraska Indian Community College
- Salish Kootenai College
- Sinte Gleska University
- Turtle Mountain Community College
- United Tribes Technical College

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MS-CC: Coalescing HBCUs, TCUs, HSIs, and other entities

Affiliate – Institutional (52)

- Arizona State University
- Brandeis University
- Chicago State University
- Clayton State University
- Clemson University
- College of the Marshall Islands
- Colorado State University
- Cornell University
- Fordham University
- Fort Lewis College
- George Washington University
- Georgia State University
- Georgia Tech
- Harvard Medical School
- Harvard University
- Indiana University
- Louisiana State University
- Montana State University
- New Jersey Institute of Technology
- North Carolina State University
- Penn State University
- Purdue University
- Thomas Edison State University
- University of Alabama
- University of Alberta
- University of British Columbia
- University of California – Berkeley
- University of California – Davis
- University of California – San Diego
- University of Chicago
- University of Colorado – Boulder
- University of Delaware
- University of Illinois – Urbana-Champaign
- University of Maryland – Baltimore County
- University of Maryland – College Park
- University of Michigan
- University of Minnesota – Twin Cities
- University of Mississippi
- University of Montana
- University of North Carolina – Asheville
- University of North Carolina – Greensboro
- University of North Carolina – Pembroke
- University of Oklahoma
- University of Pennsylvania
- University of South Carolina
- University of Southern Mississippi
- University of Tennessee – Knoxville
- University of Utah
- University of Virginia
- University of Wisconsin – Madison
- Villanova University
- Virginia Commonwealth University

Affiliate – Not for Profit (30)

- American Indian Higher Education Consortium
- Air Force Office of Scientific Research
- Arkansas Economic Development Commission
- Bill & Melinda Gates Foundation
- Campus Research Computing Consortium (CaRCC)
- CI Compass
- Coalition for Academic Scientific Computation
- Edge, Inc.
- HBCU Library Alliance
- Internet2
- Lawrence Berkeley National Lab
- MARIA
- MDREN
- Network Startup Resource Center
- NTIA
- Ohio Supercomputer Center
- Pacific Northwest Gigapop
- Pittsburgh Supercomputer Center
- Regulated Research Community of Practice
- San Diego Supercomputer Center
- Sicangu Lakota Treaty Council
- South Carolina Commission for Minority Affairs
- Southern Crossroads (SoX)
- TACC
- The Quilt
- TrustedCI
- University Corporation for Atmospheric Research (UCAR)
- United Negro College Fund (UNCF)
- United State Research Software Association
- Waymark Analytics

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Issues include:

- The evaluation criteria of federal grant programs that prevent resource-strained HBCUs and TCUs from being competitive among larger, well-funded institutions
- MS-CC campuses not only need to advance their CI and research infrastructure; they also need to build expertise to deploy and use CI tools and implementations
- Competing priorities in supporting the campus infrastructure and limited resources and staffing needed to implement, maintain, troubleshoot, and just keep the lights on to support the campus operating.
- Assumptions that a campus has done work towards identifying STEM research and education drivers that require the use of computational and other CI resources provided by these efforts and where the training becomes necessary.

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MS-CC Guiding Principles

Inclusion | Innovation | Stakeholder Value

MS-CC Purpose

- Increase access to cyberinfrastructure (CI) capabilities across academic disciplines
- Enhance communication between researchers, IT professionals, campus leadership, and between institutional members
- Support IT for research-enabled professional and career development
- Collective advocacy and partnerships

MS-CC Stakeholders

- Researchers, educators, and students
- IT/CI professionals
- Campus leadership
- Industry partners
- Foundations and funding agencies

MS-CC Origins

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Strength in Numbers. Power of Community.

- Join a vibrant community where you can collaborate, receive support, and advocate for our collective needs.
- Participate in MS-CC governance and committees.
- MS-CC organizes workshops at HBCUs, TCUs, and Internet2 events, and provides funding support for MS-CC participants.
- MS-CC facilitates community-driven experience sharing to support and raise awareness around key topics of interest to MS-CC participants.
- Participate in regional workshops about the importance of IT for Research.
- Stay apprised of funding, collaborator and community offerings.

Join NOW: https://www.ms-cc.org/join

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CI Center of Excellence Demonstration Pilot

Award # OAC-2137123

21st Century Research-Cyberinfrastructure for MSIs through the Minority Serving - Cyberinfrastructure Consortium: A phased approach to engage the Missing Millions

Award # OAC-2234326

Collaboratory in Climate Science

Supplement to
Award # OAC-2234326

CI Center of Excellence Demonstration Pilot *(Award # OAC-2137123)* **and 21st Century Research-Cyberinfrastructure for MSIs through the MS-CC: A phased approach to engage the Missing Millions** *(Award # OAC-2234326)*

Key Objectives: CI CoE Pilot

- Create a **connective and collaborative organization** that serves as a centralized hub for HBCUs, TCUs, and other MSIs to utilize for CI expertise, experience-sharing, and advocacy.
- Increase awareness, availability, and financial support for **CI professional development** for faculty, staff, and students at HBCUs, TCUs, and other MSIs.
- **Enhance communication** among researchers, university leadership, and CI professionals.

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NSF Award # 2137123 (pCoE) Accomplishments: October 2021 to October 2024

Engaging with the MS-CC Community

- 8 Workshops

39 HBCUs (36%*) attended a workshop to date
9 TCUs (24%**) attended a workshop to date

- 2023 Inaugural Annual Meeting and 2024 2nd Annual Meeting
  41 HBCUs (38%*) attended an Annual Meeting
  5 TCUs (14%**) attended an Annual Meeting

- Monthly All Hands Meetings
  2024 YTD averaging 49 participants from 33 institutions

- **3 Communities of Practice Launched**
  - May 2023: CI Plan CoP
  - October 2023: Cybersecurity CoP
  - July 2024: IT Leaders CoP

Funded MS-CC Participant Travel, Attendance at Events

*Of all 108 HBCUs; **Of all 37 TCUs

Engaging with Students

- May 2023: Student Hackathon @ Annual Meeting
- March 2024: Cyber-simulation at Benedict College
- March 2025: Cyber-simulation at Shorter College

Growing the MS-CC Community

500+ participants representing 200 organizations

Professional Development & Training Opportunities

- March 2023: ScienceDMZ, Network Testing, & Cybersecurity at Claflin
- September 2023: ScienceDMZ & Networking for All at TechEX23
- Winter 2023/2024: NSF CI Funding for HBCUs, TCUs, other MSIs
- January 2024: CLASS Essentials (AWS, Azure, GCP) for MS-CC
- May 2024: Network Technologies for Data Movement Supporting Research & Education on Campus Networks
- July-December 2024: Harvard Technology Enablement Program (pilot)
- August & September 2024: IAM Training with Cirrus Identity (pilot)
- December 2024: Network Technologies for Dta Movement Supporting R&E on Campus Networks at TechEx

MS-CC Community Surveys to Inform Activities

- 2022 & 2023: Stakeholder Pulse Surveys (Waymark Analytics)
- CI Facilitation Services (Summer 2023)
- Annual Meeting Surveys (May 2024)
- AI Survey (May 2024)

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CI Center of Excellence Demonstration Pilot *(Award # OAC-2137123)* **and 21st Century Research-Cyberinfrastructure for MSIs through the MS-CC: A phased approach to engage the Missing Millions** *(Award # OAC-2234326)*

Key Objectives: Phased Approach

- **Increase access to shared CI resources** for MS-CC organizations.
- **Increase and accelerate CI-enabled research and education capacity** at MS-CC campuses by piloting a model(s) for cyberinfrastructure development at HBCUs, TCUs, and other minority-serving institutions.
  - Initial allocation of **at least five (5) Proof of Concept Grant (PoCG) Awards** to select MS-CC institutions for funding and support for **CI strategic planning and capacity-building that advance CI-enabled education and research.**

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NSF Award

Minority Serving Cyberinfrastructure Consortium (MS-CC)
Award # OAC-2234326
Start date: 10/1/2022 Projected end date: 9/30/2027

21st Century Research-Cyberinfrastructure for MSIs through the Minority Serving - Cyberinfrastructure Consortium (MS-CC): A phased approach to engage the Missing Millions

Principal Investigator:
Ana Hunsinger,
Internet2
ana@internet2.edu

Co-Principal Investigators:
Al Anderson,
Salish Kootenai College
James Brenn,
Claflin University
Dr. Deborah Dent,
Jackson State University

Objective

- Significantly ***increase and accelerate cyberinfrastructure-centric research capacity*** at MS-CC campuses through a set of new approaches from which we can then learn and potentially frame a repeatable, successful model for cyberinfrastructure implementations on the campuses of minority-serving institutions.

Approach

- Initial allocation of ***at least five (5) Proof of Concept Grant (PoCG) Awards*** to select MS-CC institutions that allows each to perform campus specific CI assessments that drive an overall CI strategic plan and a roadmap to pioneer new capabilities that advance CI-centric research, and empower scientific advancements.
- Establishing ***teams of expert CI Professionals*** that will provide support to the PoCGs through consultation, implementation of expanded CI capabilities, and leading efforts to ensure these institutions are participating and collaborating with the broader CI ecosystem.
- ***MS-CC as a more robust effort*** so that it can be able to support future PoCGs and to support a more directed approach to ensure these institutions are participating and collaborating with the broader CI ecosystem.

NSF Award # 2234326 Ongoing Activities

All Proof-of-Concept Grant (PoCG) Activities

- Stakeholder Alignment toward formalized CI governance
- PoCG-funded CI Facilitator or CI Coordinator implementation

Claflin University

- R&E Facilitation informing HPC investment
- eduroam implementation

Jackson State University

- R&E Facilitation informing HPC investment
- Network Enhancement, with eduroam implementation

Salish Kootenai College

- R&E Facilitation informing conference participation, CI governance
- Virtual Lab and Network development, with eduroam implementation

Nashville HBCUs

- Chartered *Nashville HBCU CI Collaborative*
- Coordinated network development and campus CI Plans

Multi-Campus CI Collaboration

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NSF Award

Minority Serving - Cyberinfrastructure Consortium (MS-CC)

Supplement to Award # OAC-2234326

Projected Start date: 10/1/2023 Projected end date: 9/30/2025

MS-CC Collaboratory in Climate Science

Principal Investigator:
Ana Hunsinger,
Internet2
ana@internet2.edu

Co-Principal Investigators:

Al Anderson,
Salish Kootenai College

James Brenn,
Claflin University

Dr. Deborah Dent,
Jackson State University

Objective

- Develop a **Collaboratory in Climate Science** that **pairs cyberinfrastructure expertise and capabilities with ongoing climate science research initiatives**, strengthening the pipeline of faculty, staff, and students from HBCUs and TCUs with expertise in cyberinfrastructure-enabled climate science research and learning.
- Build **community-driven collaboration around climate science** across the MS-CC and key partners to develop long term education and research community efforts.

Approach

- The MS-CC Collaboratory in Climate Science will be a **campus-based effort** that focuses on local community or regional climate issues and concerns as well as workforce development.
- MS-CC will **partner with three anchor institutions**, including a climate-focused TCU and two HBCU National Oceanic and Atmospheric Administration (NOAA) Cooperative Science Centers (CSCs), to **develop campus-based events, collaboration opportunities, and summer internships** for participants from multiple HBCUs and TCUs.
- MS-CC will use its engagements to carry out **Communities of Practice to support informal collaboration in climate science and CI to identify shareable solutions in CI**, while serving as an opportunity for the broader community to communicate and share information with the MS-CC.

INTERNET2

JSU JACKSON STATE UNIVERSITY

SALISH KOOTENAI COLLEGE

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Panel Discussion: Cybersecurity
Threat Landscape


The Minority Serving-
The Minority Serving-


CONSORTIUM
nnual Meeting
Inaugural MS-CC Annu
Atlanta, GA
May 10-11, 2023

Strength in Numbers. Power of Community.

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Join NOW: https://www.ms-cc.org/join

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Pre-Workshop Survey:

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Break

CI Quick Poll:

https://bit.ly/CAUCIQuick

Workshop Resources:

https://bit.ly/CAUMaterials

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Pathways to Research Institution Status: Funding, Infrastructure, and Campus Readiness

Keynote Speaker: Dr. Doretha Williams, Association of African American Museums, Smithsonian

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Break

Until 10:30 AM

Wireless info:
SSID: eduroam (your home institution must participate)

OR

SSID: CSU-Guest

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Coppin Technology & Research Readiness Showcase

Moderator: Dr. Denyce Watties-Daniels, Chairperson of Coppin's Faculty Research and Development Committee

Panelists:

Thomas Smith, *MD-REN*; Dr. Dondra Bailey, *Coppin State University*; Dr. Mintesinot Jiru, *Coppin State University*; Taha Mohammed, *Coppin State University*; Marcus Hammond, Coppin State University; Tamara Petronka, *Maryland Enterprise Education Consortium;* Zayed Mohammed Uddin, *Student, Coppin State University*

Coppin State University Technology & Research Readiness Showcase

MS-CC Workshop

Tuesday, September 30, 2025

Agenda

Dr. Denyce Watties-Daniels, Moderator

- **Harnessing MD-REN and External Connectivity for Research and Innovation**
  Mr. Thomas R. Smith, III
- **Advancing Teaching and Research with a Modernized Network**
  Mr. Taha Mohammed
- **Transforming Teaching, Learning, and Research Possibilities with Azure Labs**
  Mr. Marcus Hammond
- **Procurement with Purpose: Leveraging MEEC to Expand Technology Research Capacity**
  Ms. Tamara Petronka
- **Transforming Access and Equity through “Connect Eagle Nation” NTIA Broadband Grant**
  Dr. Dondra Bailey and Dr. Mintesinot Jiru
- **Performance and Sustainability Analysis of CH_3NH_3, CH_3NH_2Sn, and CH_3NH_2Br Based Perovskite Solar Cells via SCAPS-1D Simulation**

MDREN Benefits and Impact on Research Computing

Enhancing collaboration and innovation through advanced networks

Thomas R. Smith, III
Chair, MDREN Executive Board
Deputy Chief Information Officer
Division of Information Technology
Coppin State University

September 2025

MDREN

What is MDREN?

Maryland Research and Education Network (MDREN)

Statewide High-Speed Backbone

MDREN provides a high-speed backbone connecting universities, colleges, and research labs across Maryland for seamless collaboration.

Global Research Connectivity

MDREN links Maryland institutions to national and global research networks, expanding their research capabilities and reach.

Optimized for Research Needs

MDREN is designed with high throughput and low latency to support real-time collaboration and large data transfers.

Enhancing Research & Education

MDREN offers scalable networking solutions that strengthen Maryland's research and educational landscape.

MDREN


MDREN
Maryland Research and Education Network
PENNSYLVANIA
MARYLAND
NEW JERSEY
WEST VIRGINIA
VIRGINIA
DELAWARE
Frostburg
Hagerstown
Baltimore
Havre De Grace
Dover
Bowie
Annapolis
Chesapeake
UMCP
Equinix Ashburn
Washington DC
Georgetown
Cambridge
Salisbury
Salomons
Towson
MSU
Baltimore
CSU
UB
Havre De Grace
Network Maryland
UMB
UMBC
2 mi
20 mi

Core Services Offered by MDREN

High-Speed Network Connectivity

MDREN upgrades include a 400Gb core backbone and 100Gb campus links to support fast, reliable connectivity.

Cloud and Internet2 Access

The network offers direct access to Internet2 and major cloud providers to enhance computing and storage capabilities.

Content Delivery and Security

Peering with content providers and DDoS mitigation services optimize content delivery and network security.

Collaboration and HPC Access

MDREN provides video conferencing, collaboration tools, and HPC pilot programs for smaller campuses.

Benefits for Research Computing

Advantages of MDREN for Researchers

High Performance Connectivity
MDREN provides high throughput and low latency, enabling large data transfers and real-time collaboration for researchers.

Cost Efficiency
Shared backbone infrastructure and peering arrangements reduce costs significantly for member institutions.

Access to HPC and Cloud
Researchers gain direct access to high-performance computing and cloud services, improving workflow efficiency.

Security and Collaboration
Robust security ensures data protection while fostering a collaborative community for sharing expertise and resources.

Impact and Use Cases

Real-World Applications of MDREN

Bandwidth Expansion for Underserved Areas
MDREN expands bandwidth for rural and underserved campuses, ensuring equitable high-speed internet access through NSF grants.

High Performance Computing Support
The HPC pilot program enables small institutions in USM to engage in advanced research with enhanced computing resources.

Regional Collaboration and Infrastructure
MDREN's partnership in the Mid-Atlantic Ring with KeystoneREN and University of Delaware strengthens regional research networks.

Support for Advanced Research Fields
MDREN supports cutting-edge AI, data science, big data, and hybrid cloud computing for innovative research.

Challenges and Considerations

Obstacles in Network Expansion

Last-mile Network Bottlenecks
Last-mile connectivity issues at campuses create performance bottlenecks that limit the network's overall efficiency.

Funding and Sustainability
Ongoing infrastructure upgrades require strategic funding plans to ensure long-term sustainability and growth.

Coordination Complexity
Multiple institutions must coordinate governance and resource allocation, adding layers of complexity to network expansion.

Security and Training
Ensuring data privacy and training researchers on HPC and cloud tools is essential for secure, effective network use.

Future Directions

Strategic Goals for MDREN

Network Backbone Upgrade
Upgrading to a 400Gb backbone will significantly enhance Maryland's network capacity and performance.

HPC Program Expansion
Expanding the pilot HPC program into a permanent service ensures consistent access to advanced computing resources.

Regional Research Network
Building a Mid-Atlantic research network ring will improve collaboration and connectivity among institutions.

Cloud Integration and Support
Integrating with cloud providers enhances scalability while training programs support effective resource use.

THANK YOU.

COPPIN STATE UNIVERSITY | BE MORE.

2500 West North Avenue, Baltimore, MD 21216-3698

WWW.COPPIN.EDU

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Advancing Teaching and Research with a Modernized Network

Taha Mohammed
Assistant Director Campus Infrastructure Team
Division of Information Technology
Coppin State University

Why Modernize Educational Network?

- Modern education relies on high-speed, secure, and scalable networks
- Teaching and research demand uninterrupted access to digital tools, cloud, and data
- Smart Classrooms Technologies
- LMS - Blackboard with reliable access
- Hybrid/Remote Learning: Consistent performance regardless of student location

Research in the Age of Data

- High-Performance Computing (HPC): Fast data processing and modeling
- Collaboration Tools: Real-time data sharing with researchers worldwide
- Data Storage & Retrieval: Access large datasets without lag
- Secure Research Environments: Compliance with data privacy standards

Aging Infrastructure

- Installed in 2013
- Old architecture that was not build for modern IT networks
- Prone to downtime
- No software upgrade or patches available
- De-centralized Management

Network Upgrade Project

- 2022 Project approval
- Vendor discussion
- Hands-on equipment testing
- Finalizing vendor, proposal and architecture
- Gartner vetting
- Budget
- Spring 2024 PO issued

- Extreme Networks selected
- Inside-Out phased project approach
- Phase 1 – Datacenter – Summer ‘24
- Phase 2 – Core Upgrade – Summer ‘24
- Phase 3 – Campus Buildings – Fall ‘24
- Phase 4 – SmartClass Rooms – Spr ’25

- 8 Datacenter Switches – 2 locations
- 4 Core Switches – 4 locations

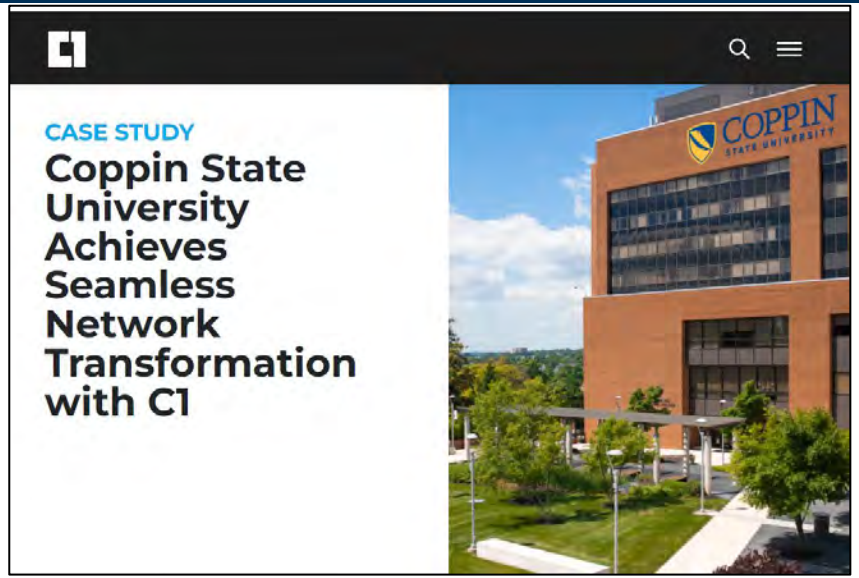
Outcomes

- Modern Network with student centric approach
- Supports high bandwidth to accommodate growing network needs
- Better Wi-Fi connectivity across campus
- Centralized Management
- Reliable connectivity for learning
- Fully reductant design
- Support for data-intensive projects
- Foundation for advanced digital initiatives like AI, Research Initiatives, VR, etc.

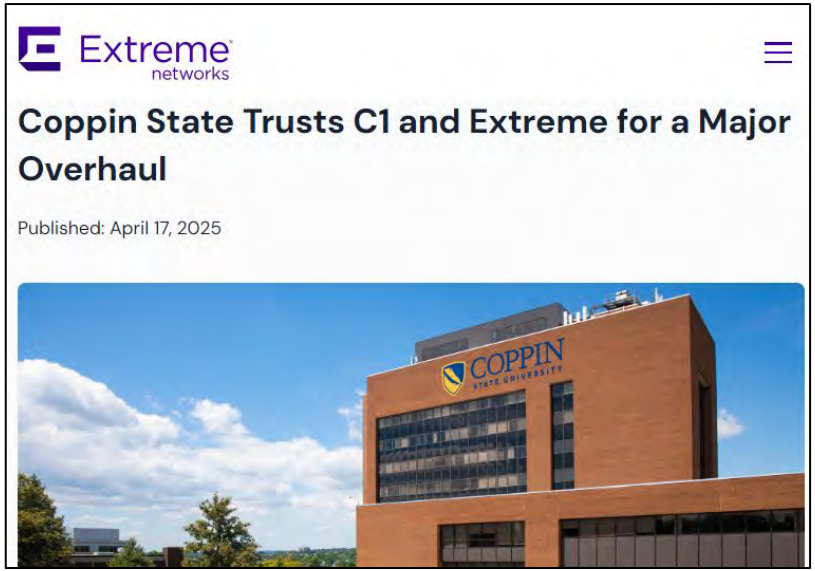
Statistics

- Edge connectivity – 20Gbps to 50Gbps – dual redundancy
- Core backbone capacity – 40Gbps to 100Gbps – Full redundant mesh design
- 400% increase in WiFi connectivity – 1Gbps to 5Gbps per AP*
- Datacenter backbone supports 100Gbps connectivity – Full redundant mesh design
- Two internet connection at 25Gbps – 100Gbps planned
- Wi-Fi only Dorm Rooms

Case Studies



C1 Case study:
https://www.onec1.com/resources/case-study/coppin-state-university



Extreme Case Study:
https://www.extremenetworks.com/resources/case-study/coppin-state-trusts-c1-andextreme-for-a-major-overhaul

THANK YOU.

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Azure Lab Services

Transforming Teaching, Learning, and Research Possibilities

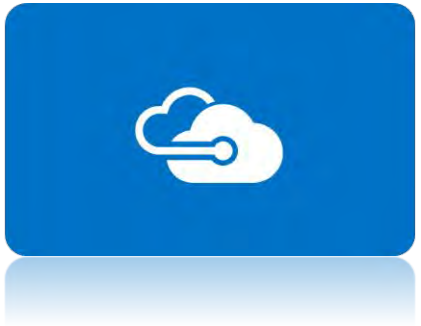
September 2025

Agenda

- What is Azure Lab Services?
- Benefits of Azure Lab Services
- Azure Lab Services @CSU
- Summary

What is Azure Lab Services?

- Microsoft's Cloud Computing platform
- Computer Labs in the cloud



Benefits of Azure Lab Services

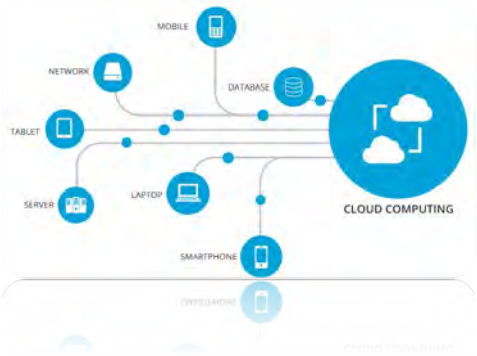
Flexibility…..

- Build Windows or Linux environments
- Create and Experiment
  - Ideal for deploying labs for
    - courses, hack-a-thons, hands on labs,
    - Environments for demo,
    - PCs Development and test environments
  - Provision each lab with specific software and settings

Benefits of Azure Lab Services

Accessibility…

- Access Any Time, Any Where, Any Device
- Single Sign on available



Benefits of Azure Lab Services

Simple and easy to use…

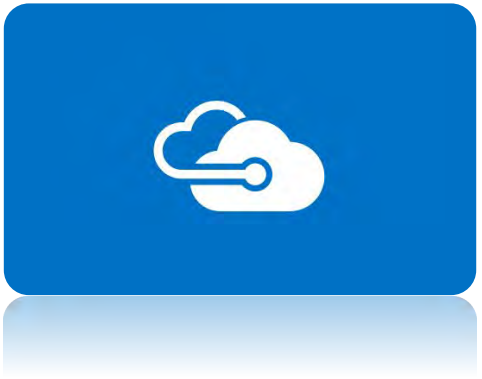
» Share Labs via sharing feature or URL link

» From a dashboard, lab users can easily join and view resources

» Lab resources are schedulable

Benefits of Azure Lab Services

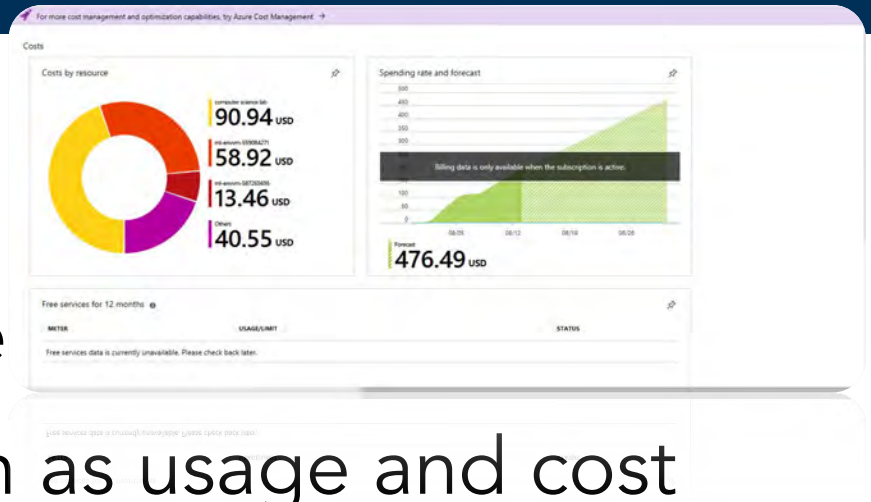
Cost optimization…



- No upfront cost
- No termination fees
- Pay as you go
- Per-hour billing
- Streamline costs with usage parameters, by user or by lab

Benefits of Azure Lab Services

Dashboard Analytics…



» Track recipient's lab use

» See activity trends such as usage and cost from our dashboard

Azure Lab Services @CSU

The Pilot Lab….

- Talon Lab - 50 PCs
- Shared by 3 Professors in Comp Sci
- 30 Users Registered
- Over 5000 user hours

Azure Lab Services @CSU

The Pilot Lab….

User reactions

- “Very fast, I like it”, S. Acharya
- “I will be using it for my class”, A. Gonzalez
- “This is great, it like I have my own pc in the cloud”, M. Johnson

Azure Lab Services @CSU

Currently….

- Total # of Semesters 14
- Total # of Courses 118
- Total # of Labs 117
- Total # of Stud PCs 766
- Total # of Computing Hrs. 33,943

Azure Lab Services @CSU

Top courses @CSU that use Azure

- MISY 356 12 times
- COSC 199 11 times
- MISY 360 10 times
- MISY 355 8 times
- COSC 406 7 times
- COSC 316 7 times
- COSC 312 6 times
- COSC 409 5 times
- COSC 221 5 times

Summary…

» Azure Lab Services revolutionizes teaching, learning, and research by providing a scalable, cost-effective, and managed virtual lab environment in the cloud.

» Azure Lab Services eliminates the need for expensive, on-premise physical computer labs and allows students and researchers to access powerful computing resources from anywhere, on any device, at anytime.

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Maryland Education Enterprise Consortium

SEPTEMBER 2025

MEEC Defined!

Hosted by the University System of Maryland

- Member open to K-20 public, private, federal institutions and libraries
- MEEC leverages its size to negotiate IT Hardware, Software and Services Contracts
- Approximately 200 member institutions including all USM, CC and K-12 public institutions
- 250,000 FTE of Faculty and Staff
- 1.25M Students

Contracts

Solicitation

- Sole Source
- Single Vendor Award
- Multi-vendor Award

Discounts and Savings

MEECs Value Add

- Ease of use saves time
- Terms & Conditions established
- Higher brand discounts / Lower max hourly rates
- Members receive at minimum the discount negotiated
- Members can always further negotiate
- Multi-Vendor contracts provides options

Beyond the Contracts

Member Engagement

- Newsletter
- Vendor Webinars / Event Journal
- Member Conference and Vendor Showcase
- Outreach

Help MEEC!

- Volunteer
- Complete Surveys
- Spotlight / Member Webinars
- Conferenc

Help You!

- Interaction with Members
- Gain Knowledge
- Share Knowledge

MEEC

Contact

- www.meec-edu.org
- meecadmin@usmd.edu
- tpetronka@usmd.edu

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CONNECT EAGLE NATION

National Telecommunications and Information Administration (NTIA)

Connecting Minority Communities (CMC) Pilot Program

Connect Eagle Nation

Dondra Bailey (PI) and Mintesinot Jiru (Co-PI)

MS CC

September 30, 2025

Overall Program Goal

NTIA - Office of Minority Broadband Initiatives (OMBI)

Working to directly address the lack of broadband access, connectivity, adoption, and equity to close the digital divide.

Connecting Minority Communities Pilot Program (CMC)

- **$268 million grant program supporting HBCUs, TCUs, and MSIs.**
- **Funds can be used to purchase broadband internet access and eligible equipment.**
- **Supports hiring and training of information technology personnel.**

Data Snapshot: Digital Literacy & Access in West Baltimore

Broadband Access: 40.7% of Baltimore households lacked wireline broadband (ACS, 2018). In Coppin's Anchor communities, ~46% lack broadband.

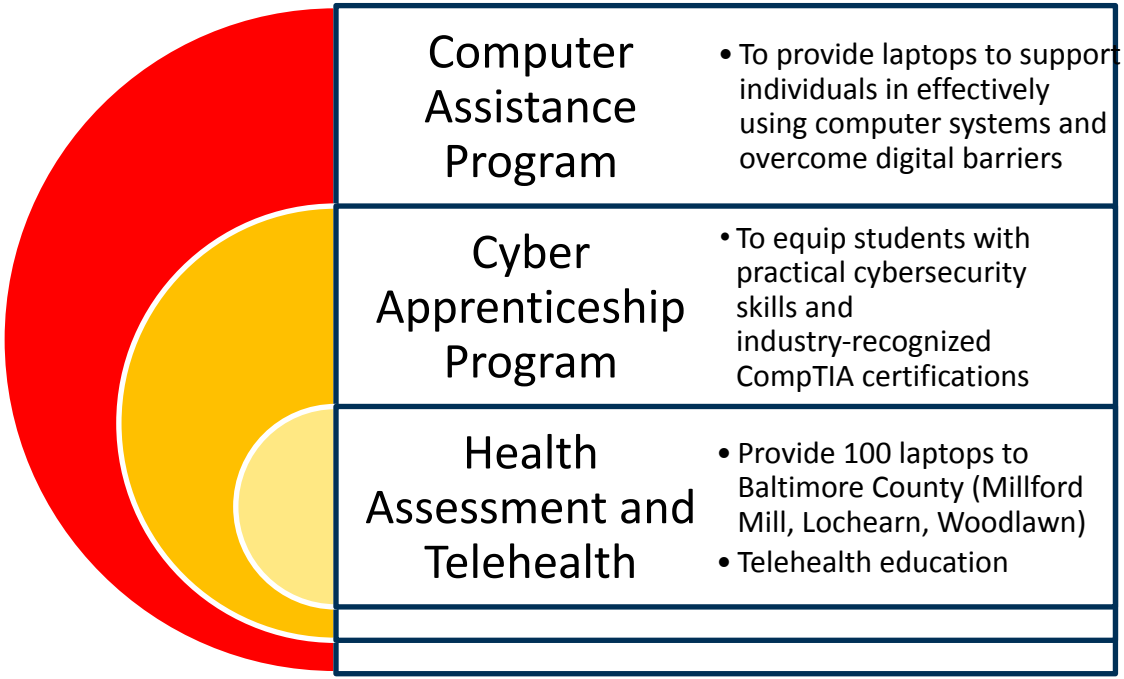
Device Access: One in three Baltimore households lack a desktop or laptop computer. In anchor communities, ~28% have no computer.

Skills Gaps: 92% of U.S. jobs require digital skills, yet one in three workers lack them (National Skills Coalition, 2021).

Equity Context: Anchor neighborhoods have ~25,400 residents; 91% identify as Black or African American; nearly half fall below 250% of the poverty threshold.

Source: US Census Bureau, American Community Survey (ACS) 2016-2020

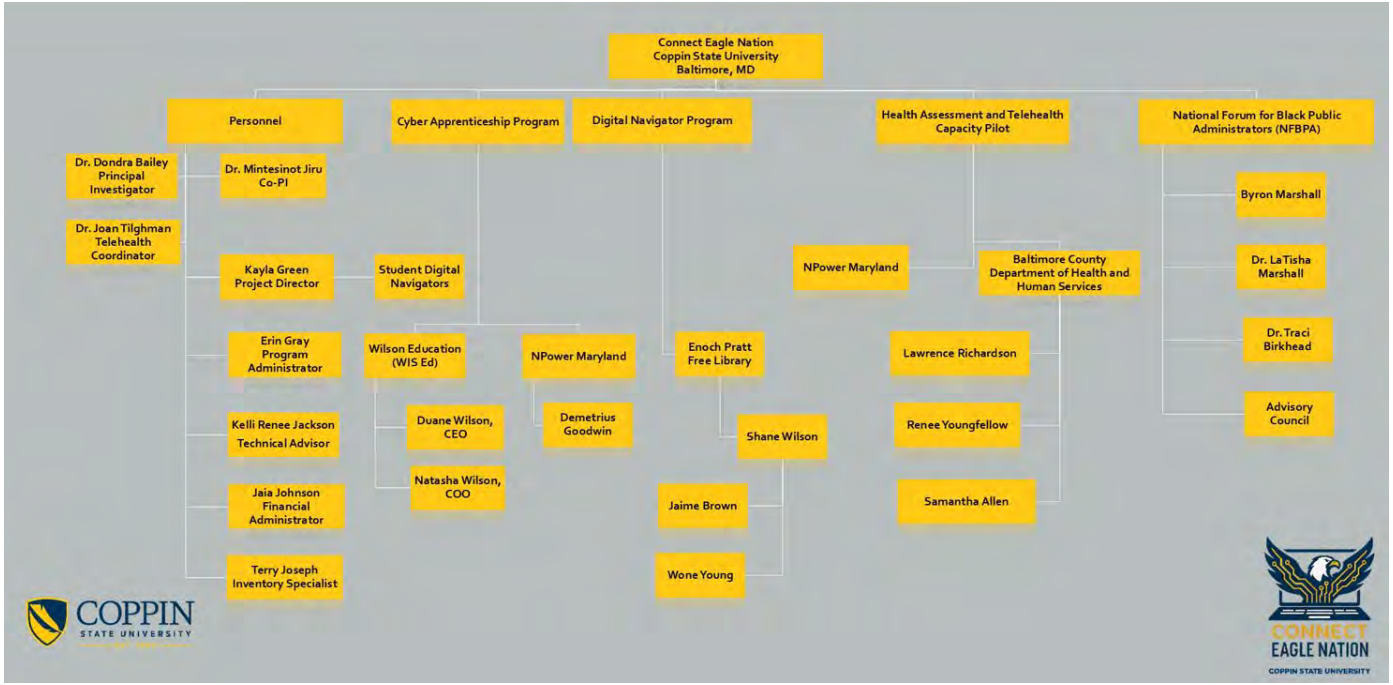
Goals and Programmatic Activities



Computer Assistance Program	• To provide laptops to support individuals in effectively using computer systems and overcome digital barriers
Cyber Apprenticeship Program	• To equip students with practical cybersecurity skills and industry-recognized CompTIA certifications
Health Assessment and Telehealth	• Provide 100 laptops to Baltimore County (Millford Mill, Lochearn, Woodlawn) • Telehealth education

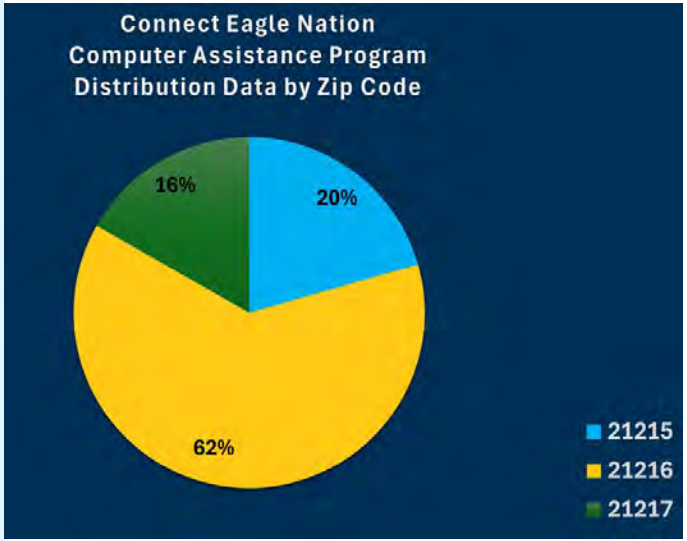
CONNECT EAGLE NATION

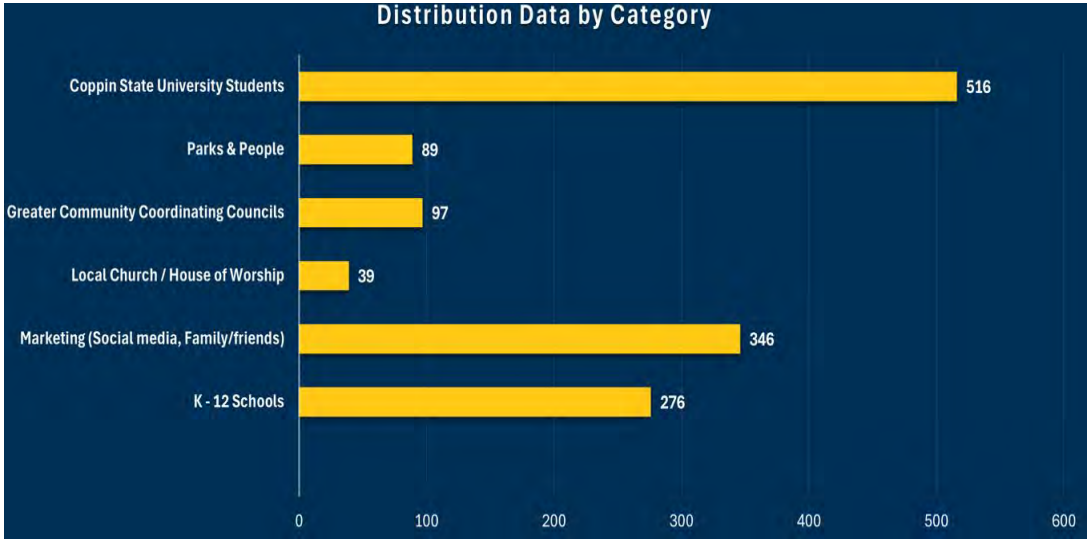
Organizational Chart



Computer Assistance Program

1,400 laptops distributed to Anchor Community residents





Connect Eagle Nation Impact

- Partnered with NPower for Resource Fair on June 17, 2025, at CareFirst
- Partnering with Baltimore City for Digital Literacy Resource Fair (1st for West Baltimore) – October 9, 2025
- Digital Navigation Program in partnership with Enoch Pratt trains Coppin student Navigators and builds digital navigation courses and workshops.
- Workforce training through WIS ED (CompTIA) and NPower (CompTIA and Google certifications), preparing participants for IT careers. Training has been provided for over 60 students.
- Quarterly Advisory Council guiding development of a West Baltimore Digital Equity Strategic Plan.

Impact: Health Assessment and Telehealth

- 100 Laptops distributed through the Baltimore County Health Department to eligible community members with chronic illnesses.
- Telehealth education led by NPower with oversight from Coppin's School of Nursing, expanding healthcare access.

Sustainability Strategic Plan

- Three Digital Hubs across campus: Library, Science and Technology Center, College of Business
- Strengthen community partnerships
- Expand graduate coursework, work-study, and internships to support program evaluation and digital navigation.
- As an anchor institution, Coppin will continue to bridge the digital divide in the surrounding communities

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CONNECT EAGLE NATION

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https://www.coppin.edu/connecteaglenation

Email
ConnectEagleNation@coppin.edu

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Perovskite Solar Cells

Material Comparison, Unsupervised Learning Analysis & SCAPS-1D simulation study

September 30, 2025

Outline

- Introduction & Motivation
- Simulation Setup & Device Architecture
- Quantum Efficiency & Absorption
- I–V Characteristics & PCE
- Electrical Metrics & Defect Influence
- Unsupervised Clustering Analysis
- Conclusions & Outlook

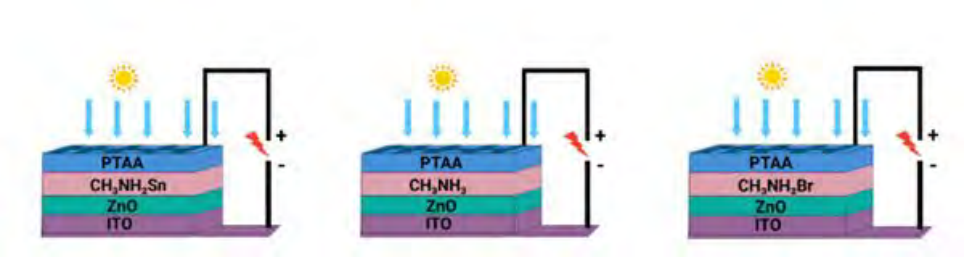
Introduction & Motivation

- Perovskite solar cells (PSCs) have achieved record efficiencies exceeding 25%, outperforming many commercial PV technologies.

- Lead toxicity and environmental concerns motivate the search for lead-free alternatives, such as tin- and bromide-based perovskites.

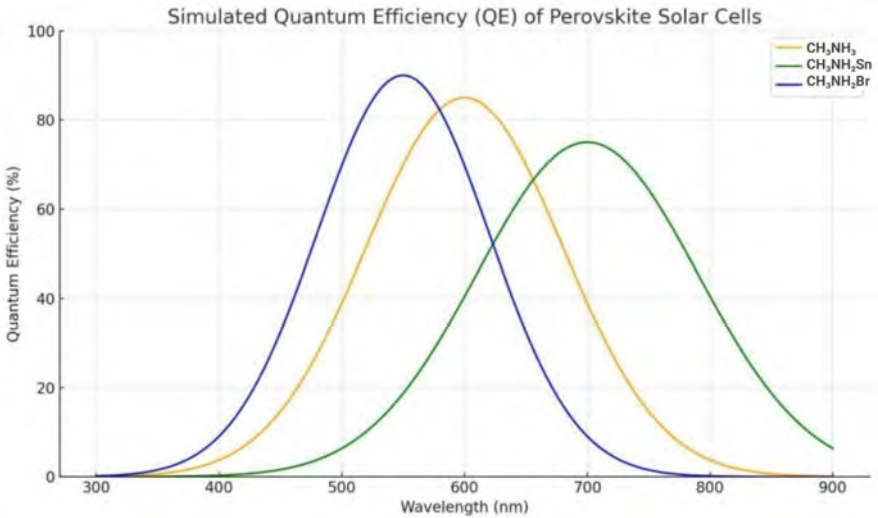
- Our study compares CH_3NH_3, CH_3NH_2Sn, and CH_3NH_2Br under identical SCAPS-1D conditions to evaluate optical, electrical, and device metrics.

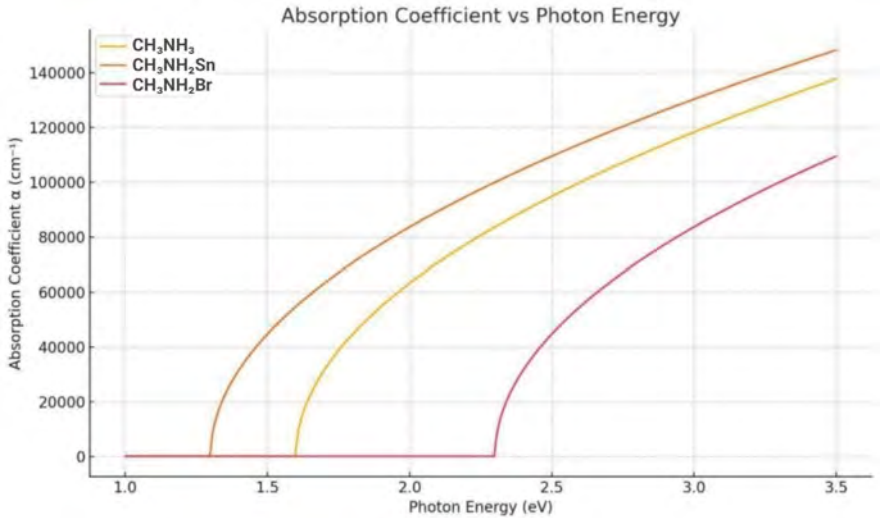
Simulation Setup & Device Architecture



- p-i-n planar heterojunction: ITO / PTAA / Perovskite / ZnO / Ag
- SCAPS-1D simulations under AM 1.5 G illumination (1000 W m^{-2}) at 300 K
- Absorber thickness 300–500 nm; defect density 10^{14}–10^{16} cm^{-3}; material parameters from literature
- Evaluate quantum efficiency, I–V, series resistance, defect influence and clustering

Quantum Efficiency & Absorption



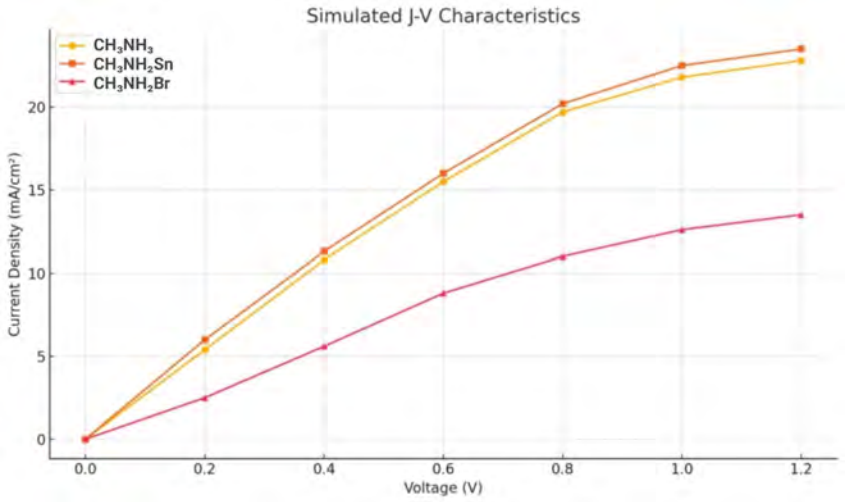


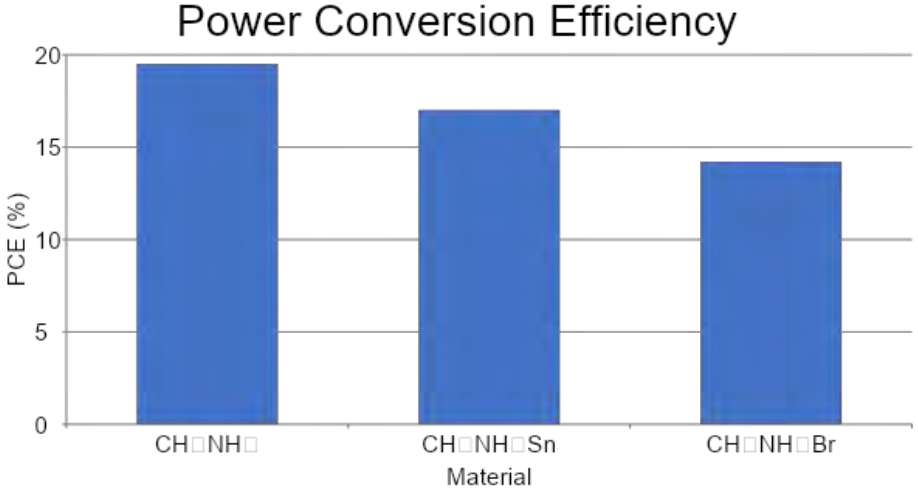
- CH_3NH_3 peaks near 600 nm – balanced absorption
- CH_3NH_2Sn peaks near 700 nm – red-shifted absorption
- CH_3NH_2Br peaks near 550 nm – high-energy photons

- CH_3NH_2Sn (1.3 eV) absorbs into infrared
- CH_3NH_3 (1.6 eV) covers the visible spectrum
- CH_3NH_2Br (2.3 eV) absorbs UV/blue photons

These two plots indicate the (wavelength vs bandgap): each material “specializes” in a different slice of the spectrum.

I–V Characteristics & PCE

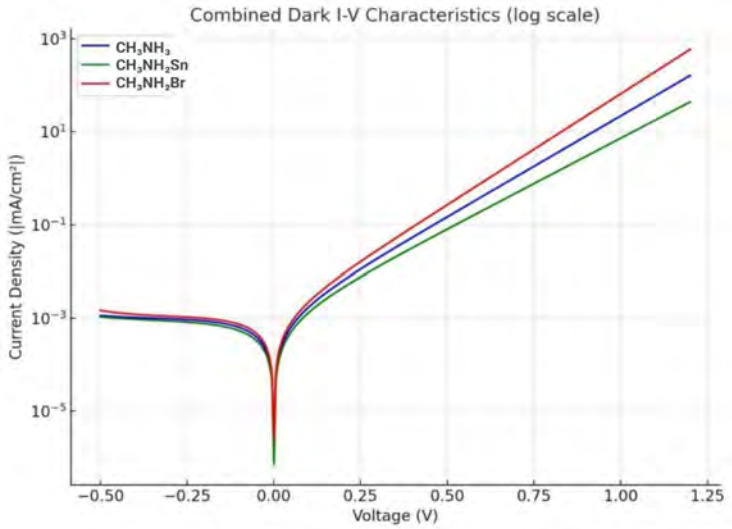


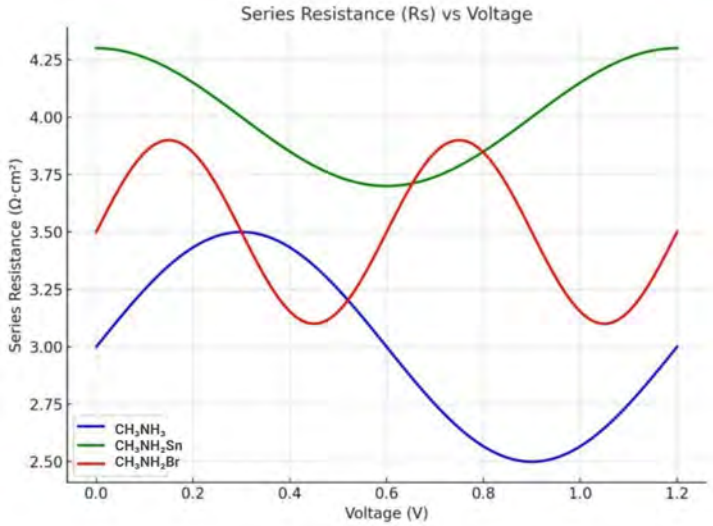


- CH_3NH_3 shows the highest current density and balanced V_{OC}
- CH_3NH_2Sn has high photocurrent but slightly lower V_{OC}
- CH_3NH_2Br delivers the lowest current due to its wide bandgap
- PCE: 19.5 % (CH_3NH_3), 17.0 % (CH_3NH_2Sn), 14.2 % (CH_3NH_2Br)

In single junctions, the balanced gap of CH_3NH_3 wins; Sn's long-λ boost doesn't fully compensate its lower Voc; Br trades current for higher-energy photons.

Dark I–V Characteristics & Series Resistance

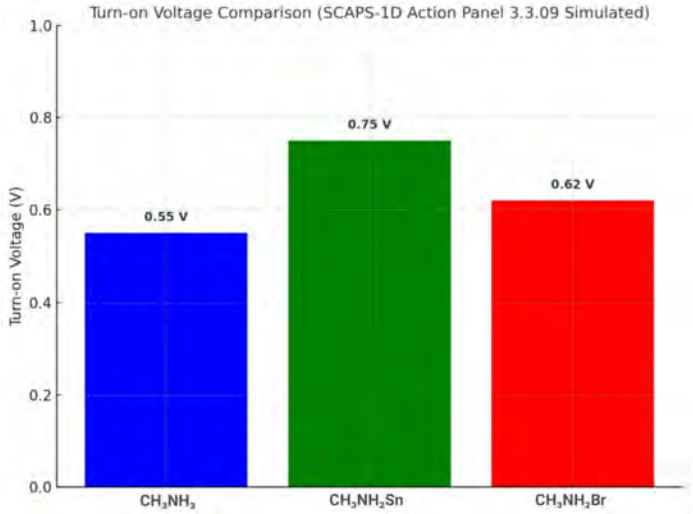


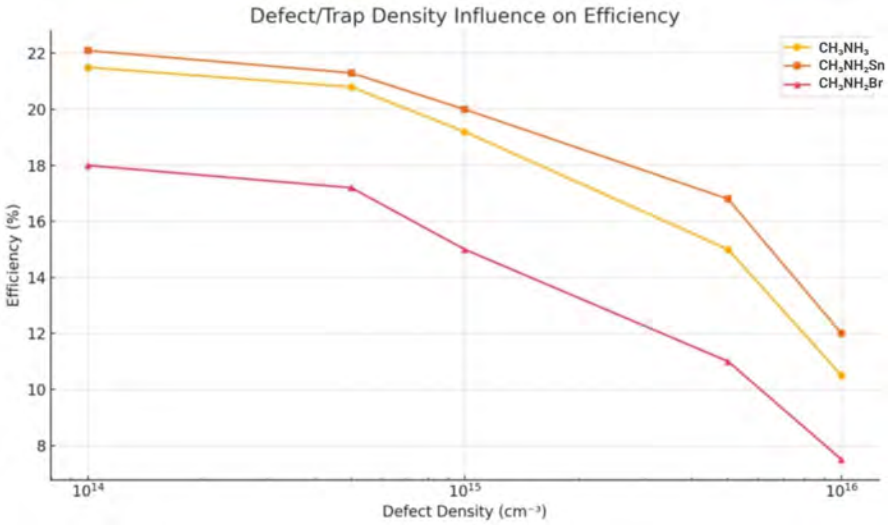


- CH_3NH_2Br exhibits the highest forward dark current; CH_3NH_2Sn the lowest
- All materials show negligible reverse leakage, indicating good diode quality

- Series resistance decreases with voltage from ~3.7 to ~2.5 Ω·cm²
- Average Rs: 3.05 (CH_3NH_3), 4.04 (CH_3NH_2Sn), 3.55 Ω·cm² (CH_3NH_2Br)

Turn-on Voltage & Defect Impact





- Turn-on voltage: 0.55 V (CH_3NH_3) < 0.62 V (CH_3NH_2Br) < 0.75 V (CH_3NH_2Sn)
- Increasing defect density reduces efficiency; CH_3NH_3 and CH_3NH_2Sn are more tolerant than CH_3NH_2Br
- CH_3NH_2Br's efficiency drops steeply at high trap densities

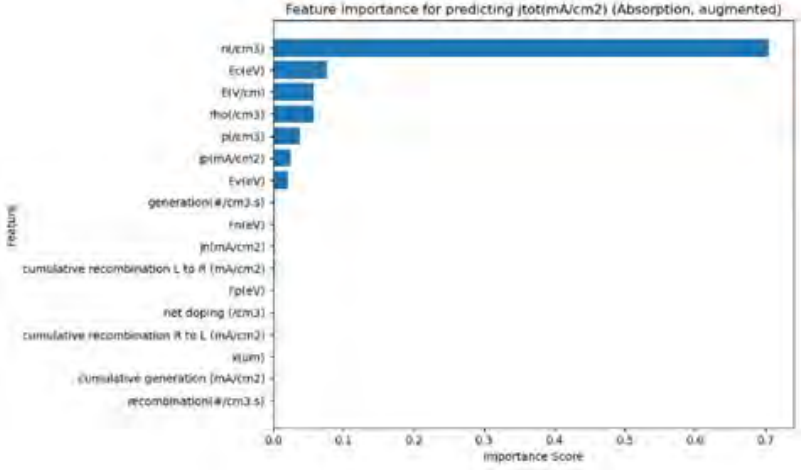
Turn-on favors CH_3NH_3 for low-light conditions. Defect control matters for all, but Br-rich devices need tighter process control.

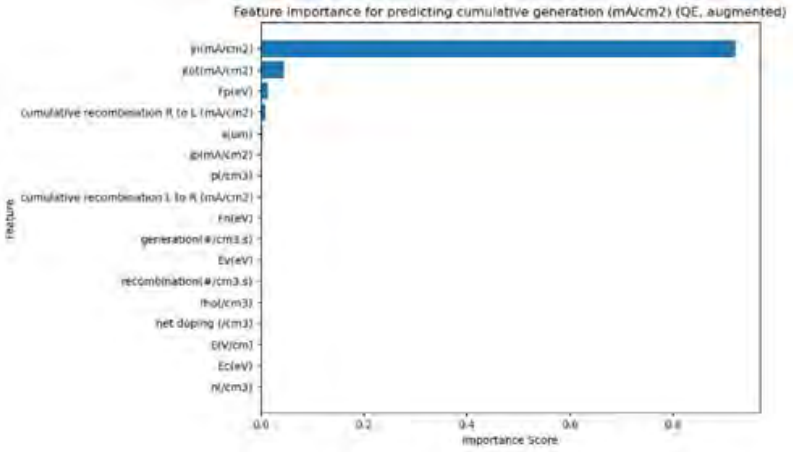
Unsupervised Clustering Analysis

Data prep: add ~5% physics-consistent Gaussian noise to expand datasets (Absorption ~660→2,648; QE 400→1,600); select top features via RF importance; StandardScaler.

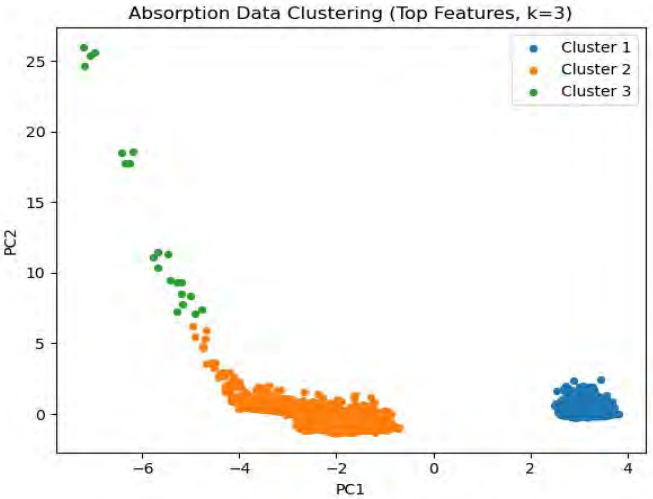
Clustering: k-means (k=3) on selected features; PCA used only for visualization; strong quality metrics (Silhouette > 0.5, DB < 1, high CH)

Interpretation: three well-separated regimes; materials leave distinct “fingerprints” in optoelectronic behavior; median profiles summarized.

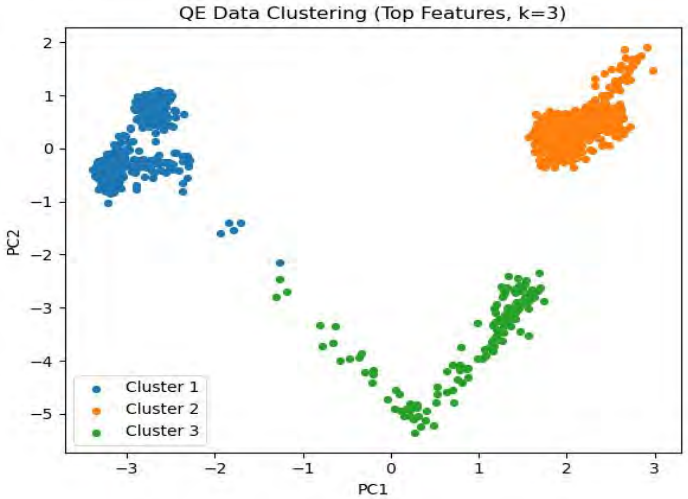




Unsupervised Clustering Analysis



Clusters map to device physics: (i) bulk-like quasi-neutral, (ii) more active bulk with moderate field, (iii) interface-dominated high-field region.



The ML view independently rediscovers the regions we reasoned about from the device plots: cross-validation without hand labels.

- k-means (k=3) identified three distinct clusters for absorption and QE datasets
- Silhouette scores: 0.551 (absorption) and 0.694 (QE) – good cohesion and separation
- Davies–Bouldin index < 1 and Calinski–Harabasz > 1900 confirm well-separated clusters

Unsupervised Clustering Analysis

Absorption Coefficient dataset clusters (medians)	Cluster 1	Cluster 2	Cluster 3
n (/cm³)	8.997 × 10^17	3.009 × 10^13	3.409 × 10^–14
p (/cm³)	5.906×10^{10}	3.279×10^{15}	1.370×10^{25}
Ec (eV)	0.077	0.724	2.123
Ev (eV)	−3.547	−1.602	−0.771
E (V/cm)	-6.54×10^{-4}	7.455×10^{3}	4.708×10^{5}

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n (/cm³)	8.997 × 10^17	3.009 × 10^13	3.409 × 10^–14
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Ev (eV)	−3.547	−1.602	−0.771
E (V/cm)	-6.54×10^{-4}	7.455×10^{3}	4.708×10^{5}

Translate stats to physics: bulk vs active-bulk vs interface; near-front inactive vs deeper active.

Why ML here?

- Label-free clustering confirms our physics story and cuts bias
- Mild physics-consistent augmentation (≈±5% noise) + scaling + multiple initializations shows clusters are stable (not artifacts)
- Features are physical, so the clusters translate to device regions we can act on
- Quality metrics (Silhouette/DBI/CH) prove the structure is real, not noise
- We keep PCA for pictures only; clustering uses real device features.
- This pipeline is reusable for new absorbers and saves fab time by pointing to the right knobs first

Conclusions & Outlook

- CH_3NH_3: balanced performance with highest PCE (19.5 %) peak QE (~600nm), moderate Rs and lowest turn-on voltage – ideal single-junction PSC
- CH_3NH_2Sn: extends absorption into near-infrared with high photocurrent but lower V_oc and higher Rs; PCE ≈ 17 % – promising for tandem applications
- CH_3NH_2Br: efficiently absorbs high-energy photons but suffers from low PCE (14.2 %) and high dark current; suited for tandem layers
- Unsupervised clustering corroborates distinct material regimes and supports feature-based material selection
- Future work: optimize doping and passivation, develop multi-junction devices, and validate through experiments

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Questions
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?
Answers
?

Pre-Workshop Survey:

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Workshop Materials:

https://bit.ly/CoppinMaterials

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Strategic CI Panel: Building Research Capacity through Strategy, Security & Faculty–IT Partnership

Moderator: Jennifer Kim, MS-CC

Panelists:

Lethia Jackson, *Bowie State;* Glen McLachlan, *CAAREN;* Jennifer Oxenford, *Keystone REN; and* Dr. Ali Al-sinayyid, *West Virginia State University*

BOWIE STATE UNIVERSITY
1865

Dr. Lethia Jackson

- Bachelor of Science (BS), Master of Science (MS) and Doctor of Science (DSc) degrees in Computer Science
- Senior Academic Leader & Technology Educator
- Professor, Department of Technology & Security, Bowie State University
- Expertise in Cybersecurity, AI, and Quantum Computing
- Principal Investigator on multiple NSF and NIH-funded initiatives
- Advocate for student success, workforce development, and inclusive STEM education
- Passionate about bridging theory and practice through **hands-on, experiential learning**

Introduction

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CyberSecurity Innovation Center

- Ali Alsinayyid(PhD)
  West Virgninia State University

- Director of the Cybersecurity Innovation Center

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Cybersecurity Innovation Center at WVSU – NOV/2023

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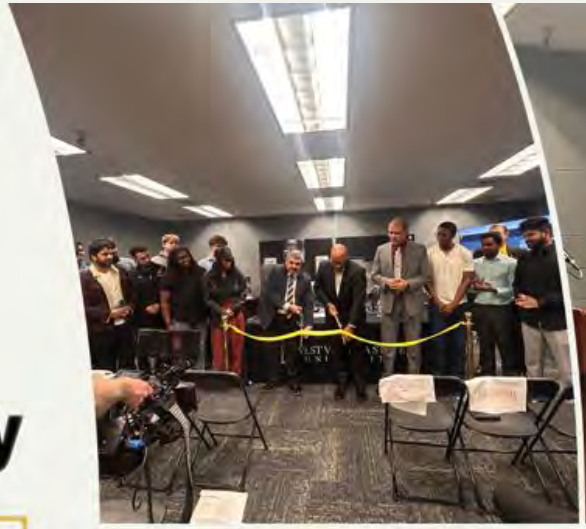
Conducting Cybersecurity Evaluation to 27 Entities in WV SB, NPO and CI



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About KeystoneREN...

KeystoneREN
Research • Education • Network

KeystoneREN, LLC, is a subsidiary of KINBER established on Aug. 8, 2023.

The driving focus of KeystoneREN is to advance research and education networks and advance connectivity and cyberinfrastructure empowering communities across the state.

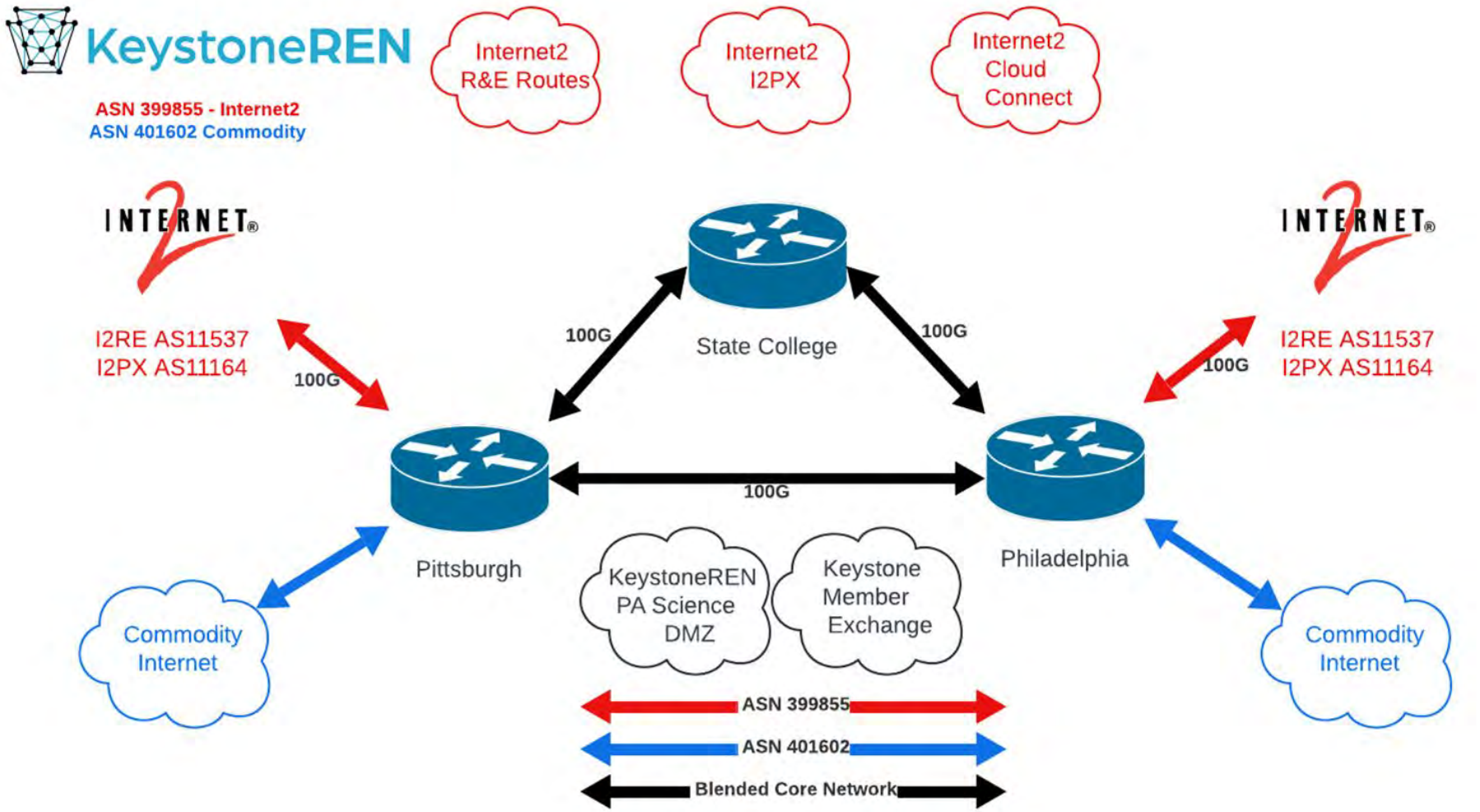
Our core competencies are advanced networking, R&E cyberinfrastructure, and R&E cybersecurity.

KeystoneREN is the only statewide Research and Education Network in Pennsylvania.

Currently connects 40+ organizations to Internet2 (including four of PA's R1s) but the majority are smaller, lesser resourced educational institutions.

KeystoneREN Connected Campuses

- Bucks County Community College
- Commonwealth University (Bloomsburg, Lockhaven, Mansfield)
- Carnegie Mellon University
- Cheyney University
- Community College of Philadelphia
- Duquesne University
- East Stroudsburg University
- Edinboro University
- Franklin & Marshall College
- Geisinger
- Harrisburg Area Community College
- Indiana University of Pennsylvania
- Jefferson University
- Lafayette College
- La Salle University
- Lehigh University
- Kutztown University
- Lehigh Carbon Community College
- Marywood University
- Millersville University
- Montgomery County Community College
- Muhlenberg College
- Northampton Community College
- Penn Highlands Community College
- Penn State University
- Reading Area Community College
- Susquehanna University
- Thaddeus Stevens College
- Thiel College
- Ursinus College
- University of Pittsburgh
- University of Scranton
- Shippensburg University
- Slippery Rock University
- Villanova University
- Westminster College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I2PX AS11164
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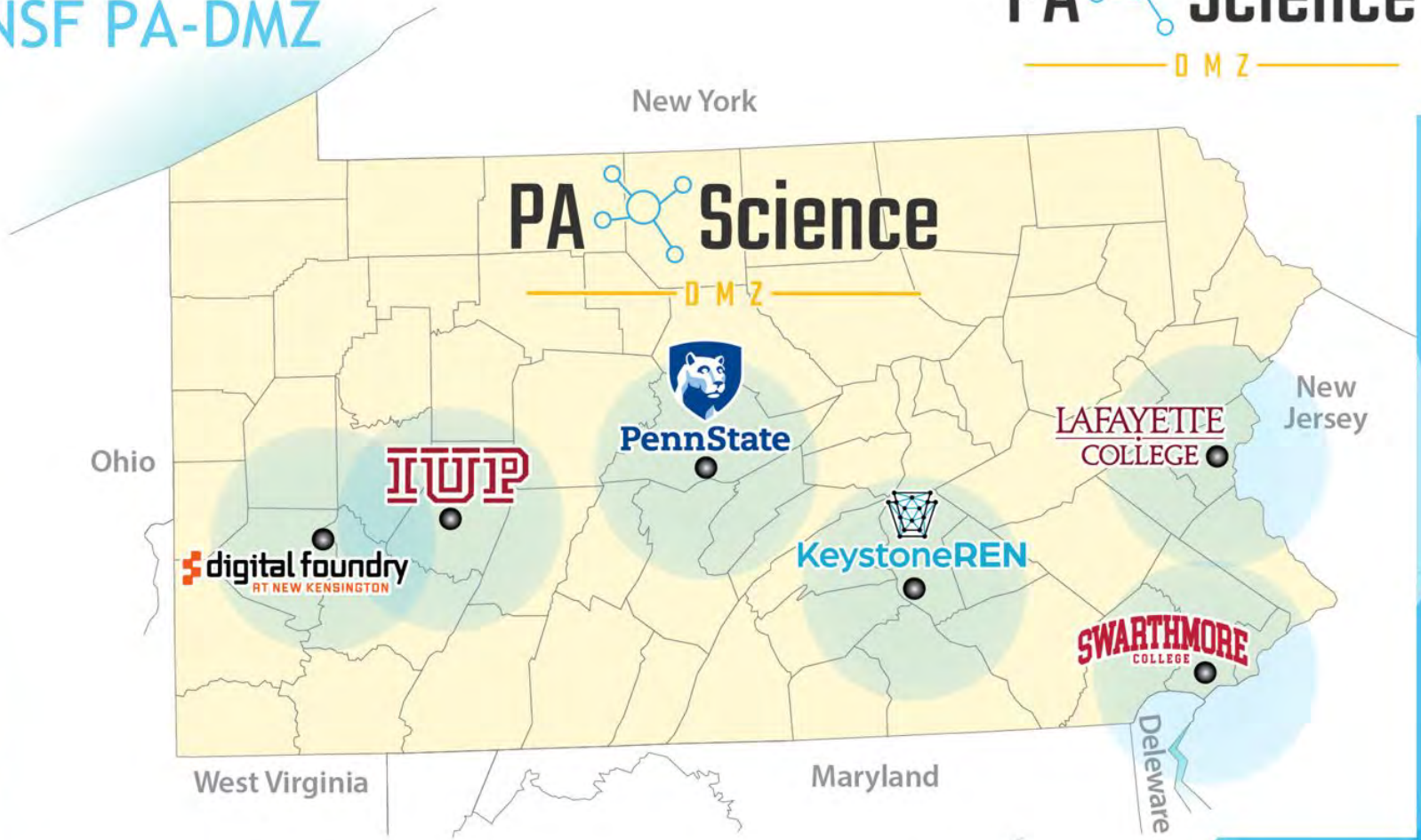
ASN 399855
ASN 401602
Blended Core Network

NSF PA-DMZ

PA Science DMZ



Upcoming Training Events/Opportunities

KINBERCON 2025 - KeystoneREN Advanced Cyberinfrastructure Track
October 16-17, 2025
Lancaster, PA
https://www.kinbercon.org/

SPECIAL GUEST

Use Code SPECIAL GUEST for comp reg
as an MS CC Workshop Attendee

Contact Info - Stay In Touch

joxenford@keystoneren.org
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keystoneren.org

INTERNET 2

NSF

MS-CC

AI Readiness and Research: From Policy to Practice

Moderator: Quiana Bannerman, Maryland Center for Computing Education

Panelists:

Dr. Karen Terrell, *Loyola University*; Dr. Marisel Torres-Crespo, *Hood College; and* Dr. Peter Taiwo, *Morgan State (Center for Equitable Artificial Intelligence & Machine Learning Systems (CEAMLS))*

INTERNET 2

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Break

Until 3:30 PM

Wireless info:
SSID: eduroam (your home institution must participate)

OR

SSID: CSU-Guest

Join the MS-CC

https://bit.ly/JoinMS-CC

Institutional Roadmap Lab: What Must Shift to Support Research Growth?

Moderator: Amanda Tan, MS-CC

Panelists:

Tiffany Davis, *MLIS, Interim Library Director/Public Access & Electronic Resources Librarian, Lincoln University*; Dr. Naveed Zaman, *WVSU Dean, College of Natural Sciences and Mathematics*; and Dr. Ebony Terrell Shockley, *University of Maryland, College Park*

Naveed Zaman

- Professor of Mathematics
- Dean, College of Natural Sciences and Mathematics
- West Virginia State University
- Developing a Cybersecurity Ecosystem at WVSU

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MS-CC
ms-cc.org

Service & Milestones

- Academic Programs
- Student Success
- Strategic Partnerships
- Research & Grants
- Future vision

Conference Speaker Bio- Tiffany Davis

Tiffany Davis serves as Library Director, Public Access and E-Resources Librarian, and Assistant Professor at Lincoln University of Pennsylvania, where she has transformed digital resource accessibility for more than 2000 students, faculty and staff since January 2023. She holds a Masters in Library and Information Studies from Florida State University and a Bachelors in African-American Studies from Florida Agricultural and Mechanical University with over 10 years of library science experience.

Professor Davis has strategically expanded institutional research infrastructure through innovative partnerships with Getty Images and Ancestry Institution, while adding a comprehensive repository to the archives and significantly expanding database and resource access for faculty, staff, and students. Creating technological pathways to empower the Lincoln University community.

INTERNET 2

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Welcome to Day 2

October 1, 2025

Breakfast & Networking

Workshop Materials:

https://bit.ly/CoppinMaterials

Agenda Overview

Day 2

Now	Lightning Talks: Faculty Research Sparks (STEM + Humanities)
Next	Break
Early AM	Collaborative Visioning Session: Building Research Together at Coppin and Beyond
Lunch + Networking	
Early PM	Closing Remarks

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INTERNET 2

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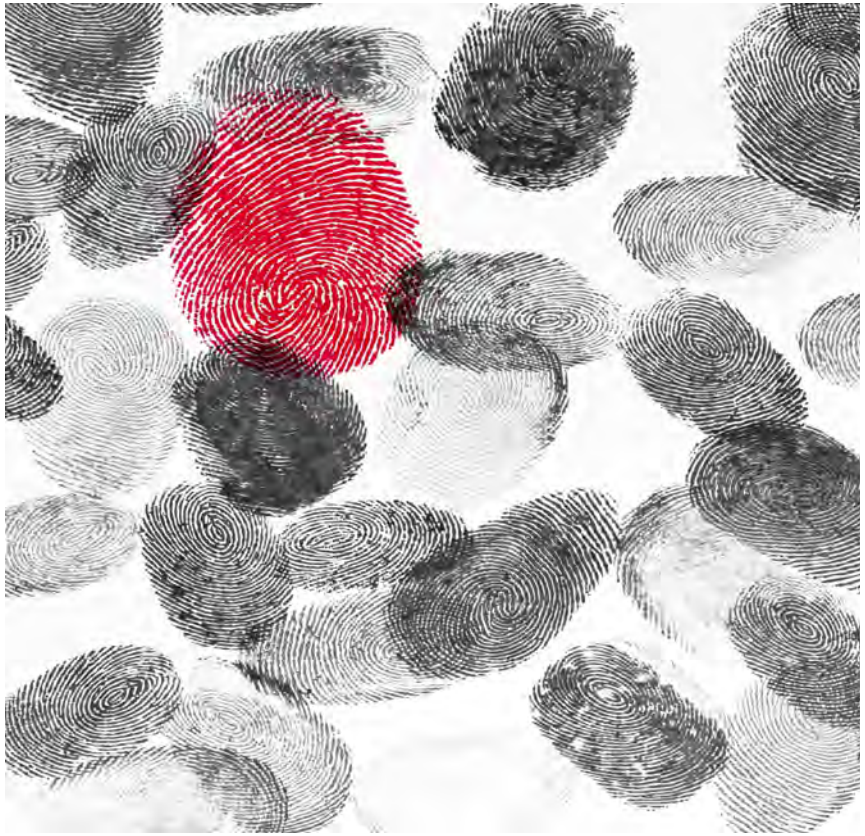
Lightning Talks: Faculty Research Sparks
(STEM + Humanities)

Immersive Forensic Science Education

- From VR Crime Scenes to Virtual Autopsies
- Dr. Darlene Brothers-Gray & Wendy Velez-Torres
- Coppin State University



Why Immersive Learning?

- Traditional methods: barriers (cost, logistics, access)
- VR/Simulations = safe, repeatable, hands-on
- Bridges theory with practice + accessibility

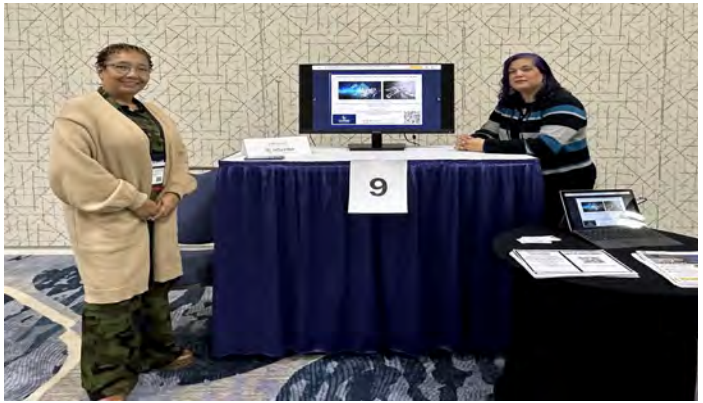
Study 1 – Virtual Crime Scenes (2024)

- Undergrad (CRJU486) & Grad (CRJU524)
- Tools: Oculus Quest, 360° videos, Playposit
- Activities: search, photography, sketching, evidence collection

Topics
Photography/Sketching
Crime Scene Search Techniques
Presumptive Tests and Chemical Enhancements
Latent Fingerprint Development
Evidence Collection and Packaging
Physical Evidence/Serological Evidence
Trace Evidence
Firearms and Toolmark Evidence

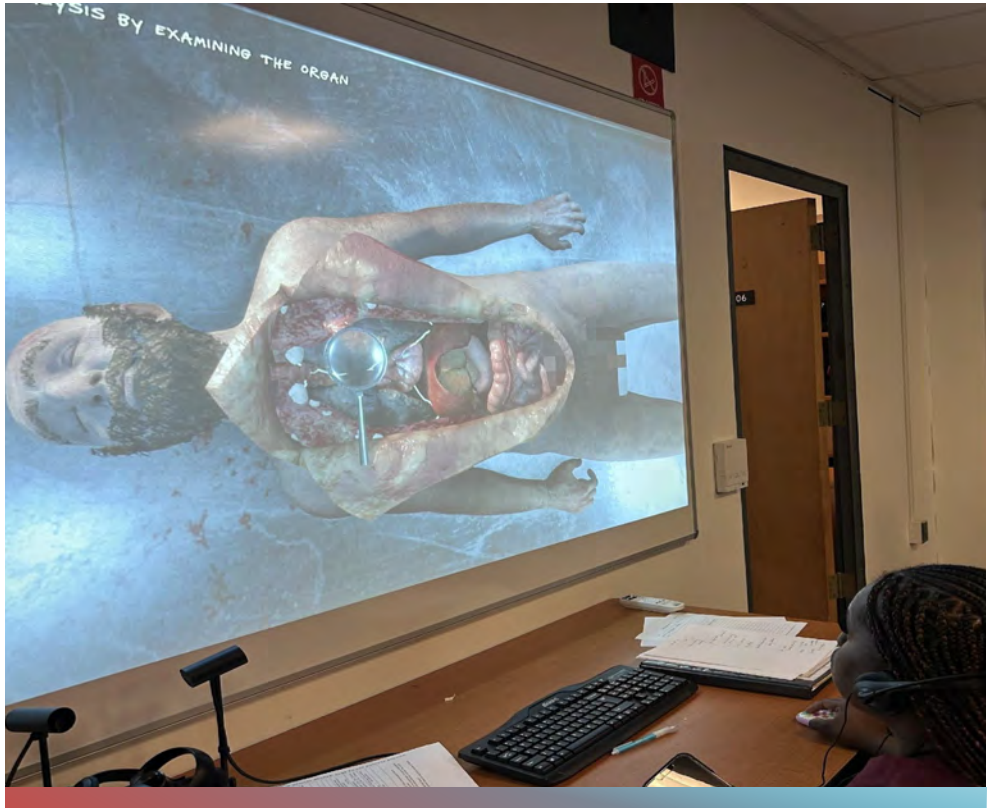
Outcomes – Virtual Crime Scenes

- High engagement & completion rates
- Strong graduate performance
- Positive external recognition (OLC Innovate 2024)
- Students gained deeper understanding & confidence



Study 2 – Virtual Autopsy Simulation (2025)

- Graduate course: Death Investigation (CRJU524)
- Tool: Autopsy Simulator (Woodland Games)
- 6-week pilot, 10



Outcomes – Virtual Autopsy

- 90% reported enhanced learning & skill development
- Mastery Report: Analytical Reasoning, Critical Thinking, Quantitative Literacy

Accessibility & Inclusion

- Playposit: captions, transcripts, alternative formats
- Microsoft Forms: screen-reader compatible
- Alternatives: video walkthroughs, keyboard input
- Aligned with UDL and CSU accessibility standards

Implications & Lessons Learned

- Immersive tools = engaging, scalable, accessible
- Limitations: cost, motion sickness, usability issues
- Future: expand to health sciences & collaborative simulations
- Safe space for practice: progress over

THANK YOU

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Coppin State University, Baltimore, MD

Virtual Reality in Higher Education

From Simulation to Capstone: Implementing Virtual Autopsy Software in Forensic Science Education

Quantum Fourier Transform w/ Leakage Ctrl

Dr. Stephen Providence

October 1, 2025


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Title: Tenured Assistant Professor of Computer Science,
Thesis Defense & Publication: Feb. 2000, CUNY
Dissertation Advisor: Distinguished Professor Dr. Victor Y. Pan
E-mail: sprovidence@coppin.edu

Phone: +1(410)951-6479

Awards:

$2 million+ from NSF as PI or Co-PI since 2000

$130 thousand+ from Dept. of Energy & IBM Quantum at Coppin

Research Areas:

Computational Mathematics

Quantum Computing, Architectures & Algorithms

Quantum Chemistry & Machine Learning on SLMs

Abstract:
In circuit QED (cQED) systems we can manipulate the cavity Fock states to use a quantum processing unit or QPU. Because of the long coherence times associated with Fock states, ”qudit” based computations are possible. The quantum Fourier transform QFT is instrumental in the synthesis of selective number-dependent arbitrary phase gate and displacement gates that comprise a QPU.

The QFT is the quantum mechanical version of the classical Fourier transform which maps signals in the continuous time domain into the frequency domain. The quantum Fourier transform maps signal into the phase domain. Posited over complex variables, the mathematics is simpler in phase space. We report conjectured results at the end.

Its aspects

- Phase space (rotations) instead of frequency space

Its aspects

- Phase space (rotations) instead of frequency
- space Cost functions with and without leakage control

Its aspects

- Phase space (rotations) instead of frequency
- space Cost functions with and without leakage
- control SNAP and displacement gates

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- Phase space (rotations) instead of frequency
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- Bumper states

Its aspects

- Phase space (rotations) instead of frequency
- space Cost functions with and without leakage
- control SNAP and displacement gates
- Bumper states
- Analysis of results

Its aspects

- Phase space (rotations) instead of frequency
- space Cost functions with and without leakage
- control SNAP and displacement gates
- Bumper states
- Analysis of results

Acknowledgements

Phase space

QFT produces amplitudes that in phase space that can define a signal in a more mathematically convenient manner than frequency space. Frobenius norms and related calculations are simpler.

Complex conjugates abound and if these computations were taken over the reals, mathematical difficulties arise.

$$a, b \in \mathrm{R}, a \pm b\, i \in \mathrm{C} \text{ where } i \text{ is imaginary}$$

Cost function w/o leakage control

Our na¨ıve cost function:

$$\mathrm{L} = 1 - \left| \frac{1}{N_c} \mathrm{Tr}\ U(\alpha, \theta) U_T^{\dagger} \right| \tag{1}$$

where $N_c \times N_c$ U_T is the target gate to engineer, and $N_c \times N_c$ $U(\alpha, \vec{\theta})$ is the gate that we can engineer with SNAP and displacement blocks.

Cost function w leakage control

Our na¨ıve cost function:
Thus, we define a new cost function that penalizes the leakage after each displacement operator. We define the cost function as

$$L_p = 1 - \frac{\mathrm{Tr}\ U^{\dagger} U(\vec{\alpha}, \vec{\theta}) Q}{d} + \sum_{k=1}^{K} w_k \frac{|| P U_k(\vec{\alpha}, \vec{\theta}) Q ||^2}{d}, \quad (2)$$

where $||(A)|| = \sqrt{\mathrm{Tr}(A^{\dagger} A)}$ is the Frobenius norm, and w_k is the arbitrary weight we can define for each layer.

SNAP and displacement gates

To facilitate qudits in circuit quantum electrodynamics (cQED) systems we alter the state of these qudits via SNAP (Selective Number-dependent Arbitrary Phase) and displacement gates. The QFT is used to synthesize them in alternating configurations.

As stated, $U(\alpha, \vec{\theta})$ is the gate that we can engineer with SNAP and displacement blocks. The $U(\alpha, \vec{\theta})$ is defined as,

$$U(\alpha, \vec{\theta}) = \prod_{k=1}^{K} B(\alpha, \vec{\theta})_k \tag{3}$$

and the blocks are defined as

$$B(\alpha_k, \vec{\theta}_k) = D(\alpha_k) S(\vec{\theta}_k) D(-\alpha_k). \tag{4}$$

Bumper states

We can introduce projector operators

$$Q = \sum_{n=0}^{N-1} |n\rangle\langle n|, \quad (5)$$

which selects the logical states, and then Thus, we introduce another projector operator that selects the bumper states

$$P = \sum_{n=d}^{N_b-1} |n\rangle\langle n|, \quad (6)$$

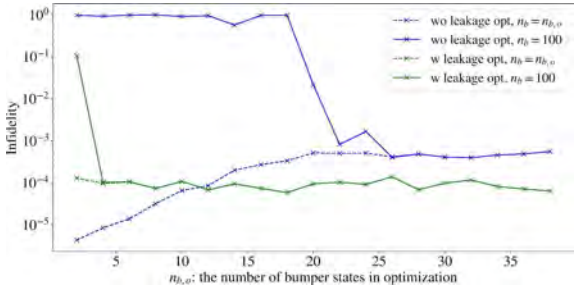
such that if we define the target unitary as

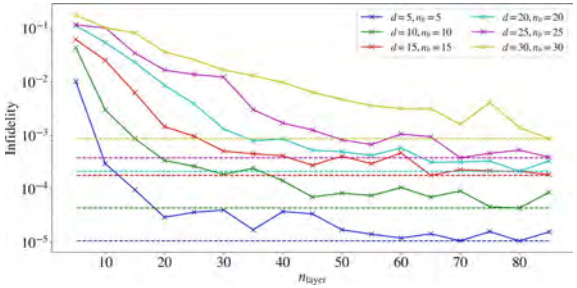
$$U_T = \begin{matrix} \mathrm{F} & 0 \\ 0 & \mathrm{B} \end{matrix}, \quad (7)$$

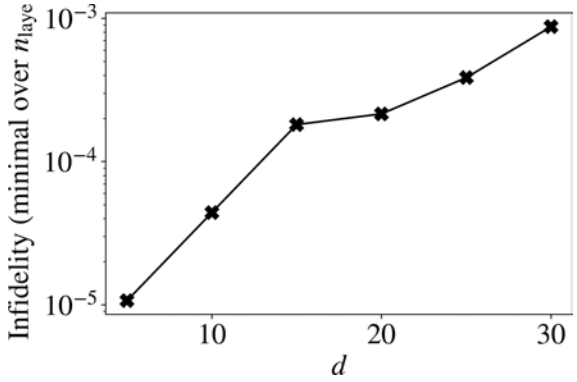
$$QU_TQ = \mathrm{F} \quad (8)$$

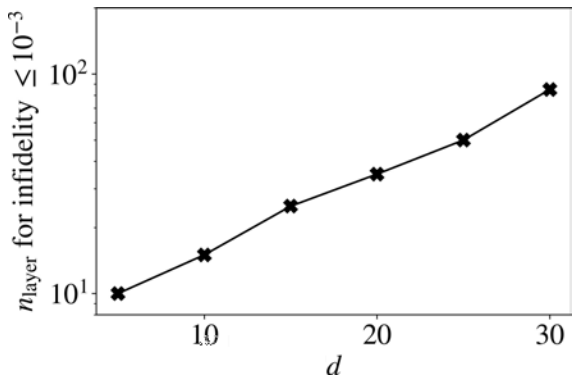
Some early tresults,

To be interpreted and refined. Further simulations are in progress.









Acknowledgements

1. This manuscript has been authored by FermiForward Discovery Group, LLC under Contract No. 89243024CSC000002 with the U.S. Department of Energy, Office of Science, Office of High Energy Physics
2. This work was supported in part by the U.S. Department of Energy, Office of Science, Office of Workforce Development for Teachers and Scientists (WDTS) under the Visiting Faculty Program (VFP).
3. Special thanks to: D. Kurkcuoglu, M.S. Alam, J.A. Job, A.C.Y. Li, A. Macridin, G.N. Perdue

JACKSON AI ASSISTANT

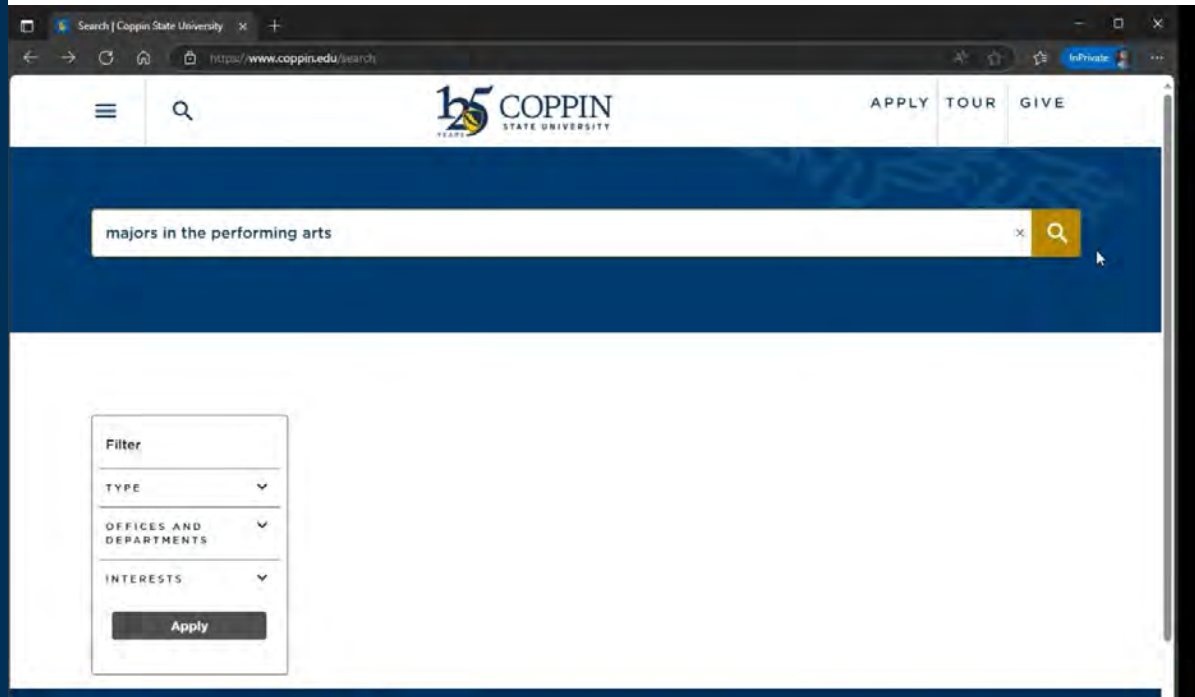
AI in Action: Introducing Coppin's Chatbot

Jackson AI Assistant Overview

- Generative Artificial Intelligence (GenAI) Chatbot
- Accessible from every page on CSU website
- Includes reference links to the information source

Chatbot Search Implementation

- Responses from Jackson included with website's search functionality
- AI generated result at the top of search results page



Range of Topics Covered by Jackson

Academic Information
- Comprehensive support for students' educational journey
- Enhances learning experience

Admissions Processes
- Detailed assistance for prospective students
- Helps navigate applications smoothly

Campus Events
- Informs users about various events
- Enriches community experience
- Encourages student participation

Administrative Services
- Support for various administrative services

Knowledge Base

Primary Sources

- **Coppin State University website**
- **Catalog website**
- **Coppin State Sports website**

Focus

- **Information from Coppin State University**
- **No external internet information**

Privacy

- **No access to PII**

Benefits

Enhance Efficiency and User Satisfaction

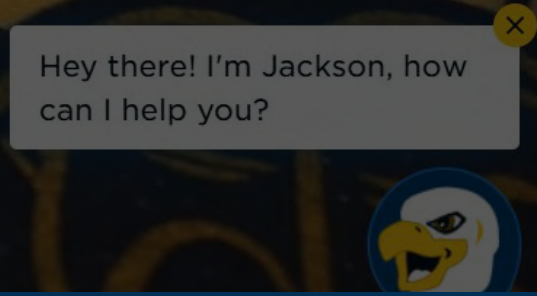
- Improves website functionality
- Provides quick answers to users

Reduce Burden on Staff

- Decreases calls and emails about FAQs
- Allows visitors to ask unlimited questions 24/7

Understand Questions Despite Errors

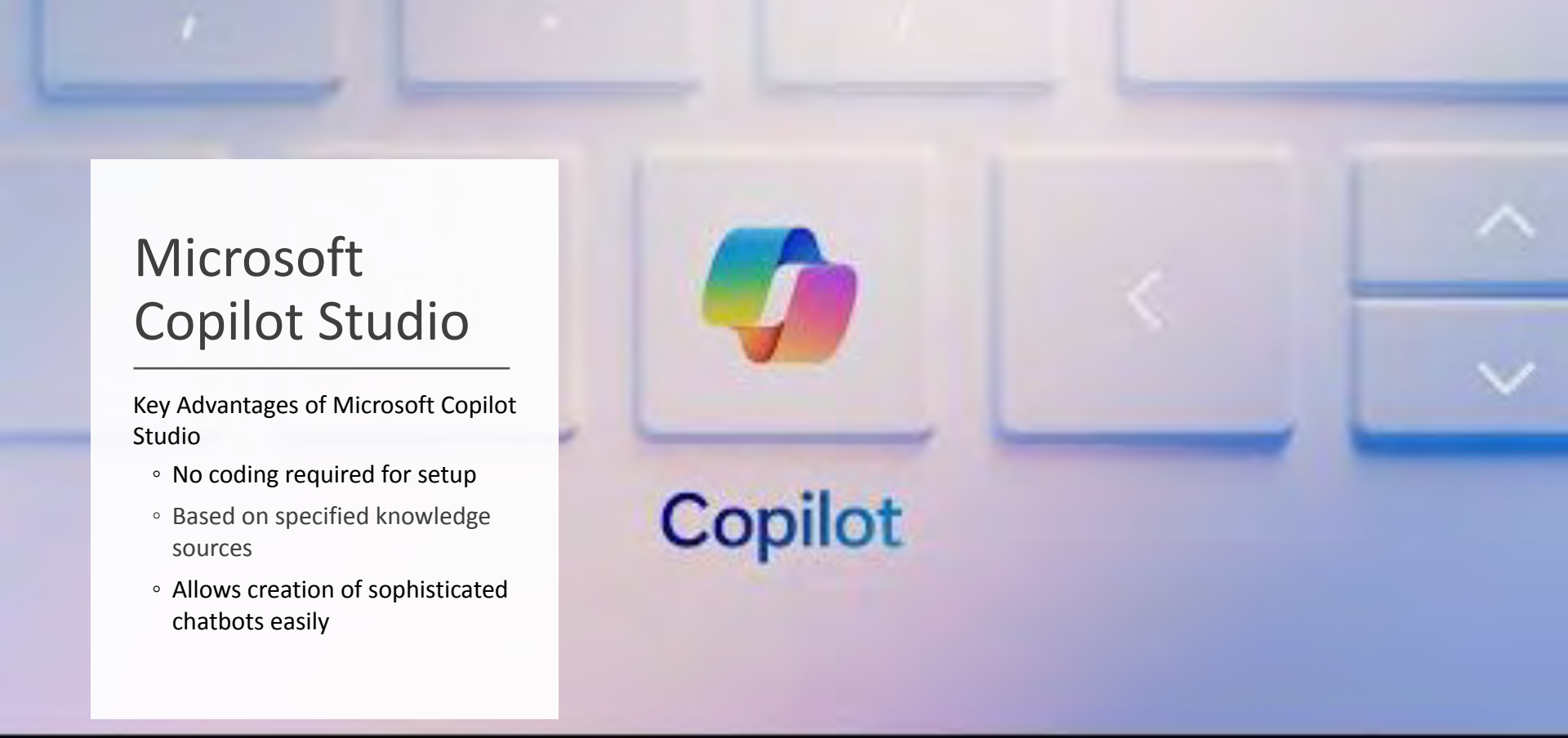
- Handles misspellings and poorly phrased questions
- Provides accurate responses



Microsoft Copilot Studio

Key Advantages of Microsoft Copilot Studio

- No coding required for setup
- Based on specified knowledge sources
- Allows creation of sophisticated chatbots easily



Your AI Assistant

*“Just some information about your **Urban Arts program**”*

*“Do you offer a bachelors degree in **public health** for international students”*

*“I would like email for register **Criminal justice master**”*

*“Greetings Jackson! I need to complete my bachelors degree and I wanted to know if there are any **online programs** for me to accomplish this.”*

*“requirements to graduate with an **accounting** degree”*

*“can i take the pre-requisites for **ABSN** at coppin university? what are the requirements?”*

Try Jackson

https://www.coppin.edu

MS-CC Science and Research Technology Workshop

Lightning Talk

The impact of CI on my research/teaching/outreach.

Dr. Feseha Abebe-Akele

Assistant Professor

Elizabeth City State University (ECSU)

Why CI support is crucial to my research, teaching and outreach?

- CI is an ecosystem of **computing, data, software, and networking resources.**
- It enables researchers to tackle problems that can't be solved on a single laptop or in a small lab.
- It is the "research superhighway" that combines:
  - **High Performance Computing (HPC):** supercomputers, clusters, and cloud systems.
  - **Data resources:** storage, sharing platforms, and curated databases.
  - **Advanced software tools & workflows:** optimized algorithms, modeling/simulation frameworks, workflow automation.
  - **Networking & collaboration tools:** high-speed research networks, portals, and science gateways.
  - **Expert support services:** training, consulting, and communities of practice.

How do I leverage CI in my areas of work?

1. Genomics & Microbiome Research

- **large-scale read mapping,**
- **genome assembly and metagenome annotation**

2. **Shotgun microbiome sequence analysis.**

- Use CI resources to build **workflow pipelines** (e.g., integrating Prokka annotation, EggNOG functional assignments, ML feature extraction, and primer validation).
- Access **community-supported libraries** and benchmarking datasets hosted on CI platforms.

How do leverage CI in my areas of work?

3. Education

In BIOL 512 Bioinformatics for NGS data analysis:

- I use science gateway resources like **Jetstream2**, **EDGE-Bioinformatics-Gateway** to provide **hands-on cloud-based computing environments** for students with no prior computing background.

- Offer students access to HPC “sandbox” resources where they can run small-scale genomics or bioinformatics workflows safely

How do leverage CI in my areas of work?

4. STEM Outreach

In collaboration of the ECSU Biology Club and Local high school biotechnology chapters,

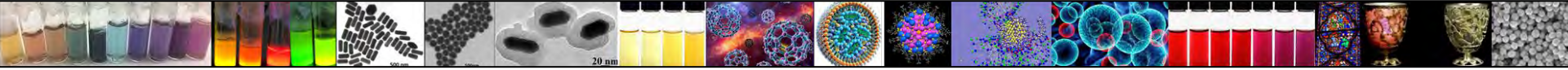
- I have developed an **interactive biotechnology self-learning hub** that:
- Uses AI/ML to generate adaptive content from a pool based on student progress.
- It is a work in progress but a prototype can be seen here:

Summing up

- CI is very essential
  - to keep up with the accelerated rate of growth in all fields of biology,
  - to attract, engage and retain the digital generation in STEM fields such as:
    - Bioinformatics
    - Biotechnology
    - Genetics and
    - Molecular biology.

Acknowledgement

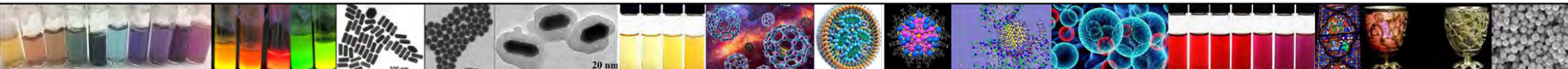
- MS-CC
- Internet-2
  - For travel support.



NANOTECHNOLOGY CENTER

Prof. Dr. JAMAL UDDIN
Founding Director
Center for Nanotechnology
Coppin State University, MD, USA

https://www.coppin.edu/research/center-nanotechnology

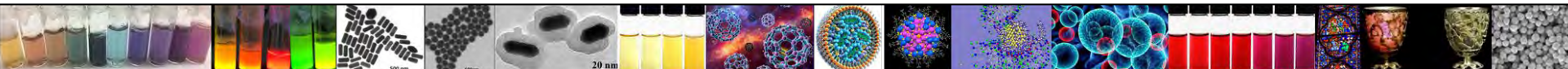


What is Nanotechnology?

- Nanotechnology = science, engineering, and technology conducted at the nanoscale. (Including atomic, molecular or macromolecular levels)

- Structures, devices and systems = with new properties & functions due to reduction in size

- Capacity to control or manipulate matter on the atomic scale



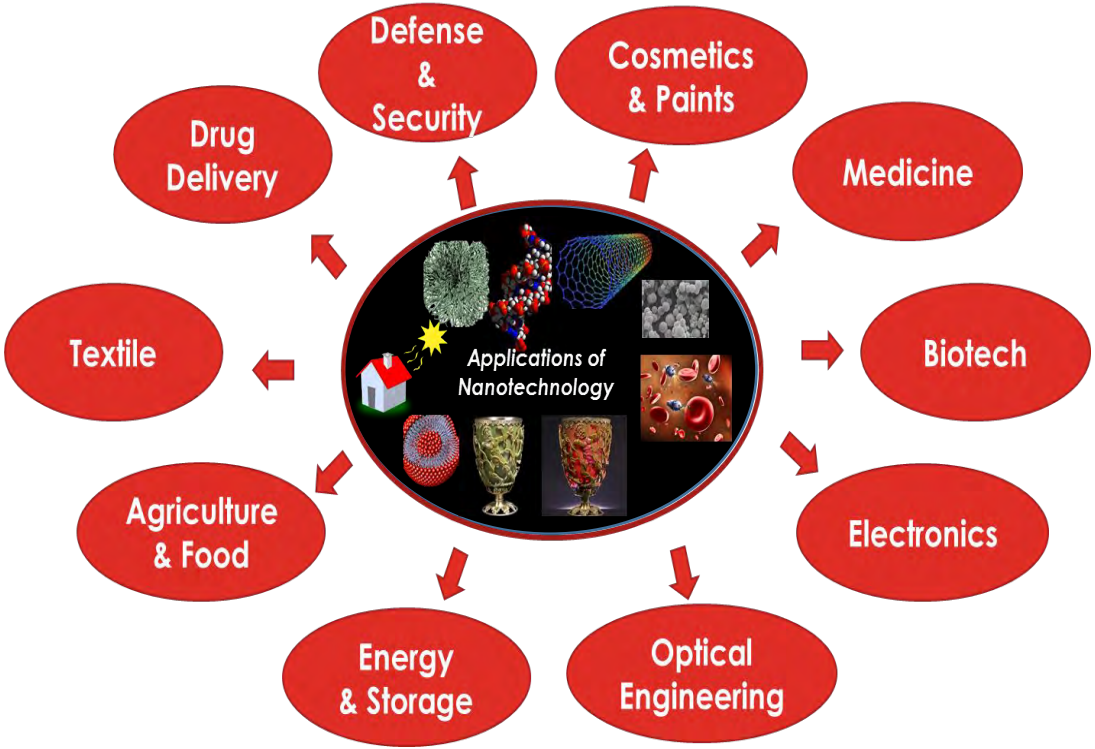
Why do we care about nano?

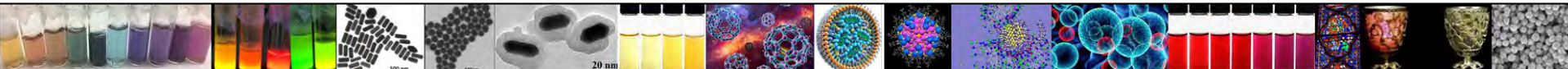
Physics is different on the nanometer scale

Properties not seen on a macroscopic scale now become important

You work with individual atoms & molecules rather than bulk materials

APPLICATIONS OF NANOTECHNOLOGY





EVERYDAY PRODUCTs

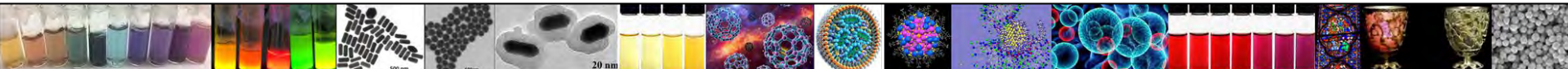
Shoe Sprays, Scratch resistant sunglasses, Polyethylene terephthalate (PET) bottles, Clothing

Nano titanium dioxide spray product

Nanotechnology offers scratch resistant coatings based on nano-composites and anti-fog coatings for enhanced visibility

Nanotechnology in clothing has been its ability to create dirt repellent fabrics.

When clay nanoparticles are put into plastics, the plastic forces the clay platelets apart and gives a much larger exposed surface area which enables the strength of the plastic to be retained when less of it is used.



EVERYDAY PRODUCTs

Television screen, Mobile phones, Laptops, Frying pans, Cleaning Products, Cosmetics

Samsung QLED is a quantum dot based TV

NanoBond™ surface is a proprietary blend of alloys including titanium, creating a highly strong, resilient and lasting finish.

Hestan NanoBond™ Stainless-Steel Skillet

New Smartphone Battery Recharges in 30 Seconds Flat: Using Quantum Dot Technology and also Graphene

Materials such as Graphene, Carbon nanotubes and nanowires are expected to be used in charging laptops

Using nanomaterials in the cleaning process that are antibacterial, such as silver nanoparticles.

Liposomes and niosomes are used in the cosmetic industry as delivery vehicles.

Instrumentation used in Nanotechnology

Acknowledgment

- E2- ENERGY TO EDUCATE GRANT PROGRAM (163893)
- GRANT AMOUNT - $575, 000.00

- DEPT. OF EDUCATION, SAFRA TITLE III GRANT
- GRANT AMOUNT - $ 800, 000.00

- MIPS GRANT
- GRANT AMOUNT - $100,000.00

- NSF PLANNING GRANT
- $100,000.00

- NSF EiR (BEING SUBMITTED)
- $500,000.00

U.S. DEPARTMENT OF ENERGY

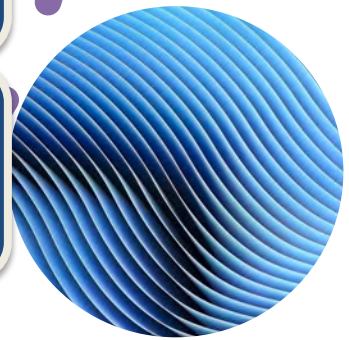
- DEPT. OF ENERGY
- $2,175,000.00

Artificial Intelligence in Nanotechnology

THE FUSION OF INTELLIGENCE AND PRECISION AT THE NANOSCALE

DR. WILLIAM E. GHANN/DR. JAMAL UDDIN
CENTER FOR NANOTECHNOLOGY

DATE : 10/01/2025



Introduction

Nanotechnology

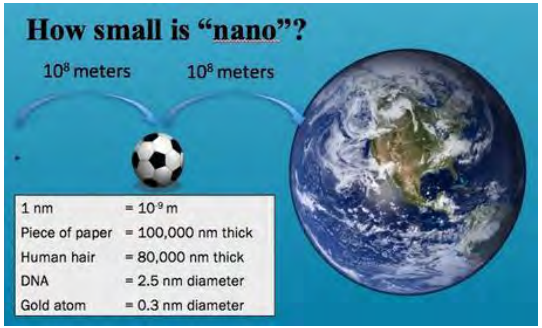
- Manipulating matter at the nanoscale

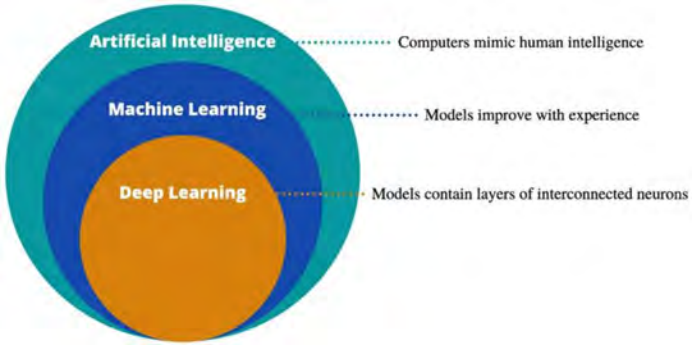
Artificial Intelligence

- Simulating human intelligence through machines

Combined power or Synergy

- Intelligent design and analysis at nanoscale using AI to guide, optimize, and analyze nanoscale experiments





Role of AI in Nanotechnology

Data Analysis:

•AI models interpret UV-Vis, XRD, SEM, and PL spectroscopy datasets

Pattern Recognition:

•AI distinguishes nanoparticle morphologies from SEM images

Optimization:

• Guides synthesis of stable and uniform nanomaterials

Predictive Modeling:

•Anticipates material behavior in biomedical or energy applications

- DATA ANALYSIS AT NANOSCALE

- PATTERN RECOGNITION IN IMAGING

- OPTIMIZING SYNTHESIS

- PREDICTIVE MODELING IN MEDICINE

Role of AI in Nanotechnology (Advanced Data Analysis)

Challenge: Interpreting large datasets from spectroscopy and microscopy tools can be time-consuming and prone to human error.

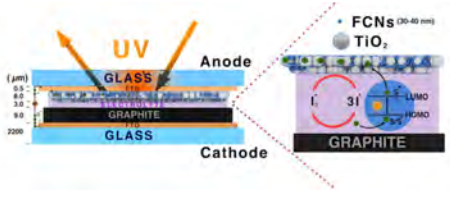
AI Solution:

Machine learning algorithms can rapidly analyze data from UV-Vis, photoluminescence (PL), and Fourier-transform infrared (FTIR) spectroscopy.

AI tools extract key features (e.g., absorbance peaks, and band gaps) with higher accuracy and speed.

Application at the center for nanotechnology:

Students working on carbon nanoparticles for solar cells can use UV-Vis and PL data; AI models help determine quantum efficiency and emission profiles faster and more consistently



Role of AI in Nanotechnology (Pattern Recognition in Imaging)

Challenge: Identifying subtle morphological differences in nanoparticles using SEM or AFM images requires expertise.

AI Solution:

Deep learning and convolutional neural networks (CNNs) classify and quantify nanoparticle shapes, sizes, and distribution.

Reduces subjectivity and accelerates material characterization.

Application at the center for nanotechnology:

In silver nanocube and electrospun fiber projects, AI can assist in measuring fiber diameter, uniformity, and detecting defects from SEM images—making data analysis more accessible for undergraduate researchers.

Role of AI in Nanotechnology (Synthesis Optimization)

Challenge: Synthesizing nanomaterials involves tuning multiple parameters (e.g., pH, temperature, precursor ratios).

AI Solution:

Supervised learning models and neural networks predict outcomes based on historical experimental data.

AI provides synthesis recommendations to achieve optimal yield, stability, and reproducibility

Application at the center for nanotechnology:

In the synthesis of biochar-nanocomposites for water treatment, AI could optimize activation conditions and doping ratios for maximum adsorption efficiency.

Role of AI in Nanotechnology (Predictive Modeling for Functional Performance)

Challenge: Experimental testing of every material variation is resource-intensive.

AI Solution:

Models trained on known data can predict how nanomaterials will behave in energy, biomedical, or environmental systems.

Supports inverse design, where desired properties are specified and AI suggests the best material composition or structure.

Role of AI in Nanotechnology (Predictive Modeling for Functional Performance)

Examples at the Center for Nanotechnology

Energy: Predicting light absorption, electron transport, and device stability in dye-sensitized solar cells (DSSCs).

Biomedicine: Estimating biocompatibility or antimicrobial activity of nanoparticles before in vitro testing.

Environmental: Modeling pollutant adsorption capacity of various biochar-based nanomaterials.

Applications in Nanomedicine

- **AI-guided Drug Delivery:** Nanoparticle targeting using bio-distribution models
- **Cancer Detection:** DL models analyzing imaging data of nanoparticle-tagged tissues
- **Personalized Medicine:** Matching nanoparticle treatments to patient genomics
- **Smart Sensors:** Wearable nanosensors using AI for real-time health monitoring

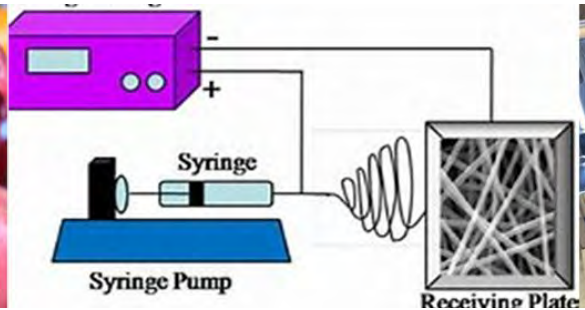
Applications in Materials Science

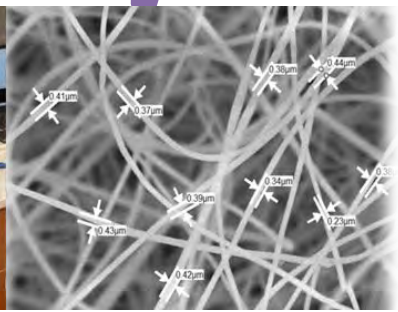
Material Discovery:
Machine learning predicts promising nano-alloys or dopants

Property Simulation: AI models mechanical, optical, or electronic properties

Advanced Composites: AI-driven optimization of polymer-nanoparticle interfaces.

Example: Ongoing research at Coppin on electrospun nanofibers infused with natural extracts and nanoparticles for antibacterial filters





Case Studies

Integration with Research at Coppin Examples from the Center for Nanotechnology:

AI-assisted design of fluorescent carbon nanoparticles synthesized from teak leaves for DSSCs.

Modeling electrospinning parameters (voltage, viscosity, flow rate) to achieve uniform nanofiber mats for antimicrobial applications.

Optimizing silver nanocube synthesis by correlating morphology with antibacterial performance.

Predictive screening of biochar-based nanocomposites for pollutant adsorption, using machine learning to simulate material efficiency.

Challenges and Limitations

Data Scarcity: Not enough labeled nanotech datasets

Computational Load: High-performance computing is required

Integration Gap: Experimental and AI workflows must sync

Ethical Issues: Transparency, bias, and privacy

Conclusion

AI is transforming nanotechnology at the research and application levels

Work at the Center for Nanotechnology is well-positioned to harness these synergies

Continued development, ethical consideration, and collaboration are key

INTERNET 2

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Break

Until 10:30 AM

Wireless info:
SSID: eduroam (your home institution must participate)

OR

SSID: CSU-Guest

Join the MS-CC

https://bit.ly/JoinMS-CC

Collaborative Visioning Session: Building Research Together at Coppin and Beyond

Facilitators: MS-CC and Coppin State University Staff

MS-CC Workshop at Coppin State - Public Folder

https://bit.ly/ms-cc-coppinstate-pubfolder

1. Create a GoogleDoc in the Public Folder
2. Designate a note taker
3. Include fields for:
    a. Group name and members
    b. Answers to the questions on the next slide
4. Designate a reporter

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1. **What is a research question, topic, or challenge that you're currently passionate about?**
    - What makes it important for your campus or community?

2. **What barriers are you facing in advancing your work—and where could collaboration help?**
    - Consider technical gaps, partnerships, training, or funding needs.

3. **Are there natural points of alignment between your work and others in the room?**
    - What themes or challenges might be shared across disciplines or institutions?

4. **If your group were to pursue a joint project or proposal, what would be a strong first step?**
    - Co-developing a concept paper, convening a follow-up meeting, or sharing data/tools?

5. **What resources, expertise, or infrastructure could be shared to support this collaboration?**

6. **What support or follow-up would help move your idea from discussion to implementation?**
    - Who else should be at the table?

Closing Remarks

MS-CC and Coppin State University Leadership

You Don’t Have to Do it ALONE

Post Survey

MS-CC’s Programming Can Help You

- Connect with other campuses.
- Learn from each other’s endeavors.
- Identify opportunities for shared resources and advocacy.
- Develop CI capabilities in your students, faculty, and staff.
- Develop a CI strategic plan.

Join the MS-CC

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Reflections

Amanda Tan,
Associate Director of Research Development, MS-CC

Reflection: Closing the Loop, Opening the Path

- Something you **liked** or **learned** today
- Something you wanted **more** of
- Something that could have been **better**

“We are caught in an inescapable network of mutuality, tied in a single garment of destiny.” – Dr. Martin Luther King Jr.

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Tell Us About the Connections You've Made Today

-

Help us tell NSF about the value of MS-CC: If there are any connections or partnerships made from this workshop or other MS-CC convenings, please let us know!

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Learned / Liked	More / Better
•	•

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Got Extra Time Today?

Come Visit Coppin States Nanotechnology Center in the Science & Technology Building