RII Track 2 FEC: Multi-Scale Integrative Approach to Digital Health: Collaborative Research and Education in Smart Health in West Virginia and Arkansas

2025 AAAS EPSCoR Live! Presentation

Don Adjeroh (Lead PI), WVU
Founding Director, AI+Health Engineering Center

October 29, 2025

Quick Outline

Project Overview

Project Activities

Outcomes & Impact

Lessons Learned

Comments & Discussion

Project Overview: From NSF ILI-DOP Y1 Report

Key Outcome Measures

Demographics
Funding
Publications
Patents
Presentations

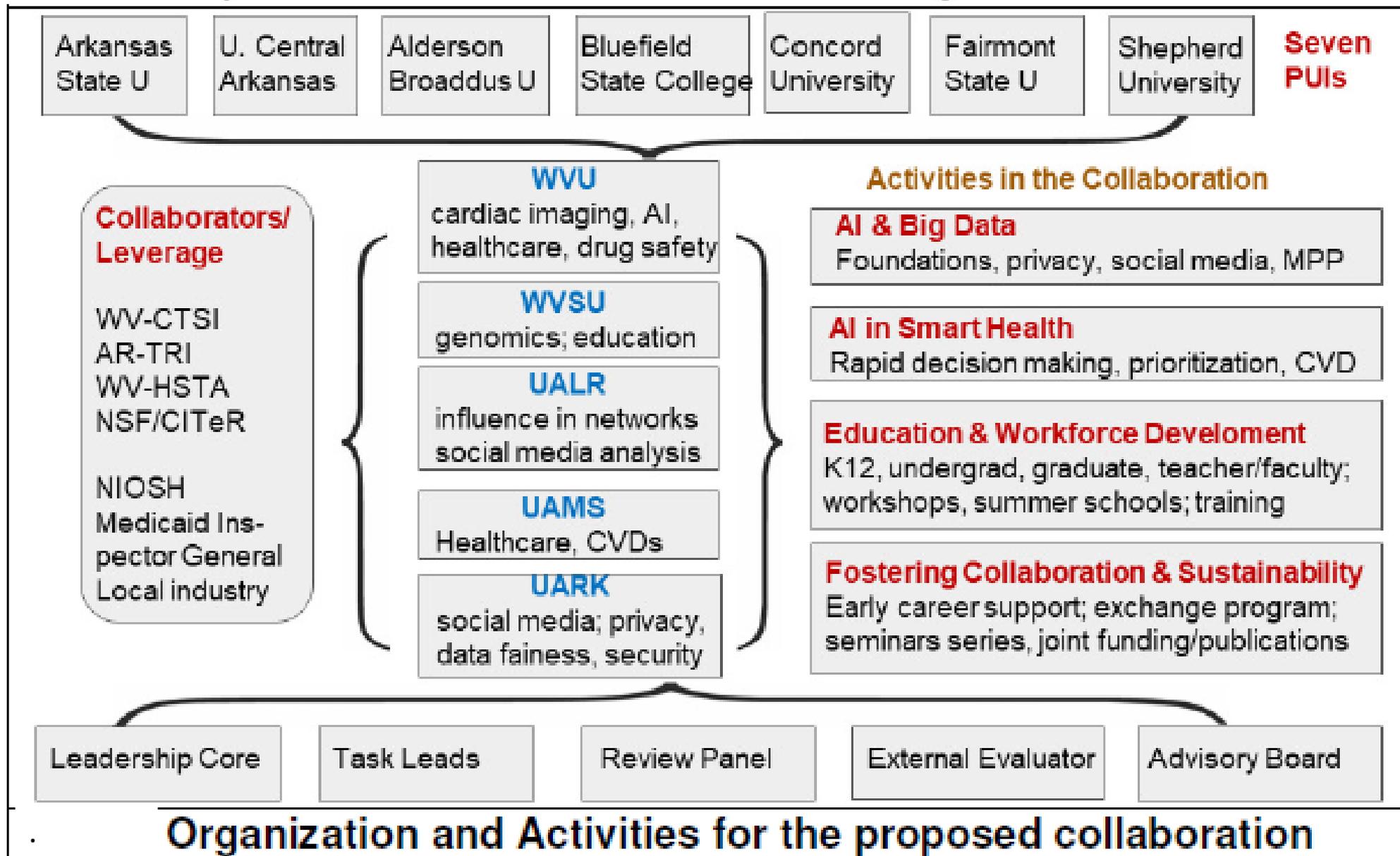**Trainees**
Fellowships
Early Career

Collaboration:
– within Jurisdictions
– across Jurisdictions

NSF FEC Track-2 Objectives include:

1. Developing capabilities to create and disseminate new knowledge

2. Building collaborations, with an emphasis on inter-jurisdictional collaborations

3. Enhancing the research development of researchers, with an emphasis on early-career researchers

4. Increasing engagement in the NSF strategic activities (e.g., funding) for all researchers, with an emphasis on early career researchers
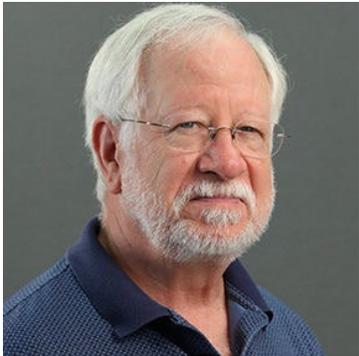
DOP: Data Outcomes Portal

Project Structure & Organization

						Seven PUIs
Arkansas State U	U. Central Arkansas	Alderson Broaddus U	Bluefield State College	Concord University	Fairmont State U	Shepherd University

Collaborators/ Leverage

WV-CTSI
AR-TRI
WV-HSTA
NSF/CITeR

NIOSH
Medicaid Inspector General
Local industry

WVU
cardiac imaging, AI, healthcare, drug safety

WVSU
genomics; education

UALR
influence in networks
social media analysis

UAMS
Healthcare, CVDs

UARK
social media; privacy, data fainess, security

Activities in the Collaboration

AI & Big Data
Foundations, privacy, social media, MPP

AI in Smart Health
Rapid decision making, prioritization, CVD

Education & Workforce Develoment
K12, undergrad, graduate, teacher/faculty; workshops, summer schools; training

Fostering Collaboration & Sustainability
Early career support; exchange program; seminars series, joint funding/publications

Leadership Core	Task Leads	Review Panel	External Evaluator	Advisory Board

Organization and Activities for the proposed collaboration

Leadership

Don Adjeroh, West Virginia University (WVU), Lead PI
Prof. & Assoc. Chair, Lane Computer Science & Electrical Engineering (LCSEE),
Expertise: AI, machine learning, data structures & algorithms, Bioinformatics

Gianfranco Doretto, WVU
Prof., Lane Computer Science & Electrical Engineering (LCSEE),
Expertise: Computer vision, data visualization, machine learning.

Gay Stewart, WVU
Eberly Prof., of STEM Education, and of Physics
Expertise: STEM Education; Physics Education

Umesh Reddy, WVSU, Co-PI.
Prof., of Genetics & Genomics, Dept. of Biology
Expertise: Genetics, crop science, biotechnology

Don McLaughlin, WVU (Project Manager),
Research Associate, LCSEE,
Expertise: High performance computing, data analytics

Nitin Agarwal, UARK, Co-PI (Lead at Arkansas)
Maulden-Entergy Chair & Donaghey Distinguished Professor, Director, COSMOS Center
Expertise: Social computing, influence in networks, trust and privacy

Xintao Wu (UARK), Co-PI
Charles D. Morgan/Acxiom Endowed Graduate Research Chair, EE & CS Dept.
Expertise: Privacy and security, fairness in machine learning, trust and privacy

K. Nalleballe, MD, UAMS
Neurologist, UAMS Jackson T. Stephens Spine and Neuroscience Institute
Expertise: Digital Health & Innovation, Neurology, Stroke Care

D. Adjeroh (WVU)

N. Agarwal (UALR)

G. Doretto (WVU)

D. McLaughlin (WVU)

U. Reddy (WVSU)

Xintao Wu (UARK)

G. Stewart (WVU)

K. Nalleballe (UAMS)

Project Goals and Objectives

Key Outcome Measures

Demographics
Funding
Publications
Patents
Presentations

Trainees
Fellowships
Early Career

Collaboration:
– within Jurisdiction
– across Jurisdiction

Research Objectives:

- ❖ **(R1) To perform innovative research** on specific challenges in AI and big data analytics
- ❖ **(R2) To adapt novel AI techniques** for a better understanding of the heterogeneous data sets involved in digital health, while considering privacy and fairness.

Education and Workforce Dev. Objectives:

- ❖ **(E1) To develop data analytics skills** at different educational levels in AR and WV (K-12 to grad);
- ❖ **(E2) To enhance student and faculty expertise in data analytics and smart health** through workshops, summer schools, and hand-on training on modern AI platforms.
- ❖ **(E3) Supporting early career faculty** development

Project Activities

Key Activities: Summary

Early Career Faculty Involvement (13 faculty, 11 funded via seed grants**)**

Research (250+ publications, 42 proposals funded, 150+ presentations, IPs**)**

Education &Outreach(workshop, HS Teachers, undergrad interns,HSTA, classroom**)**

Building Collaborations (within inst., intra/inter-jurisdictional, PUIs, HBCUs**)**

Demographics

Key Outcome Measures

Demographics
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Presentations

Trainees
Fellowships
Early Career

Collaboration:
– within Jurisdiction
– across Jurisdiction

Category	Total	Gender diversity		Race distribution				
		Male	Female	African/ African American	Asian	Latino	White	Others
Faculty (senior faculty)	13	8	5	1	6	2	5	0
Faculty (early-career)	15	10	5	0	9	0	4	1
Postdocs	4	4	0	0	3	0	0	1
Grad Student RAs	29	20	9	4	10	0	13	11
Undergraduate RAs	5	3	2	0	2	1	1	1
Other Professionals (HSTA Research Associates)	14	6	8	1	4	1	7	1
K-12 teachers	13	3	10				12	1(Native American)
High School Students	21	6	15	7			14	
Totals	114	60	54	13	34	4	56	15

Table does not include Final Year numbers.

Key Activities: Early Career Faculty Involvement

Early Career Faculty Involvement --via Seed Grants

Collaborating teams and selected seed grant projects

Key Outcome Measures			
Demographics			
Funding			
Publications			
Patents			
Presentations			
Trainees			
Fellowships			
Early Career			
Collaboration:			
– within Jurisdiction			
– across Jurisdiction			

ID	Early-Career PI	Mentors	Topic
1	Jessica Allen (WVU) and Khoa Luu (UARK)	D. Adjeroh (WVU) X. Wu (UARK)	AI System for Tele-Rehabilitation in Stroke Survivors
2	James Bardes (WVU) and Lu Zhang (UARK):	D. Adjeroh (WVU) X. Wu (UARK)	Personalized Health Risk Early Detection
3	Margaret F. Bennewitz (WVU), & Xiao Liu (UARK)	G. Doretto (WVU) X. Wu (UARK)	Smart Detection of Neutrophil-platelet-NET Interactions in Pulmonary Microcirculation
4	Brijesh Patel (WVU) and Hoang Ngan Le (UARK)	P. Sengupta (WVU) & X. Wu (UALR)	AI for Predicting Cardiotoxicity
5	Shuo Wang (WVU) and Krishna NalleBalle (UAMS)	Xin Li (WVU) & Yuri Zarate (UAMS)	Fracking and Risk of Stroke

Key Outcomes

❖ Various Joint publications, inc. cross-jurisdictional
❖ 2 NSF CAREER Awards('23: Lu Zhang, X. Liu, UARK)
❖ 2 NSF CAREER Award('24: M. Bennewitz, J. Allen, WVU)
❖ 2 NSF CAREER Award('25: Khoa Luu, Ngan Le, UARK)
❖ Various Joint proposals, inc. cross-jurisdictional

Notes:

❖ 3 moved out of jurisdiction; added 1 new

Key Activities: Research

Key research topics where project outcomes have contributed to in Years 1, 2 and 3.

2A: Research on AI Foundations& Big Data	2B: Applications of AI in Smart Health
1. Deep representational learning 2. Deep learning architectures 3. AutoML & neural architecture search (NAS) 4. Image Feature correspondence 5. Domain generalization 6. Social network analysis and influence 7. Fairness and privacy in AI	1. Cardiovascular image understanding 2. Interactions in the pulmonary vasculature 3. Complications in surgical procedures via AI 4. Correlation analysis of fracking and stroke 5. Telemedicine for stroke rehabilitation 6. Adverse drug event surveillance 7. COVID-19 disinformation & health policy 8. Multiview Patient Profiling 9. Obesity and body weight in human and fly
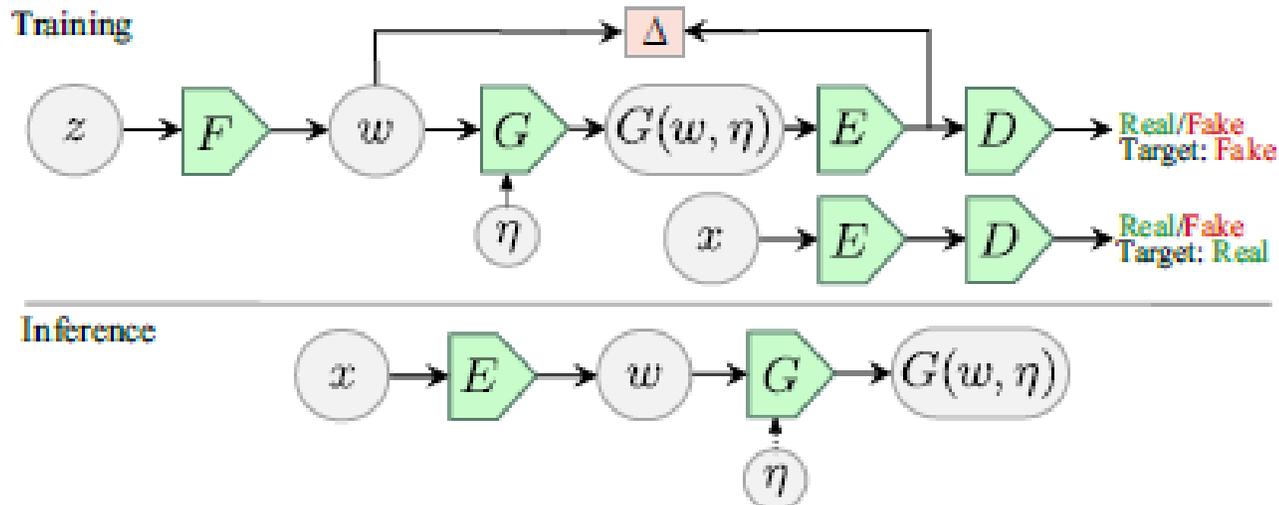
Architecture of Adversarial Latent Auto Encoder (ALAE) developed in this project (CVPR'2020)

Key Activities: Education & Outreach

Education & Workforce Development

- ❖ K-12: Train-the-trainer

- ❖ K-12: HSTA summer camp on Data Science for URMs

- ❖ Undergrads & grads
  - ❖ Classroom teaching
  - ❖ Research involvement
  - ❖ Postdocs

Outreach & Summer School

Classroom Teaching

Quick Stat on Impact:
97 courses, 2637 students

Table 2A: Summary on classroom teaching related to the project (Year 2).

| Institution	#Undergrad courses (#students)	#graduate courses (#students)
WVU	3 (93)	6(78)
WVSU	2 (22)	1(3)
UALR	2(43)	2(68)
UARK	4(190)	5(44)
Totals	11(348)	14(193)

Table 2B: Summary on classroom teaching related to the project (Year 3).

Institution	#Undergrad courses (#students)	#graduate courses (#students)
WVU	4 (86)	5(97)
WVSU	2 (40)	1(8)
UALR	2(40)	2(119)
UARK	4(143)	5(81)
Totals	12(308)	13 (395)

Table 2C: Summary on classroom teaching related to the project (Year 4).

Institution	#Undergrad courses (#students)	#graduate courses (#students)
WVU	5 (152)	6(100)
WVSU	2 (32)	2(23)
UALR	1(15)	2(43)
UARK	8(455)	7(100)
Totals	16(654)	17 (266)

Table 2D: Summary on classroom teaching related to the project (Year 5).

| Institution	#Undergrad courses (#students)	#graduate courses (#students)
WVU	3 (149)	4(95)
WVSU	0 (0)	0(0)
UALR	0(0)	2(66)
UARK	2(58)	3(108)
Totals	5(207)	9 (266)

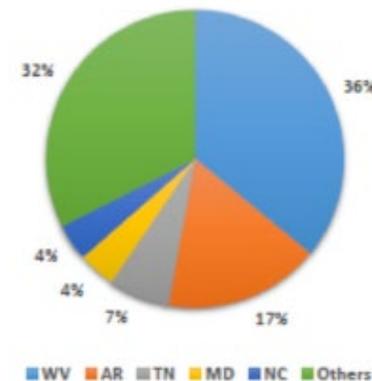# Key Activities: Education & Outreach (II)

Summer School & Outreach -- 2023

- ❖ 365 registered participants
- ❖ 265 attended
- ❖ 30 States
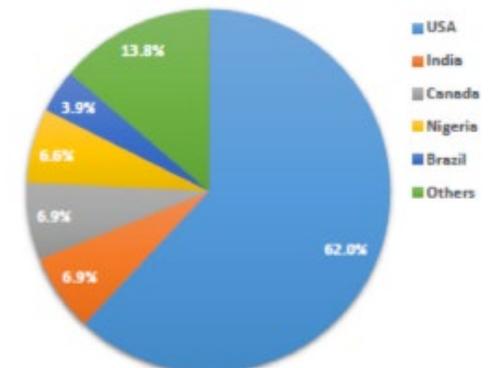- ❖ 28 countries
- ❖ All continents
- ❖ 75 disciplines

Registration By Interest Areas

Registration By Race / Ethnicity
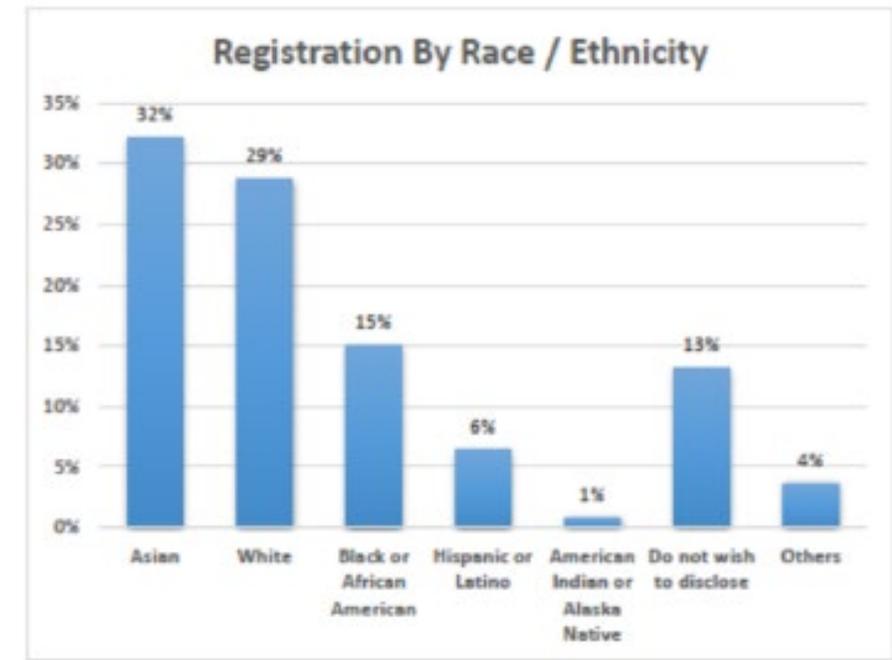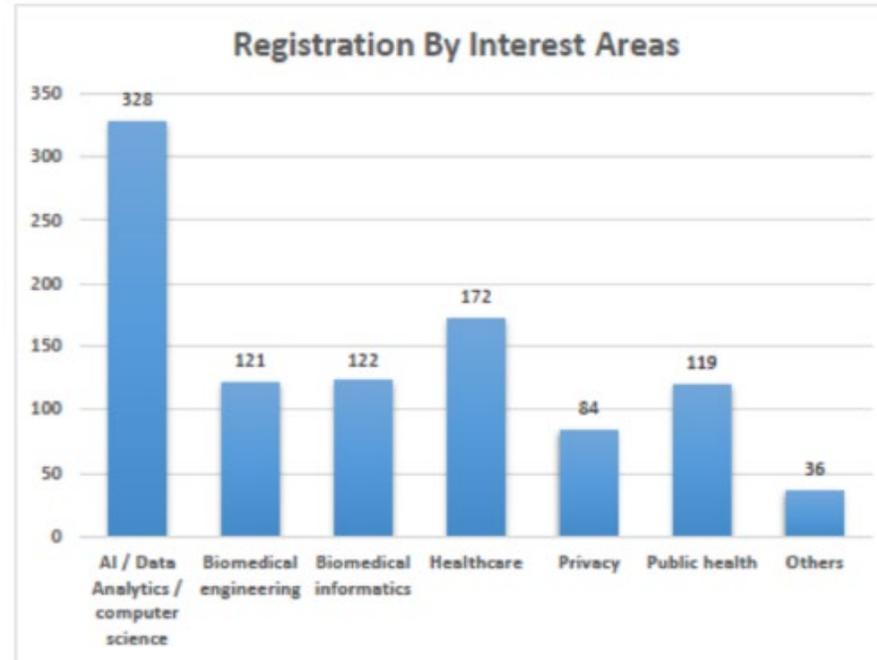
Registration By Gender
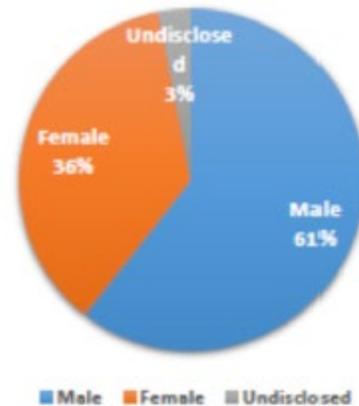
US States Represented

Registrations by Country

Key Activities : Education & Outreach

Education & Workforce Development -- Summer workshops/Summer Schools

Summer 2021
- ❖ 236 registered participants
- ❖ 130 on Day 1
- ❖ ~70 on Day 2
- ❖ >10 countries
- ❖ All continents
- ❖ Various fields

Summer 2023
- ❖ 365 registered participants
- ❖ 265 attended
- ❖ 30 States
- ❖ 28 countries
- ❖ All continents
- ❖ 75 disciplines

Summer 2024
- ❖ 429registered participants
- ❖ 24 States
- ❖ 28 countries
- ❖ All continents
- ❖ Various disciplines

Quick Stat: Summer 2022

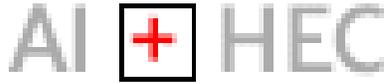~278 registered participants

Quick Stat: Summer 2025

434 participants, 14 countries, 34 states

Quick Stat on Impact: 1742+ registered participants since 2021

STEM Education -- AI Education & Outreach

New AI programs/center at WVU Connected with the project:

❖ **New AI+Health Engineering Center at WVU**

AI + HEC — Research at AI foundations, emphasis on their health applications

https://community.wvu.edu/~daadjeroh/projects/aihec

❖ **New MS-AI degree program** (starts in Spring 2026)

❖ **New Digital Health Certificate Program** at WVU

http://catalog.wvu.edu/graduate/graduatecertificates/digital_health/#text

❖ **Bio-inspired Machine Learning Workshop**

2024 BioML — July 18, 2024. (Part of 2024 Summer Workshops on AI and Digital Health at WVU): (429 registered participants (in-person & remote), from 24 States, 28 Countries)

https://wvuvl.github.io/bioml/

❖ **WVU AI Symposium**,

May 1, 2025. First ever AI Symposium
228 registered participants

https://health.wvu.edu/research-and-graduate-education/wvu-ai-symposium/

https://www.wboy.com/video/wvu-holds-first-ai-symposium-for-student-researchers-and-faculty/10680172/

❖ **Women in Computer Vision workshop**

WiCV — Women in Computer Vision

60-80 attendees;
(Part of ACCV'2024)

https://sites.google.com/view/wicvaccv2024/

❖ **Robust, Trustworthy and Cost-Optimized Learning Across Multiple Modalities: Theory, Algorithms, and Applications (LAMM)**

LAMM'24 Workshop — 60-80 attendees; (Part of ACCV'2024)

https://sites.google.com/view/lammworkshop2024/home

Key Activities in Building Collaboration

Collaborative Activities

❖ Within Institution

❖ Intra-jurisdictional
  - ❖ WVU ←→ WVSU
  - ❖ WV ←→ Shepherd
  - ❖ UALR ←→ UARK

❖ Inter-jurisdictional
  - ❖ WVU←→UARL, UCA, AState
  - ❖ WVSU, WVU←→ UAPB
  - ❖ WVU ←→ UAMS
  - ❖ WVU ←→ UARK

❖ Early-Career Faculty: **10+1**

Key to Collaboration

❖ Involving PUIs & HBCUs

Mechanisms & Policies to Enhance Collaboration

- Early Career Seed Grants mechanism
  - 2-PIs across jurisdictions
  - 2-mentors across jurisdictions
  - Quarterly progress report
- General meeting with project team (now)
- Check-in meetings with Project PIs
- Monthly meetings for Leadership Core (PLC)
- Monthly meetings with Early Career Faculty
  - Presentation by 1 seed-grant Faculty pair
  - Mentoring on P&T, grant writing, etc.
- Improving Research Competitiveness
  - Involving faculty and students from PUIs
  - Research, proposals, summer-workshop (planned)
  - AI skills for students and faculty
  - Mentoring MDs on AI in digital health

Project Impact & Outcomes

Project Outcomes Y1,Y2,Y3

Summary Statistics - Research Outcomes: Years 1 to 3

Key Outcome Measures

Demographics
Funding
Publications
Patents
Presentations

Trainees
Fellowships
Early Career

Collaboration:
– within Jurisdiction
– across Jurisdiction

Type of Product/Activity	Year 1 Collaboration Type				Year 2 Collaboration Type				Year 3 Collaboration Type			
	Count	WI	WJ	BJ	Count	WI	WJ	BJ	Count	WI	WJ	BJ
Book Chapters	4				8	8			6	6		
Journal/Juried Conf. Papers	20	5	1		30	23	1	1	75	73		5
Other Conf. Publications	10	4			42	40						
Presentations	30			1	57	7	3	1	36	23		2
Technologies & Techniques	3	3			6	3	3	1	3			
Theses– PhD Dissertations	3				3	3			5			
Theses– MS Theses	1				4	4			3			
Conference organization	4		2	1	4	1	3	1	3	1	2	1
Summer School/Workshops	*363	Y	Y	Y	*236	Y	Y	Y	*278	Y	Y	Y
	*363 registered participants				*236 registered participants				*278 registered participants			

Collaboration types: WI: within institution; WJ: within jurisdiction; BJ: between jurisdictions

Project Outcomes Y4 & Y5

Summary Statistics- Research Outcomes: Yrs 4 & 5

Key Outcome Measures

Demographics
Funding
Publications
Patents
Presentations

Trainees
Fellowships
Early Career

Collaboration:
– within Jurisdiction
– across Jurisdiction

Type of Product/Activity	Year 4					Year 5				
	Collaboration Type					Collaboration Type				
	Count	WI	WJ	BJ		Count	WI	WJ	BJ	
	1	1								
Book Chapters	3	3				4	1			
Journal/Juried Conf. Papers	87	83	1	3		28	5	2	3	
Other Conf. Publications						50				
Presentations	48	45	1	2		17	5	1		
Technologies & Techniques	4	4				3				
Theses– PhD Dissertations	6	6				2				
Theses– MS Theses	5	5				4				
Conference organization	4	1	2	1		1				
Summer School/Workshops	*365	Y	Y	Y		*429	Y	Y	Y	
	*363 registered participants					*429 registered participants				

WI: within institution; WJ: within jurisdiction; BJ: between jurisdictions

Progress Report– Proposals & Funding: Y1, Y2, Y3 & Y4

Summary statistics - Proposal Submissions & Funding

Key Outcome Measures

Demographics
Funding
Publications
Patents
Presentations

Trainees
Fellowships
Early Career

Collaboration:
– **within**
Jurisdiction
– **across**
Jurisdiction

Table 3: Summary statistics on proposals submitted and funded in Years 1, 2 and 3

| | Year 1 | | | | | Year 2 | | | | | Year 3 | | | | |
| | Collaboration type | | | | | | | | | | Collaboration type | | | | |
Proposal Status	Count	Total Amt.($)	WI	WJ	BJ	Count	Total Amt.($)	WI	WJ	BJ	Count	Total Amt.($)	WI	WJ	BJ
Pending	5	4.4M	3			17	34.7M	14	5	1	4	3.072	2		2
Recommended	1	1M	1	1		1	3.8M	1			2*	4.637	2		
Funded	5	22M	3	1		13	8.1M	8	1	1	13**	33.225	13	2	4
Denied	5	3.4M	2	1		6	7.6M	4	2		8	33.375	8	1	3

Collaboration types: WI: within institution; WJ: within jurisdiction; BJ: between jurisdictions
* includes 1 NSF CAREER;   **incl. 1 NSF NRT ($3M); 1 NIH R01, 1 MRI; 1 NSF Q-AMASE-I($20M).

Table 3: Summary statistics on proposals submitted/funded in Y4

| Year 4 | | Collaboration type | | | |
Proposal Status		Count	Total Amt.($)	WI	WJ	BJ
Pending		4	5.00M	3		3
Recommended		2	0.6M		1	
Funded		13**	32.21M	13	1	1
Denied		8	2.85M	2		2

WI: within institution; WJ: within jurisdiction; BJ: between jurisdictions
**incl. 1 NSF EFRI ($2M); 1 NIH R01, 1 NSF Track-1 ($20M); 1 NSF CAREER

Compare Years 2, 3, & 4 with Year 1 Results

Final Year data … still loading

Progress Report– Proposals & Funding: Y5

Key Outcome Measures

Demographics
Funding
Publications
Patents
Presentations

Trainees
Fellowships
Early Career

Collaboration:
– within Jurisdiction
– across Jurisdiction

Table 8: Detailed list of proposals submitted or awarded during the review period (Year 5)

PI/Co-PI or Team member	Agency	Proposal Title	Total Amount ($)	Collab. Type (I,W,B)
Pending (5)				
D. Adjeroh (PI), G. Doretto (Co-PI) G. Stewart, N. Nasrabadi, D. McLaughlin (WVU) U. Reddy, (WVSU) N. Agarwal (UALR) L. Zhang, S. Zhang, N. Le (UARK),	NSF	NSF AI Institute for Strengthening AI in Healthcare Engagement, Adaptability, and Learning (AI-HEAL)	$20M	I,W,B
Denied (5)				
PI: Lu Zhang	NSF	Collaborative Research: SaTC: Core: Medium: Data-driven Abnormal Behavior Detection in Cyber-physical Systems: Where to Find Them, What Causes Them, and How to Fix Them	$715K	B
Recommended (0)				
Funded (16)				
Doretto, MPI	NIH	Scaling Volumetric Imaging, Analysis, and Science Communication Using Immersive Virtual Reality: Administrative Supplement	$1.2M	W
Doretto, Co-I	AFOSR	Multimodal Framework for Sensation to Action Transformation	$600K	I
Bennewitz (PI)	NSF	CAREER: Impact of MRI contrast agent design on nanoscale interactions with neutrophils and platelets	$698K	I
Reddy (PI)	NSF	Collaborative Research: CISE-MSI: DP: III: Information Integration and Association Pattern Discovery in Precision Phenomics	$350K	W
Adjeroh (PI), Doretto (Co-PI)	NSF	Collaborative Research: CISE-MSI: DP: III: Information Integration and Association Pattern Discovery in Precision Phenomics	$250K	W
Adjeroh (PI), Doretto (Co-PI), Stewart (Co-PI)	NSF	NRT-HDR: Bridges in Digital Health – Supplement	$63K	W
Nitin Agarwal	ARO	Developing Socio-computational Approaches to Mitigate Collective Action-based Socio-cognitive Security Threats in a Multi-platform Multimedia-rich Information Environment	$5M	I
Nitin Agarwal	ARO	Developing Socio-computational Capabilities to Evaluate Emerging Social Cyber Threats	$5M	I
Co-PI: Xintao Wu	NIH/UAMS	Partnerships for Biomedical Research in Arkansas	$311K	W
Total (Funded)		**9 projects**	**$13.47M**	

Collaboration types: I: within institution; W: within jurisdiction; B: between jurisdictions

Summary statistics- Proposal Submissions & Funding

Selected eg. Funded Projects
>$20M Track-1 at AR (2022)
>$20M Track-1 at WV(2023)
>$20M Q-RISE at AR (2023)
>$3M NRT (2021)
>$2M EFRI/BRAID (2022)
>~$2M NIH R01 (2024)
>6 CAREER Awards (~$500K each; UARK(4), WVU(2)
>others

Summary & Lessons Learned

Summary of Project Outcomes & Impact so far

Key Outcome Measures

Demographics
Funding
Publications
Patents
Presentations

Trainees
Fellowships
Early Career

Collaboration:
– **within Jurisdiction**
– **across Jurisdiction**

Publications: 240+ publications; 150+ presentations

Proposals: 91+ submitted; 42 funded (~$104M);

Education & Workforce:

K-12 Teachers for train-the-trainer; K-12 (High school students), including URM HS students; 30+ GRAs/undergrad RAs; 4 Postdocs; Classroom **(97 courses, 2637 students)**

Early-career faculty development; (6 CAREER Awards)

Collaborative activities:

Within institution, intra-jurisdiction, inter-jurisdiction

Research competitiveness for partner institutions

Impact on Society:

Government Policy (Arkansas Attorney General's Office)

Battling the COVID-19 pandemic

Summer schools/workshops, AI Literacy: **1742+ participants**

Overall Work & New Directions (since 2023)

Key Outcome Measures

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Collaboration:
– within Jurisdiction
– across Jurisdiction

Research in AI Foundations: Deep Learning; Deep Learning Architectures; Efficiency in Deep Learning; Heterogeneous data information integration; Influence in Social Networks; Fairness & privacy; LLMs & GenAI

AI in Smart Health: Cardiovascular imaging; COVID-19 problems (genomic sequence analysis, Misinformation; image-based detection and analysis, COVID-19 drug safety); MPP – multi-view patient profiling; Drug Safety; Complications in Surgical procedures; LLMs in Healthcare

Education & Workforce Development: K-12 students; K-12 Train-the-trainer; Undergrads, grads; Outreach; Summer Workshops; Summer School;

Early Career Faculty: Mentoring; Seed grants; Research Involvement; Key to new collaborations.

Collaboration: earlier slide; joint publications, & projects

How we Facilitated Collaboration
Joint projects, publications, proposals, more …

❖ **Joint projects between team members**
  - ❖ **Intra-jurisdiction**
  - ❖ **Inter-jurisdiction**
❖ **Joint publications**
  - ❖ **Especially inter-jurisdictional**
❖ **Joint proposal Opportunities**
  - ❖ **NSF AI Institutes, SCH, IIS; NIH, Others**
  - ❖ **Especially inter-jurisdictional**
❖ **Mentors involved in Seed Grant projects should leverage that to establish a stronger collaboration.**
❖ **Helping early-career faculty to be successful.**
❖ **More PUI involvement (in research; leadership)**
❖ **Program Coordinator & Evaluators …**
  - ❖ **Identify Program Coordinator ASAP**
  - ❖ **Involve External Reviewers from the start**

Comments & Discussion