CAES Associate Director Tri-Annual Report

May – September 2024

Executive Summary

Between May 1st – August 31st 2024, ISU researchers had 40 publications (presented, published, accepted, or under review). ISU researchers presented collaborative research in more than 10 regional, national, and international conferences. There were tours of ISU and INL by the two entities leadership, new engagement and partnership with the industry in Idaho, and other activities as outlined in the report. ISU awarded $103,575 in CAES Internal Seed Grants to seven projects that were aligned with the CAES Focus Areas and INL Strategic Initiatives. Each project is lead by an ISU researcher in collaboration with an INL researcher. ISU researchers also received funding such as NSF I-CREWS for projects in collaboration with CAES. Discussions were held between ISU and INL on more than 12 joint appointments, from which multiple have already been approved. ISU received feedback from its researchers on the focus areas for the upcoming ISU-INL SUPER Agreement. The two draft focus areas are: 1) Critical and Strategic Materials and 2) Environmental Sustainability and Security. There will be follow up conversations and discussions to define these draft focus areas and the associated sub topics.

Tours Led by University Reps:

#People Attended:

- **INL's EES&T Leadership (Todd Combs) visit to ISU:** ISU hosted leaders and researchers from Idaho National Laboratory's Energy and Environment Science & Technology Directorate and the Center for Advanced Energy Studies (CAES) for a tour of some of the large-scale research facilities in Pocatello on May 16th, 2024. While on campus, they visited the Disaster Response Complex, Structural, Structural Dynamics, and Water Resources Laboratories as well as the research facilities at the Eames Complex. ISU researchers also had the opportunity to showcase their recent projects in the areas of sustainability, renewable energy, carbon reduction, and critical materials, as well as discuss potential ways INL, CAES, and ISU can collaborate.
    - **~30 people in attendance from ISU and INL.**
- **Amalgamated Sugar Company tour on May 21:** A group of ISU, CAES, and INL researchers visited one of the Amalgamated Sugary Company's plants in Paul, Idaho. ISU has ongoing research on using waste products from sugar beets in reducing carbon footprint of the built environment and for climate change adaptation.
    - **~6 people from ISU and INL in attendance.**
- **ISU President's tour of INL and CAES on May 28:** ISU's President (Dr. Robert Wagner) and Interim Provost (Dr. Adam Bradford) were hosted for a tour of INL and CAES on May 28. For the portion in the CAES Building, President Wagner was greeted by Dr. Erin Searcy, Acting Deputy Laboratory Director of INL, CAES Director (Dr. Phil Reppert), ISU Associate Director for CAES (Dr. Mustafa Mashal) and several other INL employees. A brief tour of the building and laboratories at CAES was provided.
    - **~8 people from ISU and INL in attendance.**

Section 1. University Publications on behalf of CAES

Title: Beamforming of Transmit Antennas Using Grey Wolf Optimization and L2-Norm for Performance Enhancement of Beyond 5G Communications
Journal: IEEE Open Journal of Antennas and Propagation, vol. 5, no. 4, pp. 1041–1060, Aug. 2024
Authors: Samar I. Farghaly, Mostafa. M. Fouda, and Manal M. Emara
DOI: 10.1109/OJAP.2024.3407053
Impact Factor: 3.5 (Q2)
Status: Published

Title: Placement Optimization and Power Management in a Multiuser Wireless Communication System With Reconfigurable Intelligent Surfaces
Journal: IEEE Open Journal of the Communications Society, vol. 5, pp. 4186–4206, Jul. 2024
Authors: Adel Khaled, Ahmed S. Alwakeel, Abdullah M. Shaheen, Mostafa M. Fouda, and Mohamed I. Ismail
DOI: 10.1109/OJCOMS.2024.3426495
Impact Factor: 6.3 (Q1)
Status: Published

Title: Smart Handover With Predicted User Behavior Using Convolutional Neural Networks for WiGig Systems
Journal: IEEE Network, vol. 38, no. 4, pp. 190–196, Jul. 2024
Authors: Tiago Koketsu Rodrigues, Shikhar Verma, Yuichi Kawamoto, Nei Kato, Mostafa M. Fouda, and Muhammad Ismail
DOI: 10.1109/MNET.2024.3353301
Impact Factor: 6.8 (Q1)
Status: Published

Title: Employing Machine Learning for Seismic Intensity Estimation Using a Single Station for Earthquake Early Warning
Journal: MDPI Remote Sensing, vol. 16, no. 12, article no. 2159, Jun. 2024
Authors: Mohamed S. Abdalzaher. Sami Soliman, Moez Krichen, Meznah A. Alamro, and Mostafa M. Fouda
DOI: 10.3390/rs16122159
Impact Factor: 4.2 (Q1)
Status: Published

Title: Polyhedron Optimization for Power Allocation of Cell-Free based IRS System
Journal: IEEE Access, vol. 12, pp. 76065–76073, Jun. 2024
Authors: Mohamad A. Ahmed, Abdullah Baz, and Mostafa. M. Fouda
DOI: 10.1109/ACCESS.2024.3406479
Impact Factor: 3.4 (Q2)
Status: Published

Updated 2/29/24 SK

Title: Improved Artificial Rabbits Algorithm for Positioning Optimization and Energy Control in RIS Multiuser Wireless Communication Systems
Journal: IEEE Internet of Things Journal, vol. 11, no. 11, pp. 20605–20618, Jun. 2024
Authors: Ahmed S. Alwakeel, Mohamed I. Ismail, Mostafa. M. Fouda, Abdullah M. Shaheen and Adel Khaled
DOI: 10.1109/JIOT.2024.3373563
Impact Factor: 8.2 (Q1)
Status: Published

Title: A Survey on Multi-AP Coordination Approaches Over Emerging WLANs: Future Directions and Open Challenges
Journal: IEEE Communications Surveys & Tutorials, vol. 26, no. 2, pp. 858–889, Secondquarter 2024
Authors: Shikhar Verma, Tiago Koketsu Rodrigues, Yuichi Kawamoto, Mostafa M. Fouda, and Nei Kato
DOI: 10.1109/COMST.2023.3344167
Impact Factor: 34.4 (Q1)
Status: Published

Title: Bandwidth Allocation and Power Control Optimization for Multi-UAVs Enabled 6G Network
Journal: IEEE Access, vol. 12, pp. 67405–67415, May 2024
Authors: Mohammad Alnakhli, Ehab Mahmoud Mohamed, and Mostafa M. Fouda
DOI: 10.1109/ACCESS.2024.3397165
Impact Factor: 3.4 (Q2)
Status: Published

Title: Joint Self-Organizing Maps and Knowledge-Distillation-Based Communication-Efficient Federated Learning for Resource-Constrained UAV-IoT Systems
Journal: IEEE Internet of Things Journal, vol. 11, no. 9, pp. 15504–15522, May 2024
Authors: Gad Gad, Aya Farrag, Ahmed Aboulfotouh, Khaled Bedda, Zubair Md Fadlullah, and Mostafa M. Fouda
DOI: 10.1109/JIOT.2023.3349295
Impact Factor: 8.2 (Q1)
Status: Published

Title: New Beamforming Approach Based EGWO for Beyond 5G Communication
Conference presentation: Proc. of the 2024 International Telecommunications Conference (ITC-Egypt), Cairo, Egypt, Jul. 22–25, 2024
Authors: Samar Farghaly and Mostafa M. Fouda
Status: Published

Title: Evaluating Classification Methods in Predicting Intrusion Detection Systems in IoT
Conference presentation: Proc. of the 2024 IEEE International Opportunity Research Scholars Symposium (IEEE ORSS 2024), USA, Apr.–Jun. 2024
Authors: Hamza Kaddour, Shaibal Das, Rishikesh Bajgai, Amairanni Sanchez, Jason Sanchez, Steve C. Chiu, Ahmed F. Ashour, and Mostafa M. Fouda

Updated 2/29/24 SK

Status: Published

Title: Privacy-preserving, Lightweight, and Decentralized Load Forecasting in Smart Grid AMI Networks
Conference presentation: Proc. of the 2024 IEEE International Conference on Communications (IEEE ICC 2024), Denver, CO, USA, Jun. 9–13, 2024
Authors: Mohamed I. Ibrahem, Hussien AbdelRaouf, Ahmad Alsharif, Mostafa M. Fouda, Zubair Md Fadlullah, and Ahmed Aleroud
Status: Published

Title: Federated Learning With Selective Knowledge Distillation Over Bandwidth-constrained Wireless Networks
Conference presentation: Proc. of the 2024 IEEE International Conference on Communications (IEEE ICC 2024), Denver, CO, USA, Jun. 9–13, 2024
Authors: Gad Gad, Zubair Md Fadlullah, Mostafa M. Fouda, Mohamed I. Ibrahem, and Nei Kato
Status: Published

Title: A Robust Federated Learning Approach for Combating Attacks Against IoT Systems Under non-IID Challenges
Conference presentation: Proc. of the 2024 International Conference on Smart Communications and Networking (SmartNets 2024), Harrisonburg, VA, USA, May 28–30, 2024
Authors: Eyad Gad, Zubair Md Fadlullah, and Mostafa M. Fouda
Status: Published

Title: Deep Learning-Based Throughput Prediction in 5G Cellular Networks
Conference presentation: Proc. of the 2024 International Conference on Smart Communications and Networking (SmartNets 2024), Harrisonburg, VA, USA, May 28–30, 2024
Authors: Iqra Batool, Mostafa M. Fouda, and Zubair Md Fadlullah
Status: Published

Title: Combating Malware Traffic in Emerging Networks: A Collaborative Learning Approach
Conference presentation: Proc. of the 2024 International Conference on Smart Communications and Networking (SmartNets 2024), Harrisonburg, VA, USA, May 28–30, 2024
Authors: Harshith Vaitla, Gad Gad, Zubair Md Fadlullah, and Mostafa M. Fouda
Status: Published

Title: Optimizing VNF Migration in B5G Core Networks: A Machine Learning Approach
Conference presentation: Proc. of the 2024 International Conference on Smart Communications and Networking (SmartNets 2024), Harrisonburg, VA, USA, May 28–30, 2024
Authors: Brahma Reddy Tanuboddi, Gad Gad, Zubair Md Fadlullah, and Mostafa M. Fouda
Status: Published

Title: Securing Smart Grids: Deep Reinforcement Learning Approach for Detecting Cyber-Attacks
Conference presentation: Proc. of the 2024 International Conference on Smart Communications and Networking (SmartNets 2024), Harrisonburg, VA, USA, May 28–30, 2024

Updated 2/29/24 SK

Authors: Ahmed T. El-Toukhy, Islam Elgarhy, Mahmoud M. Badr, Mohamed Mahmoud, Mostafa M. Fouda, Mohamed I. Ibrahem, and Fathi Amsaad
Status: Published

Title: Short-Term Load Forecasting Using GRU-LGBM Fusion
Conference presentation: Proc. of the 2024 International Conference on Smart Communications and Networking (SmartNets 2024), Harrisonburg, VA, USA, May 28–30, 2024
Authors: Shijon Das, Mostafa M. Fouda, and Mohammad G. Abdo
Status: Published

Title: Short-Term Load Forecasting Employing Recurrent Neural Networks
Conference presentation: Proc. of the 2024 International Conference on Smart Communications and Networking (SmartNets 2024), Harrisonburg, VA, USA, May 28–30, 2024
Authors: Tanzim Mostafa, Mostafa M. Fouda, and Mohammad G. Abdo
Status: Published

Title: Investigations and Characterization of a New FM Active Receiving Antenna for Modern Vehicles Applications
Conference presentation: Proc. of the 2024 7th International Conference on Electronics Technology (ICET 2024), Chengdu, China, May 17–20, 2024
Authors: Ahmed F. Ashour, Mostafa M. Fouda, Andrew Chrysler, Steve C. Chiu, and Ashraf Ramadan
Status: Published

Title: Development of an Online Graduate Certificate for Nuclear Safeguards and Security
Journal/conference presentations: Transactions of the American Nuclear Society, Annual 2024 Conference
Authors: Daniel LaBrier (ISU), Kathy Araujo (BSU), Matthew Bernards (UI)
Status: Published

Title: Critical Materials Workforce Development at Idaho State University
Journal/conference presentations: Summary Report: 4th Annual Workshop on Resilient Supply of Critical Minerals
Authors: Daniel LaBrier (ISU)
Status: Published
Title: Critical Review of LPBF Metal Print Defects Detection: Roles of Selective Sensing Technology
Journal: Applied Sciences (MDPI)
Authors: Donna Guillen, Scott Wahlquist, Amir Ali
Status: Published

Title: Roles of Modeling and Artificial Intelligence in LPBF Metal Print Defects Detection: Critical Review
Journal: Applied Sciences (MDPI)
Authors: Scott Wahlquist, Amir Ali
Status: Under review

Updated 2/29/24 SK

Title: Autonomous Surveillance Breakthrough by Implementing Facial Recognition in Dog Robots
Journal/conference presentations: Intermountain Engineering, Technology, and Computing Conference (i-ETC) in Utah (IEEE)
Authors: Amir Hafezi, Minhaz Zibran, Taher Deemyad
Status: Presented and Published

Title: Revolutionizing Crop Leaf Disease Detection: A Novel Ensemble Learning Framework Using Customized EfficientNets
Journal/conference presentations: 4th International Conference on Intelligent Systems and Pattern Recognition
Authors: N. Jannat, S. Hasan, M. Zibran
Status: Accepted and presented

Title: Autonomous Surveillance Breakthrough by Implementing Facial Recognition in Dog Robots
Journal/conference presentations: 4th IEEE Intermountain Engineering, Technology, and Computing Conference (i-ETC)
Authors: A. Hafezi, M. Zibran, and T. Deemyad
Status: Published

Title: Breaking the Mold: ViT-CNN Fusion for Enhanced Glaucoma Prediction Using Machine Learning Classifiers in OCT Images
Journal/conference presentations: 23rd Springer International Conference on Artificial Intelligence and Soft Computing (ICAISC),
Authors: M. Oishe, S. Hasan, M. Zibran
Status: Accepted and presented

Title: Illustration or Illusion? Reassessing the Use of Machine Learning in Phishing Email Detection
Journal/conference presentations: Springer Studies in Computational Intelligence (SCI) series
Authors: A. Champa, M. Rabbi, and M. Zibran
Status: Accepted

Title: Analyzing ChatGPT Assistance in Programming
Journal/conference presentations: Springer Studies in Computational Intelligence (SCI) series
Authors: C. Nachuma, A. Champa, M. Rabbi, and M. Zibran
Status: Accepted

Title: Data Guard: Android Application to Monitor Security Threat in Background Data Transmission.
Journal/conference presentations: Springer Studies in Computational Intelligence (SCI) series
Authors: R. Tasnim, F. Eishita, and M. Zibran
Status: Accepted

Title: Are We Aware? An Empirical Study on the Privacy and Security Awareness of Smartphone Sensors

Updated 2/29/24 SK

Journal/conference presentations: Software Engineering and Management: Theory and Application (vol. 16), Springer Studies in Computational Intelligence (SCI) series (vol. 1137), https://doi.org/10.1007/978-3-031-55174-1_9
Authors: A. Champa, M. Rabbi, F. Eishita, and M. Zibran
Status: Published

Title: Phishy? Detecting Phishing Emails Using Machine Learning and Natural Language Processing
Journal/conference presentations: Software Engineering and Management: Theory and Application (vol. 16), Springer Studies in Computational Intelligence (SCI) series (vol. 1137), https://doi.org/10.1007/978-3-031-55174-1 9
Authors: M. Rabbi, A. Champa, and M. Zibran
Status: Published

Title: Are rock glaciers water sources or water processors in alpine stream systems?
Journal/conference presentations: Geological Society of America Abstracts with Programs. Vol. 56, No. 5, 2024; doi: 10.1130/abs/2024AM-401525
Authors: GD Thackray and OL Stanley
Status: Accepted

Title: Rock glaciers and alpine stream resilience in the semi-arid northern Rocky Mountains; Geological Society of America Abstracts with Programs. Vol. 56, No. 5, 2024 , doi: 10.1130/abs/2024AM-401520
Authors: OL Stanley and GD Thackray
Status: Accepted

Title: Let There be Light: Photo-Induced Reaction Synthesis—Advancing Manufacturing Horizons
Journal/conference presentations: ACS OMEGA
Authors: Shanae Brachtl, Rene Rodriguez, Kiyo Fujimoto
Status: in preparation

Title: Concept and Experimental Validation of Using Titanium Alloy Bars (TiABs) as Flexural Reinforcing in Concrete Beams
Journal/Conference Presentations: Structural Engineering International, Taylor and Francis
Authors: Aashish Thapa, Mahesh Acharya, Mustafa Mashal
Status: Accepted

Title: Finite Element Validation of U-Shaped Flexural Plates Integrated in a Novel Brace Dissipator
Journal/Conference Presentations: Journal of Structural Engineering
Authors: Yan Chen, A. Palermo, Mustafa Mashal
Status: Published

Title: A Disaster Response Complex for Training of Emergency Responders in the Northwest United States
Journal/Conference Presentations: Journal of Emergency Management
Authors: Kathryn Hogarth, Jared Cantrell, Mustafa Mashal, Bruce Savage, Rajiv Khadka

Updated 2/29/24 SK

Status: Published

Title: Extending Application of Titanium Alloy Bars for Retrofitting Reinforced Concrete Buildings
Journal/Conference Presentations: 18th World Conference on Earthquake Engineering
Authors: Hana Al-Ghanim, Wael Al-Nahhal, Mustafa Mashal
Status: Published

Title: Comparative Evaluation of Performance & Behavior of Metallic Dissipaters to Mitigate Seismic Energy
Journal/Conference Presentations: 18th World Conference on Earthquake Engineering
Authors: Saksham Maharjan, Jared Cantrell, Mustafa Mashal
Status: Published

Section 2. Conferences Presented at on Behalf of CAES

Name: 2024 IEEE International Opportunity Research Scholars Symposium (IEEE ORSS 2024)
Location: Virtual, USA, Apr.–Jun. 2024
Purpose: Presenting an accepted paper
Attendees from university/CAES: Hamza Kaddour

Name: 2024 IEEE International Conference on Communications (IEEE ICC 2024)
Location: Denver, CO, USA, Jun. 9–13, 2024
Purpose: Presenting accepted papers
Attendees from university/CAES: Mostafa M. Fouda

Name: 2024 International Conference on Smart Communications and Networking (SmartNets 2024)
Location: Harrisonburg, VA, USA, May 28–30, 2024 (Hybrid)
Purpose: Presenting accepted papers
Attendees from university/CAES: Mostafa M. Fouda

Name: 2024 7th International Conference on Electronics Technology (ICET 2024)
Location: Chengdu, China, May 17–20, 2024 (Hybrid)
Purpose: Presenting an accepted paper
Attendees from university/CAES: Ahmed F. Ashour

Name: American Nuclear Society Annual 2024 Conference
Location: Las Vegas, NV
Purpose: Presentation on CAES Nuclear Security Safeguards Certificate Program
Attendees from university/CAES: Daniel LaBrier (ISU); Kathy Araujo (BSU)

Name: 4th Annual Workshop on Resilient Supply of Critical Minerals
Location: Rolla, MO
Purpose: Presentation on Critical Materials Initiative at ISU/CAES
Attendees from university/CAES: Daniel LaBrier (ISU)

Name: Intermountain Engineering, Technology, and Computing Conference (i-ETC) in Utah (IEEE)
Location: Utah State University, Logan, UT 84322
Purpose: Present and share the most recent advancement with other researchers in the field of research and looking for future collaboration
Attendees from university/CAES: Dr. Taher Deemyad and his students.

Name: Geological Society of America, Annual Meeting
Location: Anaheim, California
Purpose: Present research findings from CAES-funded project. Chair technical session focused on mountain water resources,
Attendees from university/CAES: Glenn Thackray, Olivia Stanley

Name: Idaho Conference on Undergraduate Research
Location: Boise, Idaho
Purpose: Present Poster on CAES-related work
Attendees from university/CAES: Adam Storms

Name: 18th World Conference on Earthquake Engineering
Location: Milan, Italy
Purpose: Presenting ISU-INL collaborative research
Attendees from university/CAES: Mustafa Mashal, Jared Cantrell

Sections 3. University Proposals Related to CAES Activities (use attached table)

Dr. Amir Ali:
Funding organization: DOE-NEUP
Title: Predictive Modeling and Mitigation Strategies of Fouling in Heat Exchangers for Nuclear Applications
PI: Amir Ali
Collaborators: N/A
Status: Under Review

Funding organization: NSF
Title: REU Site: Intelligent Manufacturing for a Sustainable Energy Future
Co-PI: Amir Ali
Collaborators: University of Idaho
Status: Under Review

Dr. Rene Rodriguez
Title: Experimental and Theoretical Studies of Phosphonium Ionic Liquids in Separation Chemistry
(PI) Srinath Pashikanti (Co-PIs) Marilu Perez-Garcia, Kavita Sharma, Andrew Holland, Rene Rodriguez
DOE Proposal

Title: Fiscal Year 2025 Scientific Infrastructure Support for Consolidated Innovative Nuclear Research
(PI) Mackenzie Gorman, (co-PI) Rene Rodriguez
DE-FOA-0003312

Funding organization: Battelle Energy Alliance
Title: Laboratory Operations Supervisor Academy (LOSA) Pilot Program
PI: Mustafa Mashal
Collaborators: Jared Cantrell
Status: Under Review

Section 4. Patents, Licenses, other IP

1. "Precipitated Calcium Carbonate-Upcycled Recycled Concrete Aggregate Concrete Structures in Mitigating Near-Shore Ocean Acidification While Protecting Shoreline From Erosion" by Chikashi Sato was filed in the U.S. Patent and Trademark Office on June 12, 2024.

Impact: The patent is aligned with the EES&T research and associated INL strategic initiatives. The tetrapod manufactured using PCC-concrete offers multiple benefits, including the reduction of CO2 emissions and mitigation of near-shore ocean acidification. Additionally, it provides shelters for small shelled creatures such as planktonic baby crabs, and protects shorelines from extreme storms intensified by warm ocean waters and rising sea levels.
Optimized implementation of PCC-RCA concrete tetrapods and related structures could represent an innovative "net-zero" technology, potentially becoming a vital component of civil engineering projects aimed at environmental sustainability.

Section 5. Grants and Awards

<u>2025 ISU-CAES Internal Seed Grants:</u>
Total of seven projects were selected for funding ($103,575). Funding was awarded to projects associated with CAES Focus Areas and INL's Strategic Science and Technology (S&T) Initiatives and that engendered collaboration with INL researchers. Proposals were evaluated in a double-blind peer review process by scientists from the United States Department of Energy's national laboratories. The main factors considered in proposal evaluation were intellectual merit/quality, relation to CAES Focus Areas and INL's Strategic S&T Initiatives and potential for external funding.

1. Dr. Chikashi Sato, Professor, Department of Civil and Environmental Engineering
   - "Lab Validation of Effectiveness of a Sustainable Solution in Mitigating Near-Shore Ocean Acidification"
   - ISU Co-PIs: Dr. John Dudgeon, Dr. Kavita Sharma
   - INL Collaborator: Dr. Asef Redwan
   - $15,000

2. Dr. Dan Dale, Professor, Department of Physics
   - "Development of a Lab for Analysis of Geothermal Brines"

- ISU Co-PI: Dr. Tony Forest
- INL Collaborators: Dr. Edna Cardenas, Dr. Michael Reichenberger
- $13,575

3. Dr. Joshua Pak, Professor, Department of Chemistry
- "Study of Precursors for F-Element Nanomaterials"
- ISU Co-PI: Dr. Andy Holland
- INL Collaborators: Dr. Liyanage Ashini Jayasinghe, Dr. Christopher Zarzana
- $15,000

4. Dr. Paul Bodily, Associate Professor, Department of Computer Science
- "Crowdsourcing and Visualization of Advanced Computational Theory for Real-World Combinatorial Problems"
- INL Collaborator: Dr. Rajiv Khadka
- $15,000

5. Dr. Mahesh Acharya, Affiliate Faculty, Department of Civil and Environmental Engineering/ Postdoctoral Research Associate, Idaho National Laboratory
- "Novel Materials for Geothermal Wells"
- INL Collaborators: Trevor Atkinson and Dr. Travis McLing
- ISU Co-PIs: Jared Cantrell, Dr. Daniel LaBrier, Dr. Mustafa Mashal
- $15,000

6. Dr. Mostafa Fouda, Associate Professor, Department of Computer Science
- "Advancing Critical Materials Exploration"
- INL Collaborator: Ahmed Hamed
- ISU Co-PIs: N/A
- $15,000

7. Dr. Minhaz Zibran, Associate Professor, Department of Computer Science
- "Interactive Software Visualization"
- INL Collaborator: Kolton Heaps
- ISU Co-PI: Farjana Eishita
- $15,000

Dr. Tadesse Wakjira (PI), Dr. Mostafa Fouda (Co-PI), and Jared Cantrell (Co-PI)
Title: Training Students and Researchers in the State of Idaho on Applied Artificial Intelligence for Engineers within the I-CREWS Framework
Awarding Organization/Institution: NSF I-CREWS Seed Program, Idaho EPSCoR, University of Idaho
Timeframe (if applicable): Jul. 2024 – Jul. 2025
Award Amount: $78,504 in total cost

Dr. Glenn Thackray (PI)

Updated 2/29/24 SK

Title: Synthetic Aperture Radar Applications to Assess Rock Glacier Change and Alpine Water Cycle Impacts in the Western United States
Awarding Organization/Institution: NASA EPSCoR
Timeframe (if applicable): 7/1/24-10/31/25
Award Amount: $49,743

Section 6. Incoming CAES Personnel

Name: Ethan Lang
Institution: Idaho State University
Focus of work: REU Summer Program

Section 7. Outgoing CAES Personnel

Dr. Rene Rodriguez
Name: Adam Storms and Shanae Brachtl
Institution: ISU
Focus of work: continuing the magnetron sputter deposition experiments, and preparing a review manuscript

Dr. Mustafa Mashal, Dr. Tadesse Wakjira
Name: Manish Acharya (MS Student), Aashish Deo (MS Student), Kathryn Hogarth (PhD Student)
Institution: ISU
Focus of work: Environmental sustainability and resilience

Dr. Mahesh Acharya and Dr. Mustafa Mashal
Name: Anjan Koirala (MS Student), Saugat Dotel (MS Student)
Institution: ISU
Focus of work: Geothermal and environmental sustainability

Section 8. Industry Engagement

Name: Dr. Mustafa Mashal and Jared Cantrell
Company: Amalgamated Sugar Company
Project Focus: Environmental sustainability

Name: Dr. Mustafa Mashal and Jared Cantrell
Company: Ash Grove Cement Company
Project Focus: Cement manufacturing and sustainability

Name: Dr. Kavita Sharma, Dr. Tadesse Wakjira, Dr. Mustafa Mashal, Jared Cantrell
Company: BUILD Dairy
Project Focus: Environmental sustainability

Section 9. New Equipment

None

Section 10. Collaborative Research Events

Dr. Amir Ali:
Name: Hosting a seminar under MOU with Gachon University
Date: August 2024
Location: CAES
Attendees: ISU, INL, Gachon University
Results/Impact: Initiating clean energy proposal for potential funding

Dr. Taher Deemyad:
Name: Meet a new INL Researcher, Dr. Marcio De Queiroz and plan future collaboration in this project
Date: 08/28/2024
Location: Online (over Google Meet)
Attendees:
Results/Impact: Developing research plan to apply for an external grant proposal

Dr. Glenn Thackray
Name: The Cryosphere & Mountain Hydrology, Past and Present and Future (conference technical session)
Date: 9/22/24
Location: Anaheim, CA
Attendees: TBD
Results/Impact: TBD

Multiple visits, online discussions, and meetings, refer to the list of the tours and Sections 8 and12

Section 11. Research Highlights

Dr. Taher Deemyad:
Description:

- Initiated SLAM (Simultaneous Localization and Mapping) practices using a Turtlebot to understand the intricacies of robotic navigation and obstacle avoidance. This foundational step involved the utilization of a depth camera and a 360-degree 2D LiDAR sensor, facilitating a comprehensive 2D map creation of our laboratory environment.
- We have effectively familiarized ourselves with the robot, sensors, motion capabilities, and wireless charging feature. A USB Wi-Fi adapter was also integrated to facilitate remote control and feedback.
- Conducted a successful face recognition test, further augmented by the addition of a thermal camera to improve recognition accuracy under varying light conditions. The findings from these experiments have been presented at the Intermountain Engineering, Technology, and Computing Conference (IETC).

Date: 05/01/2024 to 09/01/2024
Impact: Collecting preliminary data for external grant proposal

Dr. Rene Rodriguez:
Description: Working with Dr. Fujimoto of the Idaho National Lab to acquire a contract from DOE to finish work on developing metal melting point temperature sensors for visual determination of temperatures reached by nuclear reactors
Date: August-Sept 2024
Impact: Work to begin within the next month and would provide temperature sensors in the range of 700-800^{o}C.

Section 12. Other

- More than 12 ISU-INL Joint Appointment (JA) discussions were facilitated by the ISU CAES Associate Director, Dr. Mustafa Mashal. From these:
    - Dr. Mostafa Fouda, Associate Professor, received a joint appointment with INL.
    - Dr. Dan LaBrier, Associate Professor, received a joint appointment with INL.
    - Dr. Kunal Mondal (ORNL scientist) received a joint appointment with ISU.
    - Ahmed Hamed (INL researcher) received a joint appointment with ISU.
    - Dr. Mahesh Acharya (INL researcher) received a joint appointment with ISU.
    - Several other JAs are in working.
- ESTEC was given space in the Roy F. Christensen building of the ISU Pocatello Campus to expand its lab spaces. Over the next 3 years, this space will be renewed and renovated to fit ESTEC lab needs. The first phase of this work was completed during Summer 2024. Once complete, the expanded lab space will be utilized by students in all ESTEC programs. Once the new semiconductor program is able to accept students, these students will also utilize the space. (The Semiconductor technician program is a joint program run by both ESTEC and Robotics, and is currently seeking State program approval).
- Upcoming MoU between ISU and INL
- Upcoming ISU-INL SUPER Agreement
    - Draft topics after receiving feedback from ISU and INL researchers are:
        - Critical and Strategic Materials (CSM)
        - Environmental Sustainability and Security (ESS)

Proposal(s) Submitted/Awarded during Reporting Period

PI	Shortened Title	Funding Agency	Submission Date	Start Date	End Date	Amount	Status
Chad Pope	A Digital Twin Modeling and Visualization	Centroid Lab	6/28/2024	7/1/2024	6/30/2025	$20,000	PS*
Srinath Pashikanti	NIH INBRE4 Pilot	Univ of Idaho	6/6/2024	5/1/2024	4/30/2025	$71,500	AA*
Tadesse Gemeda Wakjira	ICREWS: Training Students and Research	Univ of Idaho	6/3/2024	7/1/2024	6/30/2025	$78,504	PS
Taher Deemyad	Smart Robotic System for Water and	Univ of Idaho	6/3/2024	7/1/2024	6/30/2025	$79,176	PS
Tadesse Gemeda Wakjira	Lime-glass powder (LGP) binders for	Clarkson University	6/25/2024	3/1/2025	2/29/2028	$440,443	PS
Sean McBride	Cybersecurity Upskilling and Training	Univ of Arkansas	6/12/2024	8/1/2024	7/31/2027	$329,157	PS
John Liimakka	Institute for Construction Education	U.S. Department of Transportation	7/19/2024	8/1/2024	7/30/2026	$299,001	PS
Mustafa Mashal	FY25 INL Joint Appointment Agreement	Battelle Energy Alliance LLC	6/21/2024	10/1/2024	9/30/2025	$161,327	AA
Mary Lou Dunzik-Gougar	Sabbatical Support	Battelle Energy Alliance LLC	7/22/2024	8/12/2024	9/30/2025	$65,814	AA
Mackenzie Gorham	Scientific Infrastructure Support f	US Department of Energy	7/17/2024	8/1/2025	7/31/2026	$249,708	PS
Srinath Pashikanti	Experimental and theoretical studies	US Department of Energy	7/23/2024	1/1/2025	12/31/2027	$800,000	PS
Donna Delparte	E-RISE RII: Advancing STEM-driven E	Univ of Louisiana at Lafayette	7/18/2024	7/1/2025	6/30/2028	$116,085	PS
Farjana Eishita	CAREER: Gamified Digital Intervention	National Science Foundation	8/6/2024	8/1/2025	7/31/2030	$524,814	PS
Kristi Moser-Mcintire	FY25 EHS Interns	Battelle Energy Alliance LLC	7/29/2024	10/1/2024	9/30/2025	$71,040	PS

Updated 2/29/24 SK

Kristi Moser-Mcintire	FY25 CAES Assistant Safety Officer	Battelle Energy Alliance LLC	7/29/2024	10/1/2024	9/30/2025	$131,890	PS
Kristi Moser-Mcintire	FY25 ISU CHEMICAL PURCHASES TO SUPP	Battelle Energy Alliance LLC	7/29/2024	10/1/2024	9/30/2025	$10,001	PS
Kristi Moser-Mcintire	FY25 CAES EH&S Consumables/Infrastructure	Battelle Energy Alliance LLC	7/29/2024	10/1/2024	9/30/2025	$165,465	PS

* PS = Pending, AA = Awarded