MARJORIE ANNE DARRAH

309 Highland Meadows Drive, Grafton, WV 26354
Mobile: 304-376-3506
marjorie.darrah@mail.wvu.edu
marjorie.darrah@gmail.com

EDUCATION

WEST VIRGINIA UNIVERSITY
  1995 PH. D. MATHEMATICS
  1991 M.S. MATHEMATICS
  Graduated summa cum laude

FAIRMONT STATE COLLEGE
  1989 B.S. MATHEMATICS
  1988 B.A. Education, Comprehensive Mathematics 7-12
  Graduated summa cum laude

PROFESSIONAL EXPERIENCE

CO-FOUNDER, PRINCIPAL EVALUATOR `   **8/07 – PRESENT**
  ProEvaluators, LLC

ProEvalutators conducts project and program evaluations for local, state, and national projects funded by a variety of agencies. Responsibilities include working with proposal teams, development of evaluation plans, development of instruments, collection of data, analyses of data and writing reports to submit to customers and agencies.

ASSOCIATE PROFESSOR/ PROFESSOR OF MATHEMATICS   **8/07 – PRESENT**
  West Virginia University (promoted 2016 to Professor)
  School of Mathematics and Data Sciences

Course Instruction: Responsibilities include teaching service courses and upper level mathematics courses to majors and non-majors.
Advising Graduate and Undergraduate Research: Responsibilities include serving as the chair and member of doctoral and masters committees within and outside the mathematics department and advising mathematics majors and senior capstone projects.
Research Areas Include: Development of biologically inspired algorithms (neural networks and genetic algorithms), methods for cooperative control of Unmanned Aerial Vehicles (UAVs), Haptic Technology used for Education, Evaluation of Educational Projects and Programs, Improving Learning through use of Technology, Integrating Research into the K-12 Classroom.

Research Funding:
- Lockheed Martin. *"Using Genetic Algorithms for Robust Tasking of Multiple Unmanned Aerial Vehicles with Diverse Sensors."* This funded research provided

Lockheed Martin with a theoretical approach and simulation methods for cooperative control algorithms to coordinate a team of eight Desert Hawk III unmanned aerial vehicles to perform surveillance and prosecution of varied types of targets. (PI - 1/2008-12/2008, $15,000)

- West Virginia Department of Education: Improving Teacher Quality Grant Program. *"21st Century Statistics."* This project provided a summer workshop, master's level course credit, and yearlong follow-up for high school teachers in high need schools the content area of statistics. (Co-Director - 5/2008-5/2009, $55,000)
- Award for Research Team Scholarship Award. This internal WVU award provided support for the research team to pursue the NSF ADVANCE grant. (Co-PI - 5/2009 – 4/2010, $50,474)
- National Science Foundation, WVU ADVANCE. "WVU *Program for Retaining Institutional Diversity and Equity*." This program will help to provide policies and support to retain and promote women though the ranks at WVU. I was on the proposal development team and served as the internal evaluator for the grant. (Internal Evaluator - 10/2010 – 9/2017, $154,000/ $3.2 M)
- Award for Research Team Scholarship. "*The Network Structure of Conflict and Consensus: Mathematical and Computational Tools for Understanding Social Complexity.*" This internal funding provided professors from Social Science, Political Science, and Mathematics to collaborate on research and prepare proposals for external funding. (PI - 5/2010 – 4/2011, $47,500)
- Army Research Laboratory. "*Unmanned System Algorithm Development*." This program will investigate the development of autonomous control for unmanned aerial vehicles and the cooperative control algorithms for the tasking of these vehicles. My role on the project is in the area of development, implementation, and simulation testing of cooperative control for tasking unmanned vehicles. (Task Lead - 9/2010 – 9/2013, $141,000/ $2.7 M)
- West Virginia Department of Education: Improving Teacher Quality Grant Program. *"Blue Ribbon Math One-for-All"* This project provided a summer workshop, master's level course credit, and yearlong follow-up for high school teachers in high need schools who are beginning to implement the new Common Core Mathematics Standards in the high school Math I course. (Co-PI 5/2013-5/2014, $54,081)
- West Virginia Department of Education: Improving Teacher Quality Grant Program. *"Blue Ribbon Math 10 Geometry"* This project provided a summer workshop, master's level course credit, and yearlong follow-up for high school teachers in high need schools who are beginning to implement the new Common Core Mathematics Standards in the high school Math II course. The content of the workshop focuses on Geometry that is included in Math II. (Co-PI 5/2014-5/2015, $59,589)
- National Science Foundation, EAGER. "Understanding and Improving Collegiate Persistence and STEM Opportunities for Developmental Mathematics Students" Project to evaluate methods that will help developmental mathematics students identify as a STEM major and persist in the major. I was on the proposal development team and am evaluator for the grant. (Internal Evaluator 9/2015 – 8/2017, $30,000/$299,818)
- National Science Foundation INCLUDES. "NSF INCLUDES Alliance: Expanding the First2 STEM Success Network" Project to bring together 16 agencies throughout the state aimed at increasing first generation, rural students' persistence in STEM. (Co-PI 9/2018 – 8/2023, $65,541/$7,159,324)

INTERIM CHAIR, DEPARTMENT OF MATHEMATICS 7/18 – 12/20
    West Virginia University
<u>Supervisory Role:</u> Responsible for the supervision of 25 tenure-track professors, 18 teaching-track professors and instructors, and approximately 30 graduate teaching assistants who teach mathematics course for over 10,000 students per year.
<u>Research Mission:</u> Responsible for facilitating the management of grants totaling more than 1.5M per year.
<u>Service:</u> Serve as the liaison between the Mathematics Department and every other department and division on campus. Manage the budget of the Mathematics Department that included over 1M per year in entrepreneurial funds.

SENIOR PROGRAM MANAGER 7/11 – 12/13
    Information Research Corporation
Duties included Serving as project lead on federal grant and conducting research on educational technologies.

<u>Principal Investigator</u>, *"Haptic Immersion Device for the Visually Impaired" (US Department of Education, 07/11-12/13, $1,049,279)* This project involves developing and marketing immersive math and science software that will provide access to students who are blind and visually impaired through the use of haptic technology. The software developed provides access to information through sight, sound, and touch. This is a US Department of Education Small Business Innovative Research Fast Track award. As PI, I am responsible for the oversight of every aspect of the project.

DIRECTOR, COMPUTER SCIENCES GROUP 11/ 06 – 8/07
PRINCIPAL SCIENTIST 5/02 – 11/06
    Institute for Scientific Research / West Virginia High Technology Consortium Foundation
Mathematics Related Research
<u>Cooperative Control Task Lead, Technical Support</u>, *"Simulation Research Laboratory Project," (Air Force Research Laboratory, USAF, 02/05–05/07, $2M)* Responsibilities include developing and evaluating distributed control algorithms to enable autonomous heterogeneous unmanned aerial vehicle teams to accomplish strongly coupled tasks. Provided support for the implementation of image processing algorithms for the development of a passive sensor approach to aerial refueling of unmanned vehicles.
<u>Data Mining and Algorithm Development Support</u>, *"Library and Architecture for Implementing Data Driven Prognostics," (Missile Defense Agency STTR Program 6 months, 2003, $100K)* The project team investigated the use of data mining to improve the performance of the Airborne Laser pointing and tracking system. The data driven prognostics system would look for known failure signatures in the data and would check the data for system conditions that were unknown that signaled and uncharacteristic system state.
<u>Principal Investigator</u>, *"A Formal Method for Verification and Validation of Neural Network High Assurance Systems," (NASA STTR Program, 6 months, 2004-2005, $100K*) This project investigated a specific formal method for verifying and validating an

adaptive neural network. The project resulted in a prototype software application that implemented the formal method with case studies of how this could be used by a verification and validation practitioner.

Co-Principal Investigator, "*Development of Methodologies for Independent Verification and Validation of Neural Networks*," *(Goddard Space Flight Center, NASA, 05/02–09/05, $1,210,725)* The team on this project conducted extensive research into the verification and validation of adaptive neural networks being used in safety and mission critical systems, such as intelligent flight control, power plant systems, and medical devices. The research resulted in two books, numerous articles, and ten online training modules. Along with research responsibilities in formal methods, I lead the development of the online materials. I am also the co-author of the following book resulting from this project: Methods and Procedure for the Verification and Validation of Neural Networks (Springer) and Guidance for the Verification and Validation of Neural Networks (Wiley).

Technical Support for Virtual Reality, "*Collaborative Engineering Environment*", *Goddard Institute for Systems, Software, and Technology Research (Goddard Space Flight Center, NASA, 08/01–01/04, total funding to date $7.55M)* Responsibilities included assisting with the development of DEVISE (Design Environment using Virtual Interfaces for Smart Engineering) and the integration of this system into a state-of-the-art mission design research node to be linked with NASA's Goddard Space Flight Center and Jet Propulsion Laboratory.

Data Mining and Statistic Support, "*Improvements to the Hubble Space Telescope,*" *Goddard Space Flight Center, NASA, 05/02- 03/03, $90,000)* The project used data mining to determine improvements that could be to avoid some failures of the pointing and tracking system of the Hubble Space Telescope. Analysis of both operational and field of view data was completed. Suggestions were made to Hubble team at Goddard.

Education Related Projects

Principal Investigator, "*Comprehensive Information Technology Education in Rural Appalachia (CITERA),*" *(National Science Foundation, 01/05-12/07, $1,064,338)* This project involves working with 7th to 9th grade educators to provide professional development in IT concepts, exposure to IT projects and professionals, guidance in module development, strategies to student investigation and inquiry, and opportunities to work collaboratively in summer laboratory experiences. The project also includes a student week in which teachers pilot their modules. I was responsible for writing this proposal and was responsible for the oversight of every aspect of the project.

Principal Investigator, "*Advancing Content Through Interactive Virtual Environments (ACTIVE),*" *(National Science Foundation, 10/05-12/07, 299,316)* This project involves development of Earth and space science educational materials and software for blind or visually impaired students. The educational materials utilize haptic technology to allow students to interact with NASA data, which is currently only presented visually. I was responsible for writing this proposal and was responsible for the oversight of every aspect of the project.

Principal Investigator, "*Expanding Pathways for Educational Development and Information Technology Experiences (ExPEDITE),*" *(National Science Foundation, 10/05-12/07, 750,000)* This project involves working with Fairmont State University, Pierpont Community College and Marion County Schools. The partners are working together to create educational pathways into a career in IT. The activities of the project involve industry surveys, academic program reform and alignment, internship/fellowship

programs, and establishing articulation agreements. I was responsible for writing this proposal and was responsible for the oversight of every aspect of the project.

Education Specialist, "Team Dynamics in the Information Technology Industry - Center for Technical Leadership (CTL) Project," (Defense Acquisition University through subcontracts to Booz Allen Hamilton, 06/01–10/05, total funding to date $2.912M) The project included conducting research to develop a qualitative and quantitative understanding of IT teams in terms of personnel composition, structure, and operating procedures as the basis for the CTL management curriculum. The long-term goal was to measure and assess the effect of this management training offered through the CTL against attrition and overall productivity of IT teams. The end-goal was to establish a Software Management Best Practices based upon the record of success. My role on this project was to edit the educational materials insuring relevance to industry and sound pedagogical strategies.

Evaluator, "Project ISAAC – Improving Student Achievement - Advancing Communities," (Regional Education Service Agency (RESA) VII, 12/04–07/07, $12,000) Responsibilities included evaluation design, data collection, and completing annual evaluation report for the work performed for the RESA VII Project ISAAC educational grants conducted in nine counties of northern West Virginia.

Evaluator, "Enhancing Education Through Technology," (Marion County Board of Education, 09/05-09/06, $12,000) Responsibilities included evaluation design, data collection, and completing annual evaluation report of the work performed by the Technology Integration Specialist at Monongah Middle School for Marion County Board of Education funded through a state technology education grants.

Evaluator, "Enhancing Education Through Technology," (Marion County Board of Education, 09/06-09/07, $12,000) Responsibilities included evaluation design, data collection, and completing annual evaluation report of the work performed by the Technology Integration Specialist at East Fairmont Junior High School for Marion County Board of Education funded through a state technology education grants.

DIVISION CHAIR, NATURAL SCIENCES   8/00 – 5/02
ASSISTANT/ASSOCIATE PROFESSOR OF MATHEMATICS   8/92 – 5/02
TENURE   8/99
    Alderson-Broaddus College

Division Chair responsibilities included supervising ten full time faculty members in Biology, Chemistry, Environmental Science, Mathematics and Computer Science. Managing the department budget and serving on the college's Academic Program Committee.

International Studies Program Group Leader responsibilities included supervising 24 students and one assistant group leader during a semester abroad of study and travel. The program is home based in Salzburg, Austria with travel to England, Italy and other European countries.

Assistant/Associate Professor responsibilities included teaching four undergraduate courses per semester, directing senior research projects, advising students, and serving on college committees.

HONORS AND AWARDS

Woman of the Year, presented by Association of Women Students, Alderson-Broaddus College (2002)

Business Development Award for "West Virginia Collaborative Computing Grid" (2003)

Business Development Award for "A Library and Architecture for Data Drive Prognostics" (2003)

Business Development Award for "A Formal Method for Verification and Validation of Neural Network High Assurance Systems" (2004)

Business Development Award for "Comprehensive Information Technology Education in Rural Appalachia (CITERA)" (2004)

Credibility, Service and Passion Award for the Institute for Scientific Research (2004)

Business Development Award for "Project ISAAC Evaluation" (2005)

Business Development Award for "Expanding Pathways for Educational Development and Information Technology Experiences (ExPEDITE)" (2005)

Business Development Award for "Advancing Content Through Interactive Virtual Environments (ACTIVE)" (2005)

TechConnect StartUp Innovation of the Year award (2013)

MATHEMATICS AND DATA SCIENCE RELATED PUBLICATIONS AND PRESENTATIONS

Books and Book Chapters:

1. **Darrah, M.** and Taylor, Brian. (2011) Chapter 5: Rule Extraction to Understand Changes in an Adaptive System in *Adaptive Control Approach for Software Quality Improvement* (W. Eric Wong and Bojan Cukic editors) World Scientific. 115-144.
2. Pullum, L., Taylor, B. and **Darrah, M.** (2007). *Guidance for the Verification and Validation of Neural Networks.* Wiley.
3. **Darrah, M.** (2006). Book Chapter: Neural Network Visualization Techniques. *Methods and Procedures for the Verification and Validation of Artificial Neural Networks.* Brian J. Taylor (editor). Springer.
4. **Darrah, M.** and Taylor, B. (2006). Book Chapter: Rule Extraction as a Formal Method. *Methods and Procedures for the Verification and Validation of Artificial Neural Networks.* Brian J. Taylor (editor). Springer.

Journal Articles:

1. **Darrah, M.,** Richardson, M., DeRoos, B., & Wathen, M. (2022). Optimal LiDAR Data Resolution Analysis for Object Classification. *Sensors*, *22*(14), 5152.
2. Elsarrar, O., **Darrah, M.,** & Cossman, J. (2021). Improving Neural Network Performance by Embedding Expert Knowledge in the Form of Rules. *Procedia Computer Science*, *191*, 417-424.

3. Elsarrar, O., **Darrah, M**., & Devin, R. (2020). Rule Insertion Technique for Dynamic Cell Structure Neural Network. *International Journal of Computer and Information Engineering*, 14(8), 287-292.
4. Rahem, M. A., **Darrah, M.** (2018). Using a Computational Approach for Generalizing a Consensus Measure to Likert Scales of Any Size n. *International Journal of Mathematics and Mathematical Sciences.* Volume 2018, Article ID 5726436. https://doi.org/10.1155/2018/5726436
5. Akiyama Y., Nolan, J., **Darrah, M.,** Abdal Rahem, M., and Wang, L. (2016) A Method for Measuring Consensus Within Groups: An Index of Disagreement Via Conditional Probability. *Information Sciences*, 345, pp. 116-128.
6. Rahem, M. A., **Darrah, M.** (2016). A Geometric Approach for Computing a Measure of Consensus for Groups. *International Mathematics Forum*, 11(20), pp. 961-973. dx.doi.org/10.12988/imf.2016.68115
7. **Darrah, M.**, Sorton, E., Wathen, M. and Mera Trujillo, M. (2016). Real-time Tasking and Retasking of Multiple Coordinated UAVs. *Defense Systems Information Analysis Center Journal,* 3(4) pp. 21-26.
8. **Darrah, M.**, Wilhelm, J., Munasinghe, T., Duling, K., Sorton, E., Yokum, S., Wathen, M. and Rojas J. (2015) A Flexible Genetic Algorithm System for Multi UAV Surveillance: Algorithm and Flight Testing. *Unmanned Systems,* (3)1, 1–14. doi: 10.1142/S2301385015500041
9. Zhao, P., **Darrah, M.**, Nolan, J. and Zhang, C.Q. (2014). Analyses of Crime Patterns in NIBRS Data Based on a Novel Graph Theory Clustering Method: Virginia as a Case Study. *The Scientific World Journal*, vol. 2014, Article ID 492461. doi:10.1155/2014/492461
10. **Darrah, M.**, Fuller, E., Munasinghe, T., Duling, K., Gautam, M. and Wathen, M. (2013). Using Genetic Algorithms for Tasking Teams of Raven UAVs. *Journal of Intelligent & Robotic Systems,* 70(1-4), 361-371.
11. Pullum, L., **Darrah, M.**, and Taylor, B. (2004). Independent Verification and Validation of Neural Networks – Developing Practitioner Assistance. *Software Tech Newsletter.* 2004.
12. Skias, S., **Darrah, M.** and Webb, M. (2002) Improvement of Hubble Space Telescope subsystem through data mining. *Data Mining III*. WIT Press, Southampton, Boston.
13. **Darrah, M.**, Liu, Y.P, and Zhang, C.Q. (1997). Cycles of All Lengths in Arc-3-cyclic Semicomplete Digraphs. *Discrete Mathematics*, 173(1-3), 23-33.

Conference Proceedings:

1. Elsarrar, O., **Darrah, M.,** & Cossman, J. (2021). Improving Neural Network Performance by Embedding Expert Knowledge in the Form of Rules. *Procedia Computer Science*, 191, 417-424.
2. Elsarrar, O., **Darrah, M.,** & Devine, R. (2019, December). Analysis of Forest Fire Data Using Neural Network Rule Extraction with Human Understandable Rules. *In 2019 18th IEEE International Conference On Machine Learning And Applications (ICMLA)* (pp. 1917-19176). IEEE.
3. **Darrah, M.**, Rubenstein, A., Sorton, E. and DeRoos, B. (2018). On-board Health-state Awareness to Detect Degradation in Multirotor Systems. In *Proceedings of*

2018 International Conference on Unmanned Aircraft Systems (ICUAS), Dallas, TX, USA, 2018.

4. **Darrah, M**., Trujillo, M. M., Speransky, K. and Wathen, M. (2017). Optimized 3D mapping of a large area with structures using multiple multirotors. In *Proceedings of 2017 International Conference on Unmanned Aircraft Systems (ICUAS)*, Miami, FL, USA, 2017, pp. 716-722. doi: 10.1109/ICUAS.2017.7991414

5. Trujillo, M. M., **Darrah, M.**, DeRoos, B. and Wathen, M. (2016) Real-time retasking of multiple coordinated assets. *2016 International Conference on Unmanned Aircraft Systems (ICUAS)*, Arlington, VA, 2016, pp. 1041-1048. doi: 10.1109/ICUAS.2016.7502537

6. Trujillo, M. M., **Darrah, M.**, Speransky, K., DeRoos, B. and Wathen, M. (2016). Optimized flight path for 3D mapping of an area with structures using a multirotor. *2016 International Conference on Unmanned Aircraft Systems (ICUAS)*, Arlington, VA, 2016, pp. 905-910. doi: 10.1109/ICUAS.2016.7502538

7. Mera Trujillo, M., Duling, K., **Darrah, M.**, Fuller, E. and Wathen, M. (2015) Fitness Function Changes to Improve Performance in a GA Used for Multi-UAV Tasking. *Proceedings of Workshop on Research, Education and Development of Unmanned Aerial Systems.* Cancun, Mexico, November 23-25, 2015.

8. **Darrah, M.**, Fuller, E., Munasinghe, T. Duling, K., Gautam, M. and Wathen, M. (2012). Using Genetic Algorithms for Tasking Teams of Raven UAVs. In *Proceedings of 2012 International Conference on Unmanned Aircraft Systems (ICUAS'12).* June 12-15, Philadelpia, PA.

9. **Darrah, M.**, Pullum, L., Beck Roth, S., Gilkerson, B. and Taipale, E. (2009). Using Genetic Algorithms for Robust Tasking of Multiple UAVs with Diverse Sensors. In *Proceedings of AIAA Infotech@Aerospace Conference*, Seattle, WA, April 6-9, 2009.

10. **Darrah, M.** and Niland, W. (2007). Increasing UAV Task Assignment Performance through Parallelized Genetic Algorithms. In *Proceedings of Infotech@Aerospace Conference, Rohnert Park*, California, May 2007.

11. **Darrah, M.**, Van Scoy, F. and Plunkett, P. (2007). Enabling Collaboration in High Performance Computing. In *Proceedings of ACM Special Interest Group for Information Technology Education*, Destin, FL, October 2007.

12. **Darrah, M.**, Niland, W., Stolarik, B. and Walp, L. (2006). UAV Cooperative Task Assignments for a SEAD Mission using Genetic Algorithms. In *Proceedings of Guidance, Navigation and Control Conference,* Keystone, CO, August 2006.

13. **Darrah, M.**, Taylor, B. and Livingston, R. (2005). A Geometric Rule Extraction Approach used for V&V of a Safety Critical Application." *In Proceedings of Florida Artificial Intelligence Research Symposium*, Miami, FL, May, 2005.

14. **Darrah, M.**, Niland, W. and Stolarik, B. (2005). Multiple UAV Dynamic Task Allocation using Mixed Integer Linear Programming in a SEAD Mission. In *Proceedings of the AIAA Infotech@Aerospace Conference*, Alexandria, VA, AIAA 2005-7164, September 2005.

15. **Darrah, M.**, Taylor, B. and Skias, S. (2004). Rule Extraction from Dynamic Cell Structure Neural Network used in a Safety Critical Application. In *Proceedings of Florida Artificial Intelligence Research Symposium*, Miami, FL, May, 2004.

16. Pullum, L., **Darrah, M.**, Skias, S., Tso, K.S. and Tai, A.T. (2004). Developing a Data Driven Prognostic System with Limited System Information. In *Proceedings*

of the Eighth IEEE International Symposium on High Assurance Systems Engineering (HASE), Tampa, FL, March 25-26, 2004.

17. Taylor, B., **Darrah, M.** and Skias, S. (2004). Weaving it All Together: A Methodology for the V&V of Adaptive Systems. In *Proceedings of NIPS Workshop on Verification, Validation, and Testing of Learning Systems*, Whistler, B.C., December 2004.

18. Witt, K., Giorcelli, R., **Darrah, M.**, Ives, B. and Peak, R. (2004) DEVISE: A Collaborative Virtual Environment for Integrated Concurrent Engineering. In *Proceeding of the 2004 International Symposium on Collaborative Technologies and Systems.*

19. Taylor, B. and **Darrah, M.** (2003). Verification and Validation of Neural Networks: A Sampling of Research in Progress. In *Proceedings of AeroSense*, Orlando, FL, April 2003.

Dissertations and Master Theses Directed:

1. Al-Rahem, Mushtaq K. Abd. (2017) *A Multidimensional Technique for Measuring Consensus Within Groups via Conditional Probability*. West Virginia University, ProQuest Dissertations Publishing, 2017.

2. Elsarrar, O. A. (2019). *Rule Extraction and Insertion to Improve the Performance of a Dynamic Cell Structure Neural Network.* West Virginia University, ProQuest Dissertations Publishing, 2019.

3. Buch, D. A. (2019). *Tie Strength, Optimal Connections, and Distance in Social Networks. West Virginia University*, ProQuest Thesis Publishing, 2019.

4. Aljandeel, S. (2020). *Genetic Algorithms used for Search and Rescue of Vulnerable People in an Urban Setting.* West Virginia University, ProQuest Thesis Publishing, 2020.

5. Hill, A. (2023) *Feature Extraction of Footwear Impression Images for Quality Assessment. West Virginia University*, ProQuest Thesis Publishing, 2023

Technical Reports:

1. *"Robust Cooperative Control: Final Report."* Marjorie Darrah, Stephanie Beck Roth, Beau Gilkerson, Laura Pullum, and Eric Taipale. Lockheed Martin, December 15, 2008.

2. "A Formal Method for Verification and Validation of Neural Network High Assurance Systems: Final Report." Marjorie Darrah, Brian Taylor, Spiro Skias, Dan McCaugherty, Rhett Livingston. STTR: NASA Ames. Contract Number: NNA04AA20C. 2004.

3. "Library and Architecture for Implementing Data Driven Prognostics: Phase I Final Report." Kam S. Tso, Ann T. Tai, Laura Pullum, Marjorie Darrah, Spiro Skias. STTR Topic: MDA03T-001. Contract Number: N00174-03-C-0057. 2004.

4. "Concept of Operations: Design Environment Using Virtual Interfaces for Smart Engineering (DEVISE) for the demonstration of Augmented Distributed Virtual Integrated Concurrent Engineering (ADVICE)" GISSTR-CONOPS-D001-UNCLASS-033103. 2003.

5. "Introduction to Development of Methodologies for Independent Verification and Validation of Neural Networks." IVVNN-INT-F001-UNCLASS-021403. January 2003.

6. "Toward Reliable Neural Network Software for the Development of Methodologies for Independent Verification and Validation of Neural Networks." IVVNN-LITREV-F001-UNCLASS-111202. November 2002.

Posters and Presentations:

1. **Darrah, M.** A., (2018) International Conference on Unmanned Aircraft Systems, "On-board Health-state Awareness to Detect Degradation in Multirotor Systems," IEEE, Dallas, TX, USA. (June 15, 2018).
2. **Darrah, M.** A., (2017) International Conference on Unmanned Aircraft Systems, "Optimized 3D Mapping of a Large Area with Structures using Multiple Multirotors," IEEE, Miami, FL, USA. (June 15, 2017).
3. Miller, D., Fuller, E. and **Darrah, M.** (2009). Comparing Partial-credit Graded Examinations and the End of Semester Bonus Quiz for Computerized Examination. *Presentaion at ICTCM 2009 International Conference on Technology in Collegiate Mathematics,* New Orleans, LA, March 12-15, 2009.
4. **Darrah, M.** Promising Teaching Practices for Working with Students with Disabilities. Invited Symposium. *Society for Information Technology and Teacher Education (SITE) Conference.* LasVegas, Nevada, March 3-7, 2008.
5. **Darrah, M.** (2008). The ITEST Experience: Combining Cutting Edge Technology and Pedagogy for Teacher Professional Development. *Society for Information Technology and Teacher Education (SITE) Conference.* LasVegas, Nevada, March 3-7, 2008.

EDUCATION RELATED PUBLICATIONS AND PRESENTATIONS

Books and Book Chapters:
1. **Darrah, M.** and Dowling, A. (2010) Chapter 5: Preparing the Next Generation of Innovators through Collaboration. *Collaborative Technologies and Applications for Interactive Information Design: Emerging Trends in User Experiences.* Ed. Scott Rumler and Kwong Bor Ng. IGI Publishing:Hershey NY, 2010. 67-81.
2. **Darrah, M.**, Fuller, E. and Squire, D. (2009) *Introduction to Calculus Labs.* Kendall/Hunt. ISBN-978-1-4652-0447-9 (Calculus Lab Website)

Journal Articles:
1. **Darrah, M.,** Humbert, R., & Howley, C. (2022). Differentiating Rural Locale Factors Related to Students Choosing and Persisting in STEM. *Research in Higher Education Journal*, 42.
2. **Darrah, M.,** Cowley, K., Wheatley, C., McJilton, L., & Humbert, R. (2022). Analyzing the Growth of a Statewide Network to Increase Recruitment to and Persistence in STEM. *Journal of Appalachian Studies*, *28*(2), 188-212.
3. Leppma, M., & **Darrah, M.** (2022). Self-efficacy, mindfulness, and self-compassion as predictors of math anxiety in undergraduate students. *International Journal of Mathematical Education in Science and Technology*, 1-16
14. **Darrah, M.,** Humbert, R. & Stewart, G. (2022). Understanding the Levels of First Generationness. *Inside HigherEd.*

https://www.insidehighered.com/views/2022/03/02/first-gen-category-encompasses-varied-group-opinion

4. Deshler, J., Fuller, E., & **Darrah, M.** (2019). Affective States of University Developmental Mathematics Students and their Impact on Self-Efficacy, Belonging, Career Identity, Success and Persistence. *International Journal of Research in Undergraduate Mathematics Education,* 5(3), 337-358.

5. Deshler, J., Fuller, E., & **Darrah, M.** (2019). Supporting Students Through Peer Mentoring in Developmental Mathematics. *Learning Assistance Review* (TLAR), 24(1).

6. Hougland, J. G. and **Darrah, M. A.**, (2018). Sponsorship as a Strategy for Promoting Academic Success among STEM and SBS Women Faculty. *Journal of Behavioral and Social Sciences*, 5, 237-249.

7. Hansen, E. G., Liu, L., Rogat, A., Hakkinen, M. T. and **Darrah, M.** (2016) Designing Innovative Science Assessments That Are Accessible for Students Who Are Blind. *Journal of Blindness Innovation and Research,* 6(1).

8. Fuller, E., Deshler, J., and **Darrah M.** (2016). Effects of an External Mentoring Program in a Department of Mathematics. *International Journal of Gender, Science and Technology*, 8(2) pp. 300-309.

9. Murphy, K. and **Darrah, M.** (2015). Haptics-based Apps for Middle School Students with Visual Impairments. *IEEE Transactions on Haptics*, 8(3), 318-326. doi: 10.1109/TOH.2015.2401832

10. **Darrah, M.**, Hougland, J. and Prince, B. (2014). Salary, space, and satisfaction: an examination of gender differences in the sciences. *Research in Higher Education Journal,* (23), 4-37.

11. **Darrah, M.**, Humbert R., Finstein, J., Simon, M., and Hopkins, J. (2014). Are Virtual Labs as Effective as Hands-on Labs for Undergraduate Physics? A Comparative Study at Two Major Universities. *Journal of Science Education and Technology,* 23(6), 803-814. doi: 10.1007/s10956-014-9513-9

12. Finstein, J., **Darrah, M.** and Humbert, R. (2013). Do Students in General High School Physics Classes Learn as Much from Virtual Labs as from Hands-On Labs? *National Teacher Education Journal,* 6(3), 61-70.

13. **Darrah, M.** (2013). Computer Haptics, A New Way of Increasing Access and Understanding of Math and Science for Students Who are Blind and Visually Impaired. *Journal of Blindness Innovation and Research,* 3(2)*.* DOI: http://dx.doi.org/10.5241/3-47

14. **Darrah, M.** (2013). eTouchSciences Apps, A New Way to Interact with Math and Science Content. *Future Reflections*, 32(3).

15. **Darrah, M.** (2012). The Use of Touch Technology in Science to Provide Access for Students who are Visually Impaired. *Journal of Technology Integration*, 4(1), 45-50.

16. Parker, C., Stylinski, C., **Darrah M.**, McAuliffe, C., Gupta, P. and Akbayin, B. (2010). Innovative uses of IT applications in STEM classrooms: A preliminary review of ITEST teacher professional development. *Joural of Technology and Teacher Education*, 18(2), 203-230. Chesapeake, VA: AACE.

17. **Darrah, M.**, Fuller, E. and Miller, D. (2010). A Comparative Study of Partial Credit Assessment and Computer-Based Testing for Mathematics. *Journal of Computers in Mathematics and Science Teaching*, 29(4), 373-398. Chesapeake, VA: AACE.

Conference Proceedings:

20. **Darrah, M.**, Leppma, M. & Ogden, L. (2023). Role of Grit and Other Factors in Mitigating Math Anxiety in College Math Students. In *Proceeding of Pyschology of Mathematics Education Conference*, Reno, NV, October 1-4, 2023.

21. **Darrah, M.** and Hougland, J. (2017). Sponsorship as a Strategy for Promoting Academic Success Among STEM and SBS Women Faculty. In *Proceedings of Annual American Behavioral and Social Sciences Conference*, Las Vegas, NV, January 30-31, 2017.

22. Engelke, N., **Darrah, M.** and Murphy, K. (2016) A framework for examining the 2-D and 3-D spatial skills needed for calculus. *In Proceedings of Research in Undergraduate Mathematics Education.* Pittsburgh, PA, February 25-27, 2016.

23. Fuller, E., Deshler, J., **Darrah, M.**, Mera Trujillo, M., and Wu, X. (2016). Anxiety and Personality Factors Influencing the Completion Rates of Developmental Mathematics Students. *INDRUM 2016: First conference of the International Network for Didactic Research in University Mathematics*. March 31 – April 2, 2016, Montpillier, France.

24. Jackson, K., Jouben, L. and **Darrah, M.** (2016). Encouraging Sponsorship to Build Faculty Members' Developmental Networks. In *Proceedings of University of New Mexico 2016 Annual Mentoring Conference*, Albuquerque, NM, October 24-28, 2016.

25. **Darrah, M.**, Aviles, W., Murphy, K., and Speransky, K. (2015) Computer Haptic Effects in Math and Science Lessons Support Student Learning. *Proceedings of International Conference on Education and Access for Persons with Visual Impairments,* Athens, Greece February 12-14, 2015.

26. **Darrah, M.**, Murphy, K., Speranski, K. and DeRoos, B. (2014). Framework for K-12 Education Haptic Applications. In *Proceedings of IEEE Haptics Symposium 2014*. Houston, TX, February 23-26, 2014.

27. Fuller, E., Deshler, J. and **Darrah, M.** (2014). Mentoring Women Faculty in STEM Academic Departments. In *Proceedings of University of New Mexico 2014 Annual Mentoring Conference*, Albuquerque, NM, October 21- 24, 2014.

28. **Darrah, M.**, Fuller, E. and Squire D. (2010). Using Online Context-based Labs to Motivate Students in an Introduction to Calculus Course. In *Proceedings of EdMedia Conference,* June 28 - July 2, 2010, Toronto, CA.

29. **Darrah, M.**, Fuller, E. and Miller, D. (2010). A Comparative Study of Partial Credit Assessment and Computer-based Testing. In *Proceedings of EdMedia Conference*, June 28 - July 2, 2010, Toronto, CA.

30. Humbert, R., **Darrah, M.** and Finstein, J. (2010). Applying a Heuristic Approach to Developing a User Interface for College-Level Virtual Physics Labs. In *Proceedings of EdMedia Conference*, June 28 - July 2, 2010, Toronto, CA.

31. Giorcelli, R. , Lee, C.P and **Darrah, M.** (2010). Finding an Answer to the Enrollment Crisis in Computing: An ExPEDITE Project Case Study. In *Proceedings of Decision Science Institute 2010 Annual Meeting*, November 20-23, 2010, San Diego, CA.

32. **Darrah, M.** and Blake, A. (2009). Providing Real World Experiences for High School Teachers and Students. In *Proceedings of Society for Information Technology and Teacher Education Conference*, Charleston, SC, March 2-6, 2009.

33. **Darrah, M.** and Tisdal, C. (2008). Advancing Content Through Interactive Virtual Environments. *In proceeding of Society for Information Technology and Teacher Education Conference,* Las Vegas, Nevada, March 3-7 2008.
34. Parker, C., Stylinski, C., **Darrah,** M., Gupta, P., Akbayin, B. and McAuliffe, C. (2008). Information Technology Experience for Students and Teachers: Professional Development Models and Teacher Change Processes. In *Proceedings of Society for Information Technology and Teacher Education Conference,* Las Vegas Nevada, March 3-7 2008.
35. **Darrah, M.** and Humbert, R. (2007) Information Technology Diffusion and Career Awareness in Middle and High School Science and Mathematics Classrooms. In *Proceedings of Society for Information Technology Education Conference*, San Antonio, Texas, March 2007.
36. **Darrah, M.**, Van Scoy, F. and Plunkett, P. (2007). Enabling Collaboration in High Performance Computing. In *Proceedings of ACM Special Interest Group for Information Technology Education*, Destin, FL, October 2007.
37. **Darrah, M.**, Giorcelli, R., Dodson, T. and Blake, A. (2007). A Comprehensive Program for Expanding Pathways to IT Careers. In *Proceedings of ACM Special Interest Group for Information Technology Education*, Destin, FL, October 2007.
38. Van Scoy, F., Kawai, T., **Darrah, M.** and Rash, C. (2000). Haptics Display of Mathematical Functions for Teaching Mathematics to Students with Vision Disabilities: Design and Proof of Concept. In *Proceedings of Workshop on Haptic Human-Computer Interaction.*

Dissertations and Master Theses Directed:

6. Murphy, Kristen. (2021) Remediation of Spatial Skills in First Semester Calculus Using Haptics-Based Applications. https://researchrepository.wvu.edu/etd/10206/

Posters and Presentations:

6. **Darrah, M.** A., Cowley, K., Humbert, R., & McJilton, L. (2020, October). Using Social Network Analysis to Illuminate a Growing State Network. American Evaluation Association.
7. **Darrah, M.** A., (2017) STEM Sure Program, "STEM Sure Panel," WVU, Morgantown, WV, USA. (June 29, 2017).
8. **Darrah, M.** A. and Hougland, J. (2017) 20th Annual American Association of Behavioral and Social Sciences Conference, "Sponsorship as a Strategy for Promoting Academic Success among STEM and SBS female faculty," American Association of Behavioral and Social Sciences, Las Vegas, NV. (January 2017).
9. Engelke, N., **Darrah, M.** and Murphy, K. (2016) A framework for examining the 2-D and 3-D spatial skills needed for calculus. *In Proceedings of Research in Undergraduate Mathematics Education.* Pittsburgh, PA, February 25-27, 2016.
10. Fuller, E., Deshler, J., **Darrah, M.**, Mera Trujillo, M., and Wu, X. (2016) Anxiety and Personality Factors Influencing the Completion Rates of Developmental Mathematics Students. *INDRUM 2016: First conference of the International Network for Didactic Research in University Mathematics*. March 31 – April 2, 2016, Montpillier, France.
11. **Darrah, M.** (2015) Overview of Competency Based Education. *West Virginia Higher Education Technology Conference, Morgantown*, WV, October 26-27, 2015. (was a Presenter)

12. Latimer, M., Dilks, L., Jackson, K., **Darrah, M.** and Hougland, J. (2014). Small Steps toward Big Change: Strategies for Changing a University's Climate. *Association for Applied and Clinical Sociology Conference 2014*, Pittsburgh, PA, October 9 – 11, 2014.

13. **Darrah, M.** (2014) Using Technology to Give Students What They Need. Invited Kick-off Keynote presentation at the West Virginia Higher Education Technology Conference. Confrence Theme: Innovate to Educate. Morgantown, WV, October 27-28, 2014. (was a presenter)

14. **Darrah, M.** and Hougland J. (2014) Salary, Space and Satisfaction: An Examination of Gender Issues in STEM. Webinar Presentaion to the ADVANCE Implementation Mentors Network. September 9, 2014. (was a presenter)

15. **Darrah, M.**, Hougland, J. and Prince, B. (2013). Salary, Space, and Satifaction: An Examination of Gender Differences in the Sciences. *Association for Applied and Clinical Sociology Conference 2013*, Portland, OR, October 3 – 5, 2013.

16. **Darrah, M.** and Humbert, R. (2010). Preparing Students for Algebra I: A Comprehensive Approach that is Paying High Dividends. *Presented at Math Science Partnership Regional Conference*, New Orleans, LA, March 29-31, 2010.

17. **Darrah, M.** (2012). Touch Technology for Exploring Science. Presentation at *27th Annual International Technology & Persons with Disabilities Conference*, San Diego, CA, Feb. 27 – Mar. 3, 2012.

18. Miller, D., Fuller, E. and **Darrah, M.** (2009). Comparing Partial-credit Graded Examinations and the End of Semester Bonus Quiz for Computerized Examination. *Presentaion at ICTCM 2009 International Conference on Technology in Collegiate Mathematics,* New Orleans, LA, March 12-15, 2009.

19. **Darrah, M.** Promising Teaching Practices for Working with Students with Disabilities. Invited Symposium. *Society for Information Technology and Teacher Education (SITE) Conference.* LasVegas, Nevada, March 3-7, 2008.

20. **Darrah, M.** (2008). The ITEST Experience: Combining Cutting Edge Technology and Pedagogy for Teacher Professional Development. *Society for Information Technology and Teacher Education (SITE) Conference.* LasVegas, Nevada, March 3-7, 2008.

21. **Darrah, M.** (2008). Emerging Technology as a Vehicle for Teacher Change. *NSF Information Technology Expereinces for Student and Teachers Principal Investigators Summit.* Arlington, VA, Feb. 5-7, 2008.

22. Parker, C., Stylinski, C., **Darrah, M.**, Gupta, P., Akbayin, B. and McAuliffe, C. (2008). Emerging Technology as a Vehicle for Teacher Change: Frameworks and Assessment Strategies. *American Education Research Association (AERA) Conference.* New York, NY, March 24-28, 2008.

23. **Darrah, M.**, Peduto, D., Blake, A. and Calloway, C. (2007). Using 3-D Graphics to Enhance Student Learning. Poster presentation at *National Education Computing Conference (NECC)*, Atlanta, GA, June 2007.

24. **Darrah, M.**, Peduto, D., Blake, A. and Calloway, C. (2007) Motivating K-12 Students towards Careers in Information Technology. Poster presentation at *National Education Computing Conference (NECC)*, Atlanta, GA, June 2007.

25. **Darrah, M.**, Peduto, D. and Humbert, R. (2006). Using 21st Century Tools to Motivate Students to Study Math and Science and Enter IT Careers. Presented at the *West Virginia State Technology Conference*, Charleston, WV, August 2006.

26. **Darrah, M.**, Harris, P. and Roy, S. (2006). A Multi-Modal Learning Environment for the Study of Earth and Space Science for the Inclusion of All Students. Presented at *West Virginia State Technology Conference*, Charleston WV, August 2006.
27. **Darrah, M.**, Girocelli, R. and Chenoweth, T. (2006). Expanding Pathways to Careers in Information Technology: A Project Connecting Academia to Industry Needs. Presented at the *West Virginia State Technology Conference*, Charleston, WV, Aug. 2006.