

FRANK XU, PH.D.

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RESEARCH INTERESTS

My research interests are in the areas of AI-assisted digital forensics and cybersecurity. Our repository for digital forensics education (<https://github.com/frankwxu/digital-forensics-lab>) has gained 1600 stars. These materials have been adopted by universities worldwide.

EDUCATION

Ph.D. in Software Engineering	North Dakota State University	2007
M.S. in Computer Science	Towson University	2002
B.S. in Computer Science(Math Minor)	Southeast Missouri State University	2000

EXPERIENCE

University of Baltimore 09/2018 - current
Full Professor
Director of the MS in Forensic Sciences - Cyber Forensics Baltimore, MD

- Teaching Experience
 - FSCS630 Introduction to Cryptography
 - FSCS727 Computer and Digital Forensics
 - FSCS724 Protection of Data/Information
 - FSCS728 Information Systems, Threats, Attacks and Defense Strategies
 - FSCS730 Incidence Response
- Research Grant
 - **NSF**, Collaborative Research: Education DCL: EAGER: Harnessing the Power of Large Language Models in Digital Forensics Education at MSI and HBCU, PI, \$300,000, 2023-2025, **Awarded**.
 - **Lawrence Berkeley National Laboratory, Department of Energy**, Faculty Research Fellowship, Exploring Graph Convolutional Networks for Cybercrime Investigations, 2021, **Awarded**.
 - **NSF**, Excellence in Research: Collaborative Research: Detecting Vulnerabilities in Cyber-Physical Systems with Artificial Intelligence, Co-PI, \$1M, 2021-2024, **Awarded**.
 - **U.S. Department of Justice**, Developing a Cyber Investigation Case Simulator for Enhancing Students' Learning Experience at the University of Baltimore and Towson University, PI, \$450,000, 2019-2021, **Awarded**.
 - **Department of Homeland Security**, Faculty Research Fellowship (follow-up grant), Shared CTI for Detecting Post-Compromise of Advanced Persistent Threats, \$50k, 2020-2021, **Awarded**.
 - **U.S. Department of Justice**, Developing a Cyber Investigation Case Simulator for Enhancing Students' Learning Experience at the University of Baltimore and Towson University (Supplement Award), PI, \$436,000, 2020-2024, **Awarded**.
 - **NSF** Visualized and Explainable AI to Improve Students' Learning Experience in Digital Forensics Education, PI, \$300K, 2020-2023, **Awarded**.
 - **Department of Homeland Security**, Faculty Research Fellowship, Shared CTI for Detecting Post-Compromise of Advanced Persistent Threats, 2020, **Awarded**.
 - **Department of Energy**, Faculty Research Fellowship, Building Secure Design Models for Smart Contracts with Formal Methods, 2018, **Awarded**.
 - **Department of Defense**, Faculty Research Fellowship, Detecting AI training algorithm vulnerabilities, 2018, **Awarded**.

- **NSF**, Developing a Cloud-based Cryptographic Simulator for Enhancing Undergraduates' Learning Experience in Cybersecurity Education, PI, \$399,000, 2017-2021, **Awarded**.

- Service

- ABET evaluator (2021- 2025)
- NSF panel reviewer (2018- 2025)

Bowie State University

08/2015 - 8/2018

Director of CAE-CD Cybersecurity Program

Associate Professor (Tenured), Department of Computer Science

Bowie, MD

- Teaching Experience

- Software Security
- Software and Operating System Security
- Fundamental of Cryptography
- Principles & Methods of Intrusion Detection
- Foundations of Computer & Network Security
- Information Privacy and Security
- Computer Networking

- Program/Course Development

- Leading cybersecurity curriculum committee
- Developed cybersecurity hands-on labs, including Access Control, Crack Linux Password Using Rainbow Table Buffer Overflow Attack, and SQL Injection Using Kali Sqlmap. Example labs can be accessed via <https://goo.gl/iD8LxL>

- Service and Volunteering

- Search committee member for Technology Security Manager position at Bowie State University
- Advisor of Cybersecurity club at Bowie State University
- Judge of Congresswoman Donna F. Edwards' 2015 and 2016 App Challenge
- Coach for Manor Woods Elementary school Lego teams
- Committee member for several well-known conferences

Gannon University

08/2008 - 08/2015

Director of Keystone Software Development Institute

Assistant/Associate Professor of Software Engineering

(Tenured and Promoted in 2013)

Erie, PA

- Teaching Experience

- Security-related course: Secure software engineering, software assurance
- Software engineering related courses: Software Engineering in UML, Requirement Engineering Software Design, Software Testing and Quality Assurance, Software Maintenance
- Computer Science courses: Advanced programming in Java, Mobile Application Programming, Multi-tiered Systems, Dynamic Web Programming, Data Structure, Operating System, Discrete Math, Design and Analysis of Algorithms

- Research & Grant

- Published eleven peer-reviewed journal papers and thirty conference/workshop papers
- 700+ citations based on Google Scholar
- Awarded over \$1M from GE Transportation and Precision Rehab Manufacture (PRM) Inc.

- Leadership and Service

- Led Keystone Software Development Institute
- Selected to be an ABET evaluator
- Led software engineering curriculum development, familiarity with ABET accreditation for software engineering

- Served as a faculty senator at Gannon University and made a significant contribution to drafting the administrative evaluation process.
- Served as a committee member for several well-known conferences

General Electric Transportation

08/2008 - 08/2015

*Consultant**Erie, PA*

- Managed a group of graduate student interns to develop i-based information simulation system, which is an on-board control system for locomotives
- Created project budgets for a student internship program
- Hired team members
- Coached, mentored, motivated, and supervised project team members
- Evaluated each team member's performance based on his/her project artifacts, including requirement specs, design doc, implementations, and testing plan

University of Virginia (Wise College)

08/2007 - 05/2008

*Assistant Professor of Software Engineering**Wise, VA*

- Taught software engineering courses including Software Requirements, Introduction to Software Engineering, etc.
- Helped develop undergraduate software engineering program. The undergraduate software engineering program is the first one developed in Virginia

Swanson Health Products

06/2005 - 08/2007

*Sr. Program Analyst**Fargo, ND*

- Worked closely with the business department to define the business process and translate the process to systems models
- Prepared functional specifications in the form of UML diagrams and other documents
- Communicated the requirements to the programmers who will create or modify the company's online shopping systems (<http://www.swansonhealth.com>)
- Provided assistance with the work plan development, system integration testing, and deployment

Volt Information Science Inc.

10/2004 - 06/2005

*Software Engineer**Fargo, ND*

- Worked on a Bobcat Store project (<http://www.bobcatstore.com/>). The all-new Bobcat Store is the Web's largest collection of Bobcat die-cast replicas, units, and authentic Bobcat merchandise
- Provided an end-to-end solution for Bobcat Company, from the front-end user interfaces, to backend order fulfillment and vendor integration
- Applied the latest technology, such as struts and JOD, along with J2EE and Oracle database to provide the best solution for Bobcat Company customer
- Daily tasks include architecture design, UML detail design and coding, unit testing, and system testing

North Dakota State University

12/2003 - 12/2005

*Research Assistant**Fargo, ND*

- Investigated automated test generation from behavior models of software systems and the infrastructure for model-based test execution (e.g. run-time code instrumentation)
- Modeled intra- and inter-object behaviors using UML 2.0, including automated test generation from state models of object-oriented programs, automated test generation from aspect-oriented state models of aspect-oriented programs, and automated test generation from state models of safety-critical software

PUBLICATIONS: 1-63 CONFERENCE; 64- JOURNALS

- [1] R. Xiao, Y. Luo, W. Xu, and D. Xu, "From text to stix: Reducing hallucinations through fine-tuned llms," in *2025 IEEE International Conference on Trust, Security and Privacy in Computing and Communications (TrustCom)*. IEEE, 2025, guiyang, China.
- [2] O. Ramadan, R. Xiao, D. Xu, and W. Xu, "Reconstructing judicial digital forensic evidence graphs from legal documents using large language models," in *The 49th Annual International Conference on Computer Software and Applications (COMPSAC 2025)*, Toronto, Canada, July 2025, pp. 1204–1213.
- [3] J. P. Khatiwala, D. K. N. Addai, and W. Xu, "Evaluating the reliability of digital forensic evidence discovered by large language model: A case study," in *The 49th Annual International Conference on Computer Software and Applications (COMPSAC 2025)*. Toronto, Canada: IEEE, July 2025, pp. 1067–1076.
- [4] H. Zhou, W. Xu, J. Dehlinger, S. Chakraborty, and L. Deng, "Forensic intelligence graphs: An llm approach to digital evidence extraction and relationship analysis," in *The 49th Annual International Conference on Computer Software and Applications (COMPSAC 2025)*. Toronto, Canada: IEEE, July 2025, pp. 1996–2001.
- [5] S. Shaikh and W. Xu, "Quantifying completeness of reconstructed scenarios: A case study on echo show," in *The 49th Annual International Conference on Computer Software and Applications (COMPSAC 2025)*. Toronto, Canada: IEEE, July 2025, pp. 1474–1479.
- [6] R. Xiao, Y. Luo, W. Xu, H. Lamba, and D. Xu, "Analyzing relationship consistency in digital forensic knowledge graphs with graph learning," in *The 23rd IEEE International Conference on Trust, Security and Privacy in Computing and Communications (TrustCom 2024)*. Sanya, China: IEEE, December 2024, pp. 590–599.
- [7] E. Xu, W. Zhang, and W. Xu, "Transforming digital forensics with large language models: Unlocking automation, insights, and justice," in *Proceedings of the 33rd ACM International Conference on Information and Knowledge Management (CIKM)*, Boise, USA, October 2024, pp. 5543–5546.
- [8] H. Zhou, W. Xu, J. Dehlinger, S. Chakraborty, and L. Deng, "An LLM approach to gain cybercrime insights with evidence networks," in *Proceedings of the 20th Symposium on Usable Privacy and Security (SOUP 2024)*, Philadelphia, PA, August 11-13 2024.
- [9] Y. Luo, W. Xu, K. Andersson, M. S. Hossain, and D. Xu, "Fellmvp: An ensemble llm framework for classifying smart contract vulnerabilities," in *2024 IEEE International Conference on Blockchain (Blockchain)*. IEEE, 2024, pp. 89–96.
- [10] D. Addai, S. Shaikh, E. Xu, W. Zhang, and W. Xu, "A graph-based approach for discovering evidence relationships across multiple devices in group crimes," in *2024 IEEE 24th International Conference on Software Quality, Reliability, and Security Companion (QRS-C)*. IEEE, 2024, pp. 1312–1313.
- [11] I. A. Khan, Y. Luo, W. Xu, and D. Xu, "Gnn-based transfer learning and tuning for detecting code vulnerabilities across different programming languages," in *2024 IEEE 24th International Conference on Software Quality, Reliability and Security (QRS)*. IEEE, 2024, pp. 596–607.
- [12] Y. Luo, W. Xu, and D. Xu, "Predicting code vulnerability types via heterogeneous gnn learning," in *European Symposium on Research in Computer Security*. Springer, 2024, pp. 67–87.
- [13] S. Shaikh, L. Deng, and W. Xu, "A practical survey of data carving from non-functional android phones using chip-off technique," in *International Conference on Information Technology-New Generations*. Springer, 2024, pp. 43–50.
- [14] S. V. Chinta, K. Fernandes, N. Cheng, J. Fernandez, S. Yazdani, Z. Yin, Z. Wang, X. Wang, W. Xu, J. Liu *et al.*, "Optimization and improvement of fake news detection using voting technique for societal

- benefit,” in *2023 IEEE International Conference on Data Mining Workshops (ICDMW)*. IEEE, 2023, pp. 1565–1574.
- [15] S. Sayyafzadeh, W. Xu, and H. Chi, “Forensic analysis of contents in thumbnails using transfer learning,” in *Proceedings of the Future Technologies Conference*. Springer, 2023, pp. 517–535.
- [16] H. Zhou, P. D. Nguyen, L. Deng, W. Xu, J. Dehlinger, and S. Chakraborty, “Reconstructing android user behavior through timestamped state models,” in *2023 IEEE 47th Annual Computers, Software, and Applications Conference (COMPSAC)*. IEEE, 2023, pp. 574–585.
- [17] Y. Luo, W. Xu, and D. Xu, “Compact abstract graphs for detecting code vulnerability with gnn models,” in *Proceedings of the 38th Annual Computer Security Applications Conference*, 2022, pp. 497–507.
- [18] W. Xu and D. Xu, “Visualizing and reasoning about presentable digital forensic evidence with knowledge graphs,” in *The 19th Annual International Conference on Privacy, Security and Trust (PST2022)*. Fredericton, Canada: IEEE, Aug. 2022, pp. 1–10.
- [19] W. Xu, L. Deng, and D. Xu, “Towards designing shared digital forensics instructional materials,” in *2022 IEEE 46th Annual Computers, Software, and Applications Conference (COMPSAC)*. IEEE, 2022, pp. 117–122.
- [20] H. Zhou, L. Deng, W. Xu, W. Yu, J. Dehlinger, and S. Chakraborty, “Towards internet of things (iot) forensics analysis on intelligent robot vacuum systems,” in *2022 IEEE/ACIS 20th International Conference on Software Engineering Research, Management and Applications (SERA)*. IEEE, 2022, pp. 91–98.
- [21] Y. Luo, W. Xu, and D. Xu, “Detecting integer overflow errors in Java source code via machine learning,” in *2021 IEEE 33rd International Conference on Tools with Artificial Intelligence (ICTAI)*, 2021, pp. 724–728.
- [22] W. Xu, J. Yan, and D. Stone, “A collaborative forensic framework for detecting advanced persistent threats,” in *The International Conference on Software Engineering and Knowledge Engineering*, Jul. 2021, pp. 67–74, (Virtual Conference).
- [23] A. Alatawi, W. Xu, and D. Xu, “A bigram-based inference model for retrieving abbreviated phrases in source code,” in *The 24th International Conference on Evaluation and Assessment in Software Engineering (EASE2020)*, Trondheim, Norway, Apr. 2020, pp. 11–20, (acceptance rates 27/115=23.5%).
- [24] W. Xu, J. Yan, and H. Chi, “A forensic evidence acquisition model for data leakage attacks,” in *The 17th IEEE International Conference on Intelligence and Security Informatics (ISI)*. Shenzhen, China: IEEE, Jul. 2019, pp. 53–58.
- [25] R. Tiwang, T. Oladunni, and W. Xu, “A deep learning model for source code generation,” in *IEEE SoutheastCon*, no. 1-7, Alabama, USA, 2019.
- [26] W. Xu and A. G. Fink, “Building executable secure design models for smart contracts with formal methods,” in *The 3rd Workshop on Trusted Smart Contracts In Association with Financial Cryptography*, no. 154-169, St. Kitts, Feb. 2019.
- [27] A. Alatawi, W. Xu, and J. Yan, “The expansion of source code abbreviations using a language model,” in *2018 IEEE 42nd Annual Computer Software and Applications Conference (COMPSAC)*. Tokyo, Japan: IEEE, Jul. 2018, pp. 370–375.
- [28] R. Agada, J. Yan, and W. Xu, “An affective sensitive tutoring system for improving student’s engagement in cs,” in *Proceedings of the Future Technologies Conference*. Springer, 2018, pp. 1151–1163.
- [29] R. R. Agada, J. Yan, and W. Xu, “A virtual animated commentator architecture for cybersecurity

- competitions,” in *The 15th International Conference on Information Technology-New Generations-New Generations*. Springer, 2018, pp. 43–50.
- [30] A. Alatawi, W. Xu, and D. Xu, “Bayesian unigram based inference for expanding abbreviations in source code,” in *29th IEEE International Conference on Tools with Artificial Intelligence*, Trondheim, Norway, Apr. 2017.
- [31] W. Xu, D. Xu, and L. Deng, “Measurement of source code readability using word concreteness and memory retention of variable names,” in *The 41st Annual IEEE Computer Software and Applications Conference (COMPSAC 2017)*. Turin, Italy: IEEE, Jul. 2017.
- [32] W. Xu, D. Xu, O. E. Ariss, Y. Liu, and A. Alatawi, “Statistical unigram analysis for source code repository,” in *The Third IEEE International Conference on Multimedia Big Data*. Laguna Hills, California, USA: IEEE, Apr. 2017, (acceptance rate 23.9%).
- [33] Y. Liu and W. Xu, “An empirical study to compare real time database transaction processing,” in *The International Conference On Artificial and Computer Engineering*, Jiangsu, China, Jun. 2017, (Accepted).
- [34] W. Xu, O. E. Ariss, and Y. Liu, “An empirical study of control flow graphs for unit testing,” in *The 14th International Conference on Information Technology : New Generations*. Las Vegas, Nevada, USA: Springer, Apr. 2017.
- [35] Q. Zheng, B. Li, and W. Xu, “Unified discrete time optimal control for mems gyroscopes,” in *American Control Conference (ACC), 2016*. Boston, USA: IEEE, Jul. 2016, pp. 1548–1553.
- [36] O. El Ariss, W. Xu *et al.*, “Testing software using swarm intelligence: A bee colony optimization approach,” in *The 9th EAI International Conference on Bio-inspired Information and Communications Technologies*, New York, USA, Dec. 2016, pp. 205–213.
- [37] W. Xu and O. El Ariss, “A jvm-based testing harness for improving component testability.” in *International Conference on Software Engineering and Knowledge Engineering*, Pittsburgh, USA, 2015, pp. 421–426, (acceptance rates: 29%).
- [38] W. Xu and O. el Ariss, “A force-directed program graph visualizer for teaching white-box testing techniques,” in *2015 ASEE Annual Conference & Exposition*, Seattle Washington, USA, Jun. 2015.
- [39] W. Xu, T. Ding, and D. Xu, “Rule-based test input generation from bytecode,” in *The Eighth International Conference on Software Security and Reliability*. San Francisco, CA: IEEE, Jun. 2014, pp. 108–117.
- [40] D. Xu, W. Xu, and M. Tu, “Automated generation of integration test sequences from logical contracts,” in *The 38th International Computer Software and Applications Conference Workshops (COMPSACW)*. Sweden: IEEE, Jul. 2014, pp. 632–637.
- [41] W. Xu, T. Ding, H. Wang, and D. Xu, “Mining test oracles for test inputs generated from java bytecode,” in *IEEE 37th Annual Computer Software and Applications Conference (COMPSAC)*,. Kyoto, Japan: IEEE, Jul. 2013, pp. 27–32, (Acceptance rates: $44/201 = 22\%$).
- [42] W. Xu, H. Wang, and T. Ding, “Mining auto-generated test inputs for test oracle,” in *Tenth International Conference on Information Technology: New Generations (ITNG)*. Las Vegas: IEEE, Apr. 2013, pp. 89–94, (Acceptance rates: $132/455 = 29\%$).
- [43] Y. Liu, M. Vagula, W. Xu, and T. Ding, “Gene expression games: A case study of the integration between game programming and bioinformatics education,” in *The Great Lakes Bioinformatics Conference*, Ann Arbor, MI, May 2012.
- [44] W. Xu, L. Deng, and T. Ding, “Detecting web security risks with uml design models,” in *The 7th*

IASTED International Conference on Communication, Internet, and Information Technology, Baltimore, USA, May 2012.

- [45] D. Xu, W. Xu, B. K. Bavikati, and W. E. Wong, "Mining executable specifications of web applications from selenium ide tests," in *IEEE Sixth International Conference on Software Security and Reliability (SERE)*. Washington DC, USA: IEEE, Jun. 2012, pp. 263–272, (Acceptance rates: $31/103 = 30\%$).
- [46] Q. Zheng, A. Daluom, W. Xu, and Y. Zheng, "Reduced-order active disturbance rejection control for multivariable chemical processes," in *2012 IEEE Industry Applications Society Annual Meeting (IAS)*. Las Vegas, NV, USA: IEEE, Oct. 2012, pp. 1–7.
- [47] W. Xu, L. Deng, and Q. Zheng, "Annotating resources in sequence diagrams for testing web security," in *Information Technology: New Generations (ITNG), 2012 Ninth International Conference on*. Las Vegas: IEEE, Apr. 2012, pp. 873–874.
- [48] Q. Zheng, K. K. Chedella, W. Xu, and L. Wu, "Reduced-order active disturbance rejection control for induction motors," in *IEEE International Conference on Control Applications (CCA)*. Denver, Colorado, USA: IEEE, Sep. 2011, pp. 1139–1144.
- [49] L. Thomas, W. Xu, and D. Xu, "Mutation analysis of magento for evaluating threat model-based security testing," in *Computer Software and Applications Conference Workshops (COMPSACW), 2011 IEEE 35th Annual*. IEEE, 2011, pp. 184–189.
- [50] L. Deng, W. Xu, and S. Frezza, "A resource-based approach to extend uml diagrams for web applications," in *International Conference on Computer Science and Service System*. Nanjing, China: IEEE, Jun. 2011, pp. 103–106.
- [51] W. Xu and S. T. Frezza, "A case study: Integrating a game application-driven approach and social collaborations into software engineering education." in *The 13th International Conference on Enterprise Information Systems*, Beijing, China, Jun. 2011, pp. 23–32, (Acceptance rates: $43/448 = 14\%$).
- [52] W. Xu, W. R. Betz, S. T. Frezza, and W. Lee, "Letting patients's daily living information speak: A novel approach to study geriatric patients with dementia and hypertension," in *Proceedings of the World Congress on Engineering and Computer Science*, vol. 2, San Francisco, USaA, Oct. 2010.
- [53] W. Xu, B. Luebbert, S. Frezza, Q. Zheng, and T. Dinner, "Visual manipulation for grid-based 3d surface models," in *36th Annual Conference on IEEE Industrial Electronics Society*. Phoenix, AZ: IEEE, Nov. 2010, pp. 1203–1208.
- [54] W. Xu, L. Deng, and Y. Liu, "A resource-based approach to formalize use case specification for web applications," in *IEEE International Conference on Progress in Informatics and Computing (PIC)*, vol. 2. Shanghai, China: IEEE, Dec. 2010, pp. 1072–1076.
- [55] W. Xu, B. Luebbert, S. Frezza, S. Sasi, and T. Dinner, "Building customized cushion seats using stereo visions for disabled," in *The Seventh International Conference on Information Technology: New Generations (ITNG)*,. Las Vegas: IEEE, Apr. 2010, pp. 275–280.
- [56] W. Xu and D. Xu, "Automated evaluation of runtime object states against model-level states for state-based test execution," in *Software Testing, Verification and Validation Workshops, 2009. ICSTW'09. International Conference on*. Denver, Colorado: IEEE, Apr. 2009, pp. 3–9.
- [57] D. Xu, I. Alsmadi, and W. Xu, "Model checking aspect-oriented design specification," in *The 31st Annual International Conference on Computer Software and Applications (COMPSAC 2007)*, vol. 1. Beijing, China: IEEE, Jul. 2007, pp. 491–500, (Acceptance rates: 29%).
- [58] D. Xu, W. Xu, and W. E. Wong, "Automated test code generation from uml protocol state machines." in *The Nineteenth International Conference on Software Engineering and Knowledge Engineering*, Boston, USA, Jul. 2007, pp. 99–104.

- [59] W. Xu and D. Xu, "State-based testing of integration aspects," in *The 2nd workshop on Testing aspect-oriented programs*. Portland, Maine: ACM, Jul. 2006, pp. 7–14.
- [60] D. Xu and W. Xu, "State-based incremental testing of aspect-oriented programs," in *Proceedings of the 5th international conference on Aspect-oriented software development*. Bonn, Germany: ACM, Jun. 2006, pp. 180–189, (Acceptance rates: $23/96 = 24\%$).
- [61] W. Xu and D. Xu, "A model-based approach to test generation for aspect-oriented programs," in *AOSD 2005 Workshop on Testing Aspect-Oriented Programs*, Chicago, USA, 2005.
- [62] D. Xu, W. Xu, and K. E. Nygard, "A state-based approach to testing aspect-oriented programs." in *International Conference on Software Engineering and Knowledge Engineering*, Taiwan, Jul. 2005, pp. 366–371.
- [63] H. Chi, J. Liu, W. Xu, M. Peng, and J. deGoicoechea, "Design hands-on lab exercises for cyber-physical systems security education," *2022 Journal of The Colloquium for Information Systems Security Education*, vol. 9, Mar. 2022, (<https://doi.org/10.53735/cisse.v9i1.140>).
- [64] W. Xu, D. Xu, A. Alatawi, O. E. Ariss, and Y. Liu, "Statistical unigram analysis for source code repository," *International Journal of Semantic Computing*, vol. 12, pp. 230–260, Jun. 2018, (The extension of the BigMM2017 conference paper).
- [65] D. Xu, W. Xu, M. Tu, N. Shen, W. Chu, and C.-H. Chang, "Automated integration testing using logical contracts," *IEEE Transactions on Reliability*, vol. 65, no. 3, pp. 1205–1222, 2016.
- [66] W. Xu, T. Ding, D. Xu, and O. El Ariss, "Mining decision trees as test oracles for java bytecode," *International Journal of Computers and Their Applications*, vol. 23, pp. 141–159, 2016.
- [67] O. El Ariss, S. Bou ghosn, and W. Xu, "Testing software using swarm intelligence: A bee colony optimization approach (the extended version of the conference paper)," *EAI Endorsed Transactions on Collaborative Computing*, vol. 2, 12 2016.
- [68] D. Xu, W. Xu, M. Kent, L. Thomas, and L. Wang, "An automated test generation technique for software quality assurance," *IEEE Transactions on Reliability*, vol. 64, no. 1, pp. 247–268, 2015.
- [69] W. Xu, L. Deng, Q. Zheng, and S. Frezza, "Using stereo vision to construct 3-d surface models," *IEEE Potentials*, vol. 31, no. 2, pp. 31–37, 2012.
- [70] D. Xu, M. Tu, M. Sanford, L. Thomas, D. Woodraska, and W. Xu, "Automated security test generation with formal threat models," *IEEE transactions on dependable and secure computing*, vol. 9, no. 4, pp. 526–540, 2012.
- [71] D. Xu, O. El-Ariss, W. Xu, and L. Wang, "Testing aspect-oriented programs with finite state machines," *Software Testing, Verification and Reliability*, vol. 22, no. 4, pp. 267–293, 2012.
- [72] W. Xu, W. R. Betz, S. T. Frezza, and Y. Liu, "A system design for studying geriatric patients with dementia and hypertension based on daily living information," *IAENG Transactions on Engineering Technologies*, vol. 1373, no. 1, pp. 186–198, 2011.
- [73] D. Xu, W. Xu, and W. E. Wong, "Automated test code generation from class state models," *International Journal of Software Engineering and Knowledge Engineering*, vol. 19, no. 04, pp. 599–623, 2009.
- [74] D. Xu, O. El Ariss, W. Xu, and L. Wang, "Aspect-oriented modeling and verification with finite state machines," *Journal of computer science and technology*, vol. 24, no. 5, pp. 949–961, 2009.
- [75] D. Xu, W. Xu, and W. E. Wong, "Testing aspect-oriented programs with uml design models," *International Journal of Software Engineering and Knowledge Engineering*, vol. 18, no. 03, pp. 413–437, 2008.

GRANTS AWARDED BEFORE UB

- Build Research Capacity in Cyber-Security at Bowie State University, NSF Supplement Grant, Co-PI, \$196,437, 2016-2019.
- Software Readability and Security, Bowie State University Career/Collaboration and Research Excellence for Scholar, PI, \$5,500, 2016-2017.
- Remote Locomotive Diagnostic System, GE Transportation, PI, \$1M, 2008-2015.
- Search-based Approach for Generating Testing Data, Faculty research award, Gannon University, PI, \$18,000, 2012-2013.
- 3D Modeling Using Stereo Vision Camera, Precision Rehab Manufacture, Erie, PA, PI, \$113,000, 2008-2015.
- Faculty Development Grants, Gannon University, PI, \$10,000, 2008-2014.
- Development of Benchmark Application for Web Security Testing, Faculty research award, Gannon University, PI, \$18,000, 2010-2011.
- Teaching Software Engineering through Game Design, Faculty research award, Gannon University, PI, \$2,000, 2010.
- Web-based Personal Health Record Information System, Keystone Innovation Grant, PA, PI, \$3,367, 2008.

SERVICE AT UB

- Promotion and Tenure review committee member 2019-2023
- Curriculum review committee member 2018-2024
- Draft MS Cyber Investigations Program assessment report 2019-2023
- UB Forensics Lab Task Force Discussion and Implementation 2020
- Organize to film a promotional YouTube video for M.S. in Forensic Science-Cyber Forensics program. <http://y2u.be/Bfpp6l-tuws> 2019
- Howard County Community College, Forensic Program meeting 2019
- Draft BS- Cyber Forensics program curriculum and course descriptions 2019
- SCJ search committee member for faculty hiring 2020
- Advisor for National Cyber League competition 2018-2020
- Assess MSFS program outcomes using CAE-CD course mapping criteria 2019-2020
- Organize students to participate Cyber-Day at BSU 2019
- University Technology Committee Meeting 2018
- Participate graduate student open-houses 2018-2022
- Participate graduate student orientations 2018-2022

SERVICE BEFORE UB

- Technology Security Manager position search committee at Bowie State University 2018
- Ph.D. comprehensive and quality exam committee at Bowie State University 2015-2018
- Open house representative for CS department at Bowie State University 2015-2016
- Advisor of Cybersecurity club at Bowie State University 2016-2018
- Judge for the Congresswoman Donna F. Edwards App Challenge 2015-2016
- Faculty Senator at Gannon University 2012-2015
- Committee member of the ESL director search 2013
- Committee member of the CIS department Web Track Repairs 2011-2015
- Committee member of the CIS Department Web Site 2011-2015

- Occupational Advisory Committee at Erie County Technical School 2008-2013
- Participated in open house 2008-2013
- Volunteer of Erie Asian Festival 2013
- Presented on Flip Flop Friday 2012
- Committee member of the Gannon Compensation Study 2012
- Presented on Engineering Day 2012
- Committee member of the Computer Programming Contest 2011-2012
- Participated in Grandview elementary school international festival 2012
- Participated in PA Mobile Application Contest 2011
- Committee member of the Curriculum Review for Erie Technical School 2011
- Participated in University GIVE day 2010-2011
- Judge of Celebrate Gannon 2011
- Committee member of the Learning Management System Evaluation 2011
- Represented Gannon University to China 2011
- Judge of the Gannon scholarship 2010
- Presentation at Engineering Summer Camp 2010
- Judge for the Graduate Research Conference 2010

CONFERENCE ACTIVITIES

- PC member, the International Conference on Software Engineering and Knowledge Engineering 2013-2024
- PC member, Cybersecurity Skills Journal Special Issue on the NICE Cybersecurity Workforce Framework, 2020
- Program Co-Chair, SEPT Symposium for the IEEE Computer Society Signature Conference on Computers, Software and Applications, 2020
- Session Chair, the 17th IEEE International Conference on Intelligence and Security Informatics. 2019
- Organizing Committee Member, the 9th International Symposium on Cybersecurity, Las Vegas, Nevada, USA 2018
- PC member, the Symposium On Applied Computing (Software Engineering Track) 2013-2021
- Reviewer, the Journal of Education and Information Technologies 2016-2020
- Reviewer, the International Journal of Software Engineering and Knowledge Engineering 2015-
- Member Chair, the IEEE Executive Committee 2011 - 2014
- PC member, the 22nd IEEE WETICE International Conference (Validation of Safety Critical Collaboration Systems Track) 2013
- Editorial Board Member, the ACTA Press (Software Engineering Track) 2012
- Session Chair, the International Conference on Software Security and Reliability 2012
- Committee Member, the International Association of Science and Technology(Software Engineering Track) 2009 - 2012
- Session Chair, the 13th International Conference on Enterprise Information Systems 2011
- Associate Editor, the Journal of Emerging Trends in Computing and Information Sciences 2010