Clemente Izurieta
PO Box 26 ● Bozeman, MT 59771 ● (406) 994-3720 ● clemente.izurieta@montana.edu

Education

Doctor of Philosophy in Computer Science
Emphasis: Software Engineering
Dissertation: "Decay and Grime Buildup in Evolving Object Oriented Design Patterns"
Colorado State University, Fort Collins, Colorado
Graduation: 2009

Master of Science in Computer Science
Emphasis: Artificial Intelligence
Thesis: "An Emergent Architecture for Use in Navigational Planning and Environment Learning"
Montana State University, Bozeman, Montana
Graduation: 1993

Bachelor of Mathematics
University of Wollongong, New South Wales, Australia
Graduation: 1987

Professional Experience

Montana State University – **Bozeman, Montana, 2022 - Current**
- **Gianforte School of Computing**
- **Joint Appointment, Idaho National Laboratory (Nov. 2022 – Present)**
- **Joint Appointment Pacific Northwest National Laboratory (March 2023 – Present)**
    - Senior Data Scientist in PNNL's Computing and Analytics Division in the National Security Directorate
- **Full Professor (*tenured*)**

Authors AI – **Bozeman, Montana, 2019 - 2023**
- **Chief Technology Officer**
    - authors.ai and bingebooks.com

Montana State University – **Bozeman, Montana, 2017 - 2022**
- **Gianforte School of Computing**
- **Joint Appointment, Idaho National Laboratories (Nov. 2020 – 2022)**
- **Associate Professor (*tenured*)**

Carnegie Mellon University – **Pittsburgh, Pennsylvania, January 2019 – May 2019 (*Spring Semester*)**
- **Software Engineering Institute (SEI)**
- **Invited Sabbatical**
    - Research in software engineering architecture with CMU, SEI faculty

Montana State University – **Bozeman, Montana, 2011 - 2017**
- **Department of Computer Science**
- **Assistant Professor**

Universidad de Concepcion (UdeC) – **Concepcion, Chile, May 2013 – July 2013 (*Spring Semester*)**
- **Department of Computer Science**
- **Invited Visiting Assistant Professor**
    - Teach software engineering and engage in research with UdeC faculty

<u>Carroll College of Montana</u> – **Helena, Montana, August 2010 – December 2010 (*Fall Semester*)**
- **Department of Computer Science**
- **Adjunct Professor of Software Engineering**
  - Collaboration with Carroll College to deliver the junior standing Software Engineering class through distance learning.

<u>Montana State University</u> – **Bozeman, Montana, 2009 - 2011**
- **Department of Computer Science**
- **Associate Research Professor**
  - Teach software engineering, undergraduate research, and other classes as assigned
  - Conduct research in software engineering and ecological and environmental sciences

<u>Montana State University</u> – **Bozeman, Montana, 2008 - 2010**
- **Department of Land Resources and Environmental Sciences**
- **Research Scientist**
  - Design and Architect modeling software systems for landscape flux networks.

<u>Montana State University</u> – **Bozeman, Montana, 2008 - 2009**
- **Department of Computer Science**
- **Adjunct Instructor**
  - Teach 300 and 400 level software engineering classes.

<u>Hewlett-Packard Company</u> – **Fort Collins, Colorado, 2007 – 2009**
- **Storage Works Division Research Laboratories**
  - Member of the Near line storage design team
  - Research Java architectures and code for storage products
  - Handle customer escalations for various Fortune 100 companies worldwide
  - Responsible for the success of partnerships with collaborating companies

<u>Colorado State University</u> – **Fort Collins, Colorado, Fall 2007 Semester**
- **Department of Computer Science**
- **Teaching Assistant**
  - Taught 500 level distance learning course in software engineering

<u>Intel Company</u> – **Fort Collins, Colorado, 2005 - 2007**
- **VLSI Research and Development Laboratories, Fort Collins Design Center**
  - Member of the Itanium Microchip team
  - Design and research of VLSI infrastructure for electrical circuit recognition CAD tools

<u>Hewlett-Packard Company</u> – **Fort Collins, Colorado, 1993 - 2004**
- **VLSI Research and Development Laboratories, Microprocessor Technology Division**
  - Member of the Itanium Microchip team.
  - Design and research of VLSI frameworks for Computer Aided Design (CAD) tools
  - Development of Information and Data Models to represent microchip data
  - Development of Object Oriented Models to represent layout and schematics of microchips
- **Systems And Software Research And Development Laboratories**
  - Distributed applications research and development using MS technologies
  - Research and development of web based middleware solutions
  - Development of prototype systems to showcase various technologies to store information, communications protocols, queuing theory, etc.
  - Specific technologies studied include BizTalk, XmlRpc, MSMQ, Shared Memory Systems in UNIX, ASP, etc.

- **Unix Research And Development Laboratories**
  * Developer of HP/DCE Configuration Management tools for distributed computing
  * Research in integrating HP Systems Administration Tool (SAM) with NIS+ namespace technology
  * Research on distributed architecture to merge SAM with external administration tool (OpenView/ITA)
  * Develop distributed application programming interface (API) to support SAM
  * Investigation and development of monitoring and management technologies for systems. Technologies include CA, ITO, ITA, SAM, EMS, Flipper, WBEM, and DMI

Montana State University – **Bozeman, Montana, 1991 - 1993**
- **Department of Computer Science**
  * Research Assistant in Artificial Intelligence. Worked on investigations with genetic algorithms and neural networks to predict grasshopper populations
- **Department of Computer Science**
  * Teaching Assistant. Taught 100-200 level classes in C, Pascal computer languages and data structures

FourGen Software Technologies – **Seattle, Washington, 1990**
- Information Systems programming using 4GL languages
- Systems Administration of a Laboratory consisting of approximately 30 users running on Sequent systems under Dynix

Utah State University – **Logan, Utah, 1989**
- Department of Electrical Engineering
- Development and research of a system for viewing statistical data in 3D

ForeSearch Software Pty. Ltd. – **Sydney, Australia, 1988 - 1989**
- UNIX systems administration and programming.
- Information Systems programming using C, and 4GL languages.

Professional and Technical Skills

- **Leadership:** Developing Excellence in Academic Leadership (DEAL), Faculty Senator, program and project management of large organizations
- **Programming Languages:** C, C++, R, Java, Pascal, LISP, SQL, 4GLs, K-Shell, Declarative languages, COM
- **Operating Systems:** Various Flavors of Unix, MS-DOS, Windows, NT, XP
- **Development Tools:** Traditional Unix tools, Softbench, DDE, Eclipse, ClearCase, MS Visual Studio , R Studio, various layout design editors for microchip design
- UML and Design Patterns
- Software Modeling
- Cybersecurity
- **Professional**
  * Director of the Software Engineering and Cybersecurity Laboratory (SECL) at Montana State University
  * National Science Foundation (NSF) reviewer/panelist
  * Science reviewer for grants in Canada, Chile
  * Proven experience leading large software development efforts with > $4M budgets and > 20 staff
  * Experience writing quality plans, reference specifications, test plans
  * Significant experience working with various partner laboratories across various cultures and geographies
  * Significant experience working with numerous external enterprise customers and engineering partners such as US West, Motorola, Loral Systems, MCI, Colorado State University, Eastman Kodak, NexCom, Oracle, Computer Associates, Microsoft, Siemens Nixdorf

- * Significant experience collaborating with partner national laboratories. Specifically Idaho National Laboratories (INL) and Pacific Northwest National Laboratories (PNNL)
- * Responsible for overall releases of software products
- * Significant experience with technical presentations to private industry and academia

Publications

Refereed Conferences

1. Sheppard E., Wadhams Z., Arford D., Izurieta C., Reinhold A.M., "*Wicked Problem, Parsimonious Solution: Securing Electric Vehicle Charging Station Software,*" IEEE International Conference on Cybersecurity and Resilience, CSR 2025, Chania, Greece, August 4-6, 2025.
2. Rahman K., Reinhold A.M., Izurieta C., "*Metamorphic Relation Prediction for Security Vulnerability Testing of Online Banking Applications,*" IEEE International Conference on Cybersecurity and Resilience, CSR 2025, Chania, Greece, August 4-6, 2025.
3. Shu Fuhnwi G., Reinhold A.M., Izurieta C., "*Reducing Human-Induced Label Bias in SMS Spam with Context-Enhanced Clustering (CEC),*" IEEE International Conference on Cybersecurity and Resilience, CSR 2025, Chania, Greece, August 4-6, 2025.
4. Perkins, G., Macht B., Ritzdorf L., Running Crane T., Reinhold A.M., Izurieta C., LaMeres B., "*SoK: Trusted Execution in SoC-FPGAs,*" IEEE Intermountain Engineering, Technology, and Computing Conference (i-ETC), Utah, USA, May 2025.
5. Liyanage K., Gerard E.L., Reimanis D., Reinhold A.M., Izurieta C., LaMeres B., Whitaker B., "*Unsupervised Mapping of QUantitative Measures to Qualitative Characteristics in Hierarchical Software Quality Assurance,*" IEEE Intermountain Engineering, Technology, and Computing Conference (i-ETC), Utah, USA, May 2025.
6. Johnson C., Reinhold A.M., Izurieta C., Whitaker B., LaMeres B., "*Verification Tool for Securing RISC-V FPGA-Based Process Control System,*" IEEE Intermountain Engineering, Technology, and Computing Conference (i-ETC), Utah, USA, May 2025.
7. Manzi Muneza R., Keefe A., O'Donoghue E., Izurieta C., Reinhold A.M. *"SBOM Generation Tools and Formats Affect Compliance with US Standard,"* 3rd International Workshop on Mining Software Repositories for Privacy and Security, MSR4P&S, (SANER 2025), Montreal, Canada, March 2025.
8. Fuhnwi G., Revelle M., Whitaker B., Izurieta C., *"Using Large Language Models to Mitigate Human-Induced Bias in SMS Spam: An Empirical Approach,"* 4th IEEE International Conference on AI in Cybersecurity (ICAIC 2025), Houston TX, USA. February 2025. https://doi.org/10.1109/ICAIC63015.2025.10848636
9. Wadhams Z., Izurieta C., Reinhold A.M. "*Barriers to Using Static Application Security Testing (SAST) Tools: A Literature Review,*" Workshop on Human-Centric Software Engineering & Cyber Security (HCSE&CS 2024), Co-located with the 39th IEEE/ACMInternational Conference on Automated Software Engineering, Sacramento, California, November 2024.
10. O'Donoghue E., Boles B., Izurieta C., Reinhold A.M. "*Impacts of Software Bill of Materials (SBOM) Generation on Vulnerability Detection,*" 2024 ACM Workshop on Software Supply Chain Offensive Research and Ecosystem Defenses (SCORED), Co-located with ACM CCS 2024, Salt Lake City, Utah, October 18, 2024.
11. Boles B., O'Donoghue E., Manzi Muneza A.R., Perkins G., Izurieta C., Reinhold A.M. "*Deciphering Discrepancies: A Comparative Analysis of Docker Image Security,*" 24th IEEE International Conference on Source Code Analysis and Manipulation (SCAM), Flagstaff, Arizona, October 7-8 2024.
12. Fuhnwi G., Revelle M., Izurieta C., *"A Hybrid Anomaly Detection Approach For Obfuscated Malware,"* IEEE International Conference on Cybersecurity and Resilience, CSR 2024, London, England, September 2-4, 2024.
13. O'Donoghue E., Reinhold A.M., Izurieta C., "*Assessing Security Risks of Software Supply Chains Using Software Bill of Materials,*" 2nd International Workshop on Mining Software Repositories for Privacy and Security, MSR4P&S, (SANER 2024), Rovaniemi, Finland, March 2024.
14. Wadhams Z., Reinhold A.M., Izurieta C., "*Automating Static Code Analysis Through CI/CD Pipeline Integration,*" 2nd International Workshop on Mining Software Repositories for Privacy and Security, MSR4P&S, (SANER 2024), Rovaniemi, Finland, March 2024.

15. Fuhnwi G., Revelle M., Izurieta C., "*Improving Network Intrusion Detection Performance: An Empirical Evaluation Using Extreme Gradient Boosting (XGBoost) with Recursive Feature Elimination,*" IEEE 3rd, International Conference on AI in Cybersecurity, ICAIC '24. Houston, TX, USA, February 2024.

16. Freire S., Rocha V., Mendonca M., Izurieta C., Seaman C. Spinola R., *"Assessing IDEA Diagrams for Supporting Analysis of Capabilities and Issues in Technical Debt Management,"* International Conference on Product-Focused Software Process Improvement, PROFES '23, Dornbirn, Austria, December 2023.

17. Rahman K., Izurieta C., "*An Approach to Testing Banking Software Using Metamorphic Relations,*" IEEE 24th International Conference on Information Reuse and Integration for Data Science, IRI 2023, Bellevue WA, USA, August 2023.

18. Reinhold A.M., Weber T., Lemak, C, Reimanis D., Izurieta C., "*New Version, New Answer: Investigating Cybersecurity Static-Analysis Tool Findings,*" IEEE International Conference on Cybersecurity and Resilience, CSR 2023, Venice Italy, July 2023.

19. Liyanage K., Pearsall R., Izurieta C., Whitaker B., *"Dictionary Learning on Graph Data with Weisfieler-Lehman Sub-tree Kernel and KSVD,"* 2023 IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP), Rhodes Island, Greece, June 2023.

20. Saha P., Izurieta C., Kanewala U., *"A Test Suite Minimization Technique for Testing Numerical Programs,"* 2023 IEEE/ACIS International Conference on Software Engineering, Management, and Applications (SERA 2023), Orlando, FL, USA, May 2023.

21. Ritzdorf L., Colter B., Major C., Running Crane T., Hezekiah A., Macht B., Izurieta C., LaMeres B., "Evaluating the Effectiveness of Obfuscated Instruction Codes for Malware Resistance," IEEE Intermountain Engineering, Technology, and Computing Conference (i-ETC), Utah, USA, May 2023.

22. Nelson G., Izurieta C., Reimanis D., "*Membership and Participation in Object Oriented and Procedural Paradigms,*" IEEE Intermountain Engineering, Technology, and Computing Conference (i-ETC), Utah, USA, May 2023.

23. Soares G. et al., Izurieta C., *"Investigating how Agile Software Practitioners Repay Technical Debt in Software Projects,"* doi.acm.org?doi=3571473.3571499. SBQS 2022, Brazilian Symposium on Software Quality, November 2022.

24. Rahman K., Izurieta C., "*A Mapping Study of Security Vulnerability Detection Approaches for Web Applications,*" EuroMicro Software Engineering and Advanced Applications, SEAA 2022, Gran Canaria, Spain, September 2022.

25. Barbosa L. et al., Izurieta C., *"Organizing the TD Management Landscape for Requirements and Requirements Documentation Debt,"* Workshop on Requirements Engineering, WER 2022. Brazil (virtual). August 2022.

26. Rehman F. Izurieta C., "An Approach for Verifying and Validating Clustering Based Anomaly Detection Systems Using Metamorphic Testing," IEEE AITest, 4th International Conference on AI Testing, San Francisco USA, August 2022.

27. Rehman F., Izurieta C., *"MT4UML: Metamorphic Testing for Unsupervised Machine Learning,"* SDS 2022, Swiss Conference on Data Science, Lucerne Switzerland, June 2022

28. Guerledo C. et al., Izurieta C., *"Technical Debt is not Only about Code and We Need to be Aware about It,"* SBQS 2021, Brazilian Symposium on Software Quality, November 2021. Distinguished Paper Award.

29. Rehman F., Izurieta C., *"A Hybridized Approach for Testing Neural Network Based Intrusion Detection Systems,"* IEEE SmartNets 2021 -CyberSec CIIA International Conference, (Virtual) Glasgow Scotland, September 22-24, 2021

30. Rehman F., Izurieta C., *"Statistical Metamorphic Testing of Neural Network Based Intrusion Detection Systems,"* IEEE International Conference on Cybersecurity and Resilience CSR July 26-28, 2021 (online).

31. Freire S., et al., Izurieta C., *"How Experience Impacts Practitioner's Perception of Causes and Effects of Technical Debt,"* 14th IEEE International Conference on Cooperative and Human Aspects of Software Engineering, CHASE 2021, March 20-21, 2021.

32. Freire S., Rios N., Perez B., Correal D., Izurieta C., Seaman C., Spinola R., "*How do Technical Debt Payment Practices Relate to the Effects of the Presence of Debt Items in Software Projects?,"* 28th IEEE International Conference on Software Analysis, Evolution and Reengineering, SANER 2021, Virtual (Honolulu, HI, USA) March 9-12, 2021.

33. Freire S., Rios N., Perez B., Correal D., Mendonca M., Izurieta C., Seaman C., Spinola R., *"Surveying Software Practitioners on Technical Debt Payment Practices and Reasons for not Paying off Debt Items,"* 24th International Conference on Evaluation and Assessment in Software Engineering, EASE 2020, Trondheim, Norway, April 15-17, 2020.

34. Freire S., Rios N., Mendonca M., Falessi D., Seaman C., Izurieta C., Spinola, R., "*Actions and Impediments for Technical Debt Prevention: Results from a Global Family of Industrial Surveys,*" 35th ACM/SIGAPP Symposium on Applied Computing, Brno, Czech Republic, March 30 – April 3, 2020

35. Rios N., Mendes L., Cardeiral C., Magalhaes A., Perez B., Correal D., Astudillo H., Seaman C., Izurieta C., Santos G., Spinola R., *"Hearing the Voice of Software Practitioners on Causes, Effects, and Practices to Deal with Documentation Debt,"* 26th Intl. Conference on Requirements Engineering: Foundation for Software Quality, REFSQ 2020, Pisa, Italy, March 24-27, 2020.

36. Izurieta C., Reimanis D., Griffith I., Schanz T., "*Structural and Behavioral Taxonomies of Design Pattern Grime,*" 12th Seminar on Advanced Techniques & Tools for Software Evolution. SATToSE 2019, Vol. 2510, ISSN 1613-0073, http:ceur-ws.org/Vol-2510, Bolzano, Italy, July 8-10, 2019.

37. Reimanis D., Izurieta C., "*Behavioral Evolution of Design Patterns: Understanding Software Reuse through the Evolution of Pattern Behavior,*" 18th International Conference on Software Systems and Reuse, ICSR 2019. In: Peng X., Ampatzoglou A., Bhowmik T. (eds) Reuse in the Big Data Era. Vol 11602, Springer Cham. Cincinnati, OH, June 26-28 2019.

38. Izurieta C., Prouty M., "*Leveraging SecDevOps to Tackle the Technical Debt Associated with Cybersecurity Attack Tactics,*" ACM-IEEE Second International Conference on Technical Debt, TechDebt 2019, Montreal, Canada, May 26-27, 2019.

39. Izurieta C, Gunderson-Izurieta S., "*An Experiential Report on Using a Software Factory in a Rural State to Promote Entrepreneurship,*" Technology and Engineering Management Society Conference, TEMSCON 2018, Evanston IL, June 27 – July 1 2018.

40. Izurieta C, Rice D., Kimball K., Valentien T., "*A Position Study to Investigate Technical Debt Associated with Security Weaknesses,*" ACM-IEEE First International Conference on Technical Debt, TechDebt 2018, Gothenburg, Sweden, May 27-28, 2018.

41. Griffith I., Izurieta C., Huvaere C., "*An Industry Perspective to Comparing the SQALE and Quamoco Software Quality Models,*" 11th ACM-IEEE International Symposium on Empirical Software Engineering and Measurement, ESEM 2017, Toronto, Canada, November 9-10, 2017.

42. Perreault L., Berardinelli S., Izurieta C., Sheppard J., "*Using Classifiers for Software Defect Detection,*" 26th International Conference on Software Engineering and Data Engineering, SEDE 2017, San Diego, California, October 2-4, 2017.

43. Rojas G., Izurieta C., Griffith I., "*Toward Technical Debt Aware Software Modeling,*" IEEE-ACM Ibero American Conference on Software Engineering, CibSE 2017, Buenos Aires, Argentina, May 22-23 2017.

44. Izurieta C., Ozkaya I., Seaman C., Kruchten P., Nord R., Snipes W., Avgeriou P., "*Perspectives on Managing Technical Debt. A Transition Point and Roadmap from Dagstuhl,*" 1st International Workshop on Technical Debt Analytics (TDA). In association with the 23rd Asia-Pacific Software Engineering Conference (APSEC). University of Waikato, Hamilton, New Zealand, December 6-9 2016.

45. Reimanis D., Izurieta C., "*Towards Assessing the Technical Debt of Undesired Software Behaviors in Design Patterns,*" IEEE ACM MTD 2016 8th International Workshop on Managing Technical Debt. In association with the 32nd International Conference on Software Maintenance and Evolution, ICSME, Raleigh, North Carolina, October 4, 2016.

46. Izurieta C., O'Bleness M., Trenk M., Gunderson-Izurieta S., "*The Effectiveness of Software Development Instruction through the Software Factory Method for High School Students,*" ASEE '16, 123rd Annual Conference in Engineering and Education, New Orleans, June 26-29, 2016.

47. Carroll C., Falessi D., Forney V., Frances A., Izurieta C., Seaman C., "*A Mapping Study of Software Causal Factors for Improving Maintenance,*" 9th ACM-IEEE International Symposium on Empirical Software Engineering and Measurement, ESEM 2015, Beijing, China, October 22-23, 2015.

48. Reimanis D., Izurieta C., "*A Research Plan to Characterize, Evaluate, and Predict the Impacts of Behavioral Decay in Design Patterns,*" IEEE ACM IDoESE, 13th International Doctoral Symposium on Empirical Software Engineering, Beijing, China, October 19 2015.

49. Assefi M., Liu G., Izurieta C., Wittie M.P., "*An Experimental Evaluation of Apple Siri and Google Speech Recognition,*" 24th International Conference on Software Engineering and Data Engineering, SEDE 2015, San Diego, California, October 12-14, 2015.

50. Goel U., Izurieta C., Wittie M.P., "*Understanding Factors Influencing the Citation Count of Networking Conference Papers,*" 24th International Conference on Software Engineering and Data Engineering, SEDE 2015, San Diego, California, October 12-14, 2015.

51. Izurieta C., Rojas G., Griffith I., "*Preemptive Management of Model Driven Technical Debt for Improving Software Quality,*" 11th International ACM SigSoft Conference on the Quality of Software Architectures, QoSA 2015, Montreal, Canada, May 4-8, 2015.

52. Griffith I., Izurieta C., Taffahi H., Claudio D., "*A Simulation Study of Practical Methods for Technical Debt Management in Agile Software Development,*" Winter Simulation Conference WSC 2014, Savannah, GA, December 7-10, 2014.

53. Griffith I., Reimanis D., Izurieta C., Codabux Z., Deo A., Williams B., "*The Correspondence between Software Quality Models and Technical Debt Estimation Approaches,*" IEEE ACM MTD 2014 6th International Workshop on Managing Technical Debt. In association with the 30th International Conference on Software Maintenance and Evolution, ICSME, Victoria, British Columbia, Canada, September 30, 2014.

54. Reimanis D., Izurieta C., Luhr R., Xiao L., Cai Y., Rudy G., "*A Replication Case Study to Measure the Architectural Quality of a Commercial System,*" 8th ACM-IEEE International Symposium on Empirical Software Engineering and Measurement, ESEM 2014, Torino, Italy, September 2014.

55. Griffith I., Izurieta C., "*Design Pattern Decay: The Case for Class Grime,*" 8th ACM-IEEE International Symposium on Empirical Software Engineering and Measurement, ESEM 2014, Torino, Italy, September 2014.

56. Dale M., Izurieta C., "*Impacts of Design Pattern Decay on System Quality,*" 8th ACM-IEEE International Symposium on Empirical Software Engineering and Measurement, ESEM 2014, Torino, Italy, September 2014.

57. Griffith I., Izurieta C., "*Design Pattern Decay: An Extended Taxonomy and Empirical Study of Grime and its Impact on Design Pattern Evolution,*" IEEE ACM IDoESE, 11th International Doctoral Symposium on Empirical Software Engineering, Baltimore, USA, October 9th, 2013.

58. Luhr R., Reimanis D., Cross R., Izurieta C., Poole G.C., Helton A., "*Natural Science Visualization Using Digital Theatre Software,*" IEEE ICISA 2013 International Conference on Information Science and Applications, Pattaya, Thailand, June 24-26, 2013.

59. Izurieta C., Griffith I., Reimanis D., Luhr R., "*On the Uncertainty of Technical Debt Measurements,*" IEEE ICISA 2013 International Conference on Information Science and Applications, Pattaya, Thailand, June 24-26, 2013.

60. Morrison-Smith S., Marmon C., Dighans S., Daniels T., Izurieta C., *"Technical Debt Reduction Using a Game Theoretic Competitive Source Control Approach,"* ISCA 25th International Conference on Computer Applications in Industry and Engineering, CAINE '12, New Orleans, Louisiana, November 2012.

61. Izurieta C., Poole G., Payn R.A., Griffith I., Nix R., Helton A.M., Bernhardt E., Burgin A.J., *"Development and Application of a Simulation Environment (NEO) for Integrating Empirical and Computational Investigations of System-Level Complexity."* IEEE ICISA 2012 International Conference on Information Science and Applications, Suwon, Korea, May 23-25, 2012.

62. Izurieta C., Vetro A., Zazworka N., Cai Y., Seaman C., Shull F., *"Organizing the Technical Debt Landscape."* IEEE ACM MTD 2012 3rd International Workshop on Managing Technical Debt. In association with the 34th International Conference on Software Engineering ICSE, Zurich, Switzerland, June 2-9, 2012.

63. Seaman C., Guo Y., Izurieta C., Cai Y., Zazworka N., Shull F., Vetro A., *"Using Technical Debt Data in Decision Making: Potential Decision Approaches."* IEEE ACM MTD 2012 3rd International Workshop on Managing Technical Debt. In association with the 34th International Conference on Software Engineering ICSE, Zurich, Switzerland, June 2-9, 2012.

64. Griffith I., Wahl S., Izurieta C., *"Evolution of Legacy System Comprehensibility through Automated Refactoring."* IEEE ACM MALETS 2011 International Workshop on Machine Learning Technologies in

Software Engineering. In association with the 26th International Conference on Automated Software Engineering ASE, Lawrence, Kansas, November 7-12, 2011.

65. Griffith I., Wahl S., Izurieta C., *"TrueRefactor: An Automated Refactoring Tool to Improve Legacy System and Application Comprehensibility."* ISCA 24th International Conference on Computer Applications in Industry and Engineering, CAINE '11, Honolulu, HI, November 2011.

66. Strasser S., Frederickson C., Fenger K., Izurieta C., *"An Automated Software Tool for Validating Design Patterns."* ISCA 24th International Conference on Computer Applications in Industry and Engineering, CAINE '11, Honolulu, HI, November 2011.

67. Strasser S., Sheppard J., Schuh M., Angryk R., Izurieta C., *"Graph-Based Ontology-Guided Data Mining for D-Matrix Model Maturation".* IEEE Aerospace Conference AIAA Technical Co-Sponsor, IEEEAS '11, Big Sky, Montana, USA, March 5-12, 2011.

68. Schuh M., Sheppard J., Strasser S., Angryk R., Izurieta C. "Ontology-Guided Knowledge Discovery of Event Sequences in Maintenance Data." IEEE AutoTestCon Conference 2011, Baltimore, Maryland, USA, September 12-15, 2011.

69. Izurieta C., Poole G.C., McGlynn B.L., Cross W.F., Marshall L.A., Jacobs G.A., Cleveland S., Judson I., Hauer F.R., Kucera B., *"A Cyber-Infrastructure for a Virtual Observatory and Ecological Informatics System –VOEIS".* 2010 AGU Meeting, San Francisco, USA, December 13-17 2010.

70. Schanz T., Izurieta C. *"Object Oriented Design Pattern Decay: A Taxonomy".* 4th ACM-IEEE International Symposium on Empirical Software Engineering and Measurement, ESEM '10, Bolzano-Bozen, Italy, September 2010.

71. Norick B., Krohn J., Howard E., Welna B., Izurieta C. *"Effects of the Number of Developers on Code Quality in Open Source Software: A Case Study".* Short paper/poster. 4th ACM-IEEE International Symposium on Empirical Software Engineering and Measurement, ESEM '10, Bolzano-Bozen, Italy, September 2010.

72. Nurseitov N., Paulson M., Reynolds R., Izurieta C. *"Comparison of JSON and XML Data Interchange Formats: A Case Study".* 22nd International Conference on Computer Applications in Industry and Engineering, CAINE '09, San Francisco, CA, November 2009.

73. Izurieta C., Bieman J.M. *"Testing Consequences of Grime Buildup in Object Oriented Design Patterns".* 1st ACM-IEEE International Conference on Software Testing, ICST '08, Lillehammer, Norway, April 2008.

74. Izurieta C., Bieman J.M. *"How Software Designs Decay: A Pilot Study of Pattern Evolution".* 1st ACM-IEEE International Symposium on Empirical Software Engineering and Measurement, ESEM '07, Madrid, Spain, September 2007.

75. Izurieta C. *"Case Study: A Tool Centric Approach for Fault Avoidance in Microchip Designs".* 16th International Conference on Software Engineering and Data Engineering, SEDE '07, Las Vegas, NV, July 2007.

76. Izurieta C., Bieman J.M. *"The Evolution of FreeBSD and Linux".* 5th ACM-IEEE International Symposium on Empirical Software Engineering, ISESE '06, Rio de Janeiro, Brazil, September 2006.

77. Curtis A., Izurieta C., Joeris B.L., Lundberg S., McConnell R.M. *"An Implicit Representation of Chordal Comparability Graphs in Linear Time".* 32nd International Workshop on Graph-Theoretic Concepts in Computer Science, WG '06, Bergen, Norway, June 2006.

78. Izurieta C. *"Semi Greedy Algorithm for Finding Connectivity in Microchip Physical Layouts".* 16th International Conference on Computer Applications in Industry and Engineering, CAINE '03, Las Vegas, NV, November 2003.

79. Izurieta C., Nielsen A. *"DMI Technology".* InterWorks '99 Systems Administration Conference, Chicago, IL, 1999.

Journals

1. Rehman ur F., Izurieta C., *"Testing convolutional neural network based deep learning systems: A statistical metamorphic approach,"* PeerJ Computer Science. 2025. 11:e2658 https://doi.org/10.7717/peerj-cs.2658

2. Reinhold A.M., Gore R., Izurieta C., Ezell B., Shanahan E., *"From Cyclones to Cybersecurity: A Call for Convergence in Risk and Crisis Communications Research,"* Journal of Homeland Security and Emergency Management. 2025. https://www.degruyter.com/document/doi/10.1515/jhsem-2023-0067/html

3. Izurieta C. *"Design Patterns and Reusability,"* Realizing Complex System Design. Book Chapter 12, pg. 139. CRC Press. February 2025. http://doi.org/10.1201/9781003188377

4. Crabb J., Izurieta C., Van Wie B., Adesope O., Gebremedhin A., *"Insights from a Novel Cybersecurity Summer Workshop,"* IEEE Security and Privacy. Nov.-Dec. 2024, pp. 89-98, vol. 22. DOI Bookmark: 10.1109/MSEC.2024.3473188

5. Izurieta C., Reimanis D., O'Donoghue E., Liyanage K., Manzi Muneza A.R., Whitaker B., Reinhold A.M. *"A Generalized Approach to the Operationalization of Software Quality Models,"* PeerJ Computer Science. 2024. 10:e2357 http://doi.org/10.7717/peerj-cs.2357

6. Freire S. et al., Izurieta C*., "Hearing the Voice of Software Practitioners on Technical Debt Monitoring: Understanding Monitoring Practices and the Practices' Avoidance Reasons,"* Journal of Software Engineering Research and Development, July 2024.

7. Freire S.. et al., Izurieta C., *"A Comprehensive View on TD Prevention Practices and Reasons for not Preventing It,"* Transactions on Software Engineering and Methodology (TOSEM). 2024. http://dl.acm.org/doi/10.1145/3674727

8. Reinhold A.M., Boles B., Muneza R., McElroy T., Izurieta C., *"Characterizing and Surmounting Challenges in Aggregating Static-Analysis Tool Results,"* Military Cyber Affairs, Vol. 7. Issue 1. Article 6. 2024.

9. Halvorsen J., Izurieta C., Cai H., Gebremedhin A., *"Applying Generative Machine Learning to Intrusion Detection: A Systematic Mapping Study and Review,"* ACM Computing Surveys. 2024. https://dl.acm.org/doi/10.1145/3659575

10. Reinhold A.M., Munro M., Shanahan E.A., Gore R., Ezell B.C., Izurieta C., *"Embedding Software Engineering in Mixed Methods Research: Computationally Enhanced Risk Communication,"* International Journal of Multiple Research Approaches, IJMRA, Vol.15, No. 2, 67-72. 2023. https://doi.org/10.29034/ijmra.v15n2a2

11. Reimanis D., Izurieta C., *"A Study of Behavioral Decay in Design Patterns,"* Journal of Software: Evolution and Process, October 2023. https://onlinelibrary.wiley.com/doi/10.1002/smr.2638.

12. Izurieta C., Woods N., Reinhold A.M., *"A Brief of Distributed Data Processing,"* 49th Euromicro conference series on Software Engineering and Advanced Applications SEAA 2023, WiPiEC Journal, Vol. 9, Issue 2, ISSN 2980-7298, pp.14-17. Durres, Albania, September 6-8 2023.

13. Freire S. et al., Izurieta C*., "Software Practitioners' Point of View on Technical Debt Payment,"* The Journal of Systems and Software (JSS), February 2023.

14. Berenguer C. et al., Izurieta C., *"Investigating the Relationship Between Technical Debt Management and Software Development Issues,"* Journal of Software Engineering Research and Development (JSERD), Vol.11. February 2023.

15. Reinhold A.M., Raile E., Izurieta C., McEvoy J., King H., Poole G., Ready R., Bergmann N., Shanahan E., *"Persuasion with Precision: Using Natural Language Processing to Improve Instrument Fidelity for Risk Communication Experimental Treatments"* Journal of Mixed Methods Research, April 2022. https://doi.or/10.177/15586898221096934

16. Ramac R., et al., Izurieta C. *"Prevalence, Common Causes and Effects of Technical Debt: Results from a Family of Surveys with the IT Industry,"* The Journal of Systems and Software, 2021. https://doi.org/10.1016/j.jss.2021.111114

17. Freire S., et al., Izurieta C. *"Pitfalls and Solutions for Technical Debt Management in Agile Software Projects,"* IEEE Software, 2021. doi: 10.1109/MS.2021.3101990

18. Ramac R. et al., Izurieta C., *"Technical and Non-Technical Prioritization Schema for Technical Debt: Voice of TD-Experienced Practitioners,"* IEEE Software, 2021. doi: 10.1109/MS.2021.3103121

19. Nelson G., Izurieta C., *"A Gap in the Analysis of Technical Debt in Procedural Languages: An Experiential Report of Go,"* IEEE Software, 2021. doi: 10.1109/MS.2021.3103710

20. Raile E., Shanahan E., Ready R., McEvoy J., Izurieta C., Reinhold A.M., Poole G., Bergmann N., King H., *"Narrative Risk Communication for Environmental Hazard Preparation,"* Journal of Environmental Communication, August 2021, https://doi.org/10.1080/17524032.2021.1966818

21. Perez B., Castellanos C., Correal D., Rios N., Freire S., Spinola R., Seaman S., Izurieta C.,*"Technical Debt Payment and Prevention Through the Lenses of Software Architects,"* Information and Software Technology Journal, Vol. 140, Dec. 2021, https://doi.org/10.1016/j.infsof.2021.106692

22. Rios N., Freire S., Perez B., Castellanos C., Correal D., Mendonca M., Falessi D., Izurieta C., Seaman C., Spinola R., *"On the Relationship between Technical Debt Management and Process Models,"* IEEE Software, 2021. https://doi.ieeecomputersociety.org/10.1109/MS.2021.3058652

23. Shanahan E.A., Reinhold A.M., Raile E.D., Poole G.C., Ready R.C., Izurieta C., McEvoy J., Bergmann N.T., King H.W., *"Characters Matter: How Narratives Shape Affective Responses to Risk Communication,"* PLoS One 14(12): e0225968, https://doi.org/10.1371/journal.pone.0225968, December 2019

24. Bergmann N., McEvoy J., Shanahan E., Raile E., Reinhold A.M., Poole G.C., Izurieta C. *"Thinking Through Levees: How Political Agency Extends Beyond the Human Mind,"* Annals of the American Association of Geographers. Online, Oct 14, 2019. https://doi.org/10.1080/24694452.2019.1655387

25. Reinhold A.M., Poole, G.C., Izurieta C., Helton A., Bernhardt E. S. *"Constraint-based simulation of multiple interactive elemental cycles in biogeochemical systems,"* Ecological Informatics, Elsevier. Vol.50, pp. 102-121. https://doi.org/10.1016/j.ecoinf.2018.12.008, March 2019

26. Assefi M., Liu G.,Wittie M.P.,Izurieta C., *"Measuring the Impact of Network Performance on Cloud-Based Speech Recognition Applications,"* International Journal of Computer Applications IJCA, Vol 23, Issue 1, March 2016.

27. Payn R.A., Helton A.M., Poole G.C, Izurieta C., Burgin A.J., Bernhardt E.S., *"A generalized optimization model of microbially driven aquatic biogeochemistry based on thermodynamic, kinetic, and stoichiometric ecological theory,"* Ecological Modelling. December 24, 2014.

28. Zazworka N., Vetro A., Izurieta C., Wong S., Cai Y., Seaman C., Shull F., *"Comparing Four Approaches for Technical Debt Identification,"* Springer Software Quality Journal. Vol 2, Issue 3, pp. 403-426. September 2014. doi: 10.1007/s11219-013-9200-8.

29. Della Croce P., Poole G.C., Payn R.A., Izurieta C., *"Simulating the Effects of Stream Network Topology on the Spread of Introgressive Hybridazation Across Fish Populations."* Environmental Modelling & Software. Vol 279, pp. 68-77, http://dx.doi.org/10.1016/j.ecolmodel.2014.02.014, May 10 2014.

30. Zazworka N., Vetro A., Izurieta C., Wong S., Cai Y., Seaman C., Shull F., *"Comparing four approaches for Technical Debt identification: Analysis on Hadoop Project,"* **Book Chapter** 3.2, pages 65-84. In Assessing The Impact Of Automatic Static Analysis On Software Quality, by Vetro A., Morisio M., and Torchiano M. Scholar's Press,http://porto.polito.it/2531301/ ISBN-13: 978-3-639-70516-4, 20 February, 2014.

31. Helton,A.M., G.C. Poole, R.A. Payn, Izurieta C., and J.A. Stanford. *"Relative influences of the river channel, floodplain surface, and alluvial aquifer onsimulated hydrologic residence time in a montane river floodplain."* Elsevier Journal of Geomorphology. Volume 205, pp. 17-16, January 2014. http://dx.doi.org/10.1016/j.geomorph.2012.01.004.

32. Mason S.J.K., Cleveland S., Llovet P., Izurieta C., Poole G.C., *"A Centralized Tool for Managing, Archiving, and Serving Point-In-Time Data In Ecological Research Laboratories,"* Elsevier Journal of Environmental Modelling and Software, Volume51, pp. 59-69, http://dx.doi.org/10.1016/j.envsoft.2013.09.008, January 2014.

33. Schuh M., Sheppard J., Strasser S., Angryk R., Izurieta C., *"An IEEE standards-based Visualization Tool for Knowledge Discovery in Maintenance Event Sequences,"* IEEE Aerospace and Electronic Systems Magazine, Vol 28, Issue 7, pp 30-39, July 2013.

34. Izurieta C., Bieman J.M., *"A Multiple Case Study of Design Pattern Decay, Grime, and Rot in Evolving Software Systems."* Springer Software Quality Journal. June 2013. Vol 21, Issue 2, pp. 289-323. doi: 10.1007/s11219-012-9175-x.

35. Helton A.M., Poole G.C., Payn R.A., Izurieta C., Stanford J. A., *"Scaling flow path processes to fluvial landscapes: An integrated field and model assessment of temperature and dissolved oxygen dynamics in a river-floodplain-aquifer system,"* Journal of Geophysical Research –Biogeosciences, October 2012, Vol.117, G00N14. Doi:10.1029/2012JG002025.

36. Curtis A., Izurieta C., Joeris B.L., Lundberg S., McConnell R.M. *"An Implicit Representation of Chordal Comparability Graphs in Linear Time,"* Journal of Discrete Applied Mathematics 158 (2010) 869-875, Elsevier, January 2010.
37. Izurieta C. *"Decay and Grime Buildup in Evolving Object Oriented Design Patterns".* PhD. Dissertation, Colorado State University, Fort Collins, Colorado, May 2009. Library of Congress Registration No. TX 6-692-829.
38. Izurieta C. *"An Emergent Architecture for Use in Navigational Planning and Environment Learning".* Master's thesis and ACM Computer Science Conference Poster presentation, Indianapolis, IN, 1993.

Patents (and applications)

1. LaMeres B., Major C., Izurieta C. *"Malware Resistant Obfuscated Computer Hardware For Reconfigurable Hardware Devices and Methods Thereof,"* Patent-Awarded July 30, 2024. #US12,050,688 B1.
2. LaMeres B., Izurieta C. *"CyberShield: A Malware Resistant Computer System Based on Functionally Equivalent, Heterogeneous Processing Cores,"* Disclosure 2021, TechID: LBJ-2021-CYBE.
3. Izurieta C. *"Scan and Detection Systems and Methods".* Defensive Publication US 2005-0204321 A1, US Patent and Trademark Office, September 2005. https://www.google.com/patents/US20050204321
4. Izurieta C. *"An Object Oriented Mechanism for Reporting Events in Scan Based Traversals of Microchip Physical Layout data".* Defensive Publication US 2005- 0125808 A1, US Patent and Trademark Office, September 2005. https://www.google.com/patents/US20050125808
5. Izurieta C. *"A Method For Linking Non Object Oriented Data Models to Object Oriented Data Models Using A Technique To Achieve Zero-Size Mapping". French Patent (European Union) 0201628,* granted 3/11/05. Hewlett-Packard, Ft. Collins, CO, Disclosed 2001. https://www.google.com/patents/US20020116700

Posters

1. Kimball K., Valentien T., Izurieta C. *"Measuring Software Quality: Aggregating from a Security Based Model,"* Research Experiences for Undergraduates Symposium, Alexandria, VA, Oct 22-23 2017.
2. Izurieta C. *"Mechanisms of Software Decay".* Poster presentation at the Information Science and Technology Research Colloquium, ISTeC 2006, Fort Collins, CO, 2006
3. Izurieta C. *"Finding connectivity in microchip artwork design".* Poster presentation at the Information Science and Technology Research Colloquium, ISTeC 2005, Fort Collins, CO, 2005
4. Izurieta C. *"Architecture for Use in Navigational Planning and Environment Learning".* First ACM Computer Science Conference Poster Competition Award, Indianapolis, IN, 1993

Presentations

1. *"Hierarchical Software Quality Assurance (HSQA),"* Los Alamos National Laboratory, New Mexico, September 5, 2024.
2. *"The Complexities of Hierarchical Software Quality Assurance Models,"* Washington State University CySER seminar series, March 4, 2024.
3. *"Emerging Frontiers of Battle,"* Montana State University Provost Distinguished Lecture, Museum of the Rockies, Bozeman, MT, September 12, 2023.
4. *"Software Quality Assurance,"* Pacific Northwest National Laboratories, Richland, WA, June 14, 2023.
5. *"Cybersecurity and Software Assurance,"* Macquarie University, Sydney, Australia, May 17, 2023.
6. *"Cybersecurity Efforts at Montana State University,"* Universidad Técnica Federico Santa Maria, Nov 22, 2022.
7. *"Hierarchical Software Quality Assurance Approach to Leveraging Existing Technologies and Building Quality Gates,"* Washington State University CySER seminar series, Nov 29, 2021.
8. *"Design Pattern Characterization, Detection and Refactoring,"* Software Engineering Institute, Carnegie Mellon University, February 22, 2019.
9. *"On The Technical Debt of Security Weaknesses and Attacks,"* University of Groningen, Groningen, Netherlands, Jan 24, 2019.

10. *"Technical Debt Associated with Security Weaknesses,"* University of Calgary Invited Seminar, Calgary, Canada, March 22 2018.
11. *"Design of an extensible data and workflow management system,"* AFRI FACT Workshop, USDA Agriculture and Food Research Initiative, Los Angeles, CA, USA. Dec 17, 2017.
12. *"NuMo – Interdisciplinary app development in the consumer interest,"* Annual meeting American Council on Consumer Interests. Albuquerque, NM, USA, April 20, 2017.
13. *"K-12 Outreach Through Practical Software R&D in the Software Factory Environment,"* International Conference on Learning, Teaching, and Student Success. November 4, 2016. Bozeman, MT, USA.
14. *"On Technical Debt and Quality Models of Software Systems,"* Dahlgren Naval Surface Warfare Center, Virginia, July 21, 2016.
15. *"Technical Debt Aware Modeling,"* Dagstuhl 16162, Invited Participant, Schloss Dagstuhl, Germany, April 18-22, 2016.
16. *"The interplay between architectural (or model driven) technical debt vs. code (or implementation) technical debt,"* Dagstuhl 16162, Invited Participant, Schloss Dagstuhl, Germany, April 18-22, 2016.
17. *"Modeling and Measuring Technical Debt,"* Workshop, Co-Chairs: Shull F., Izurieta C.,* 23rd Annual Meeting of the International Software Engineering Research Network, ISERN, October 19-20, 2015, Beijing, China.
18. *"Technical Debt and its Consequences,"* Montana State University College of Engineering Seminar Series, Bozeman, MT, October 2014.
19. *"Software Factories,"* Montana State University Alumni Foundation Event, Portland, OR, March 26th, 2014.
20. *"Challenges in Measuring Technical Debt: Research and Industry Perspectives,"* **Panel**. Moderator: Philippe Kruchten, **Panelists**: Izurieta C., Shull F., Boehm B., 5th International Workshop on Managing Technical Debt MTD. IEEE ACM ESEIW 2013, Baltimore, USA, October 9th, 2013.
21. *"Measurement and Prevention of Technical Debt,"* and *"An Introduction to Montana State University,"* Universidad Catolica de la Santisima Concepcion, Concepcion, Chile, June 25, 2013.
22. *"Methods to Reduce the Technical Debt of Ecosystem Informatics,"* Universidad de Concepcion, Concepcion, Chile, May 16, 2013.
23. *"Reducing the Technical Debt of Ecosystem Informatics,"* Montana State University, Institute on Ecosystems, Bozeman, MT, March 2013.
24. *"Reducing the Technical Debt of Ecosystem Informatics,"* University of Montana, Institute on Ecosystems, Missoula, MT, March 2013.
25. *"An Introduction to the Observer Pattern and Design Concepts,"* Carroll College of Montana, Helena, MT, October 2012.
26. *"Design Patterns,"* University of Wisconsin, Eau-Claire, Eau-Claire, WI, March 2011.
27. *"Mutualism and the Co-Evolution of Ecological and Software Engineering models,"* Montana State University, Bozeman, MT. February 2011.
28. *"Decay, Rot and Grime in EvolvingObject Oriented Design Patterns."* Eastern Oregon University, La Grande, OR, May 2010.
29. *"Modeling Ecosystems with Network Exchange Objects."* Rocky Mountain Supercomputing Center Application Day 2010, Butte, MT, March 2010.
30. *"Software Engineering using the UML."* RightNow Technologies, Bozeman, MT, December 2009.
31. *"Mature Products and Platforms Design and Testing."* Zoot Technologies, Bozeman, MT, November 2009.
32. *"Decay and Grime Buildup in Evolving OO Design Patterns."* Montana State University, Bozeman, MT, September 2009.
33. *"Software Decay and Grime Buildup in Evolving OO Design Patterns".* University of Wisconsin La Crosse, La Crosse, Wisconsin, March 2009.
34. *"Software Decay and Grime."* Montana State University, Invited Seminar Talk, Bozeman, MT, October 2007.
35. *"Interviewing and Researching Employers."* Montana State University, Employer Workshop for students, Three Forks, MT, February 2007.

36. *"Resume writing and Networking with Employers."* Montana State University, Employer Workshop for students, Three Forks, MT, February 2006.
37. *"Applying the Flipper Technology to System Management Tasks."* Hewlett-Packard, Ft. Collins, CO, 1997.
38. *"Flipper: A Model Based Reasoning Approach To Systems Management."* Montana State University, Bozeman, MT, 1996.
39. *"Life of a Software Engineer."* Montana State University, Bozeman, MT, 1995.
40. *"Distributed Computing Environment Configuration."* US West customer visit to Hewlett-Packard, Ft. Collins, CO, 1993.
41. *"Dynamic Path Planning In Sensor Based Terrain Acquisition."* Montana State University, Bozeman, MT, 1992.
42. *"Outstars In Neural Networks."* Montana State University, Bozeman, MT, 1991.

White Papers and Reports

1. Gore R., Ezell B., Lynch C., O'Brien J., Zamponi V., Jensen E., Reinhold A.M., Izurieta C., Munro M., Shanahan E.A., *"Building a Domain Agnostic Framework for Efficient and Effective Risk Communication Messages,"* 16th International ModSim World 2024, Norfolk, VA, May 20-22 2024.
2. Reimanis D., Izurieta C., *"Initial Capabilities Analysis of Existing and Available Software QA Analysis Tools and Models,"* Department of Homeland Security Science and Technology, March 13, 2021
3. Reimanis D., Izurieta C., *"Case Studies to Assess Developed QA Models,"* Department of Homeland Security Science and Technology, March 13, 2021
4. Reimanis D., Izurieta C., *"Initial Gap Analysis of Existing and Available Software QA Analysis Tools and Models,"* Department of Homeland Security Science and Technology, March 13, 2021
5. Bergmann N., Izurieta C., McEvoy J., Poole G.C., Raile E., Ready R., Reinhold A.M., Shanahan E., *"Narrative Risk Communication: A Lingua Franca for Hazard Preparation?"* Evidence in Governance and Politics, EGAP, ID: 20190729AA. http://egap.org, July 2019.
6. Carver J., Prikladnicki R., (Collaboration Izurieta C.), *"Industry-Academia Collaboration in Software Engineering,"* IEEE Software Magazine, Vol 35, No 5, pp. 120-124 September-October 2018.
7. *"Can optimization associated with on-farm experimentation using site-specific technologies improve producer management decisions?,"* 14th International Conference on Precission Agriculture, Montreal, Canada, June 24-27 2018.
8. Raile E., King H., Shannahan E., McEvoy J, Izurieta C., Bergmann N., Ready R., Reinhold A.M., Poole G., *"Narrative-based Risk Communication: A Lingua Franca for Natural Hazard Messages?,"* 76th Annual Midwest Political Science Association, Chicago IL, April 5-8, 2018.
9. Fontana F., Trumler W., Avgeriou P., Chatzigeorgiou A., Izurieta C., Nord R., *"Technical Debt in Agile Development,"* 9th Workshop on Managing Technical Debt (MTD 2017), Cologne, Germany, May 22, 2017. ACM SigSoft Software Engineering Notes.
10. Fontana F., Trumler W., Izurieta C., Nord R., *"Proceedings Report on the MTD 2017 Workshop,"* 9th Workshop on Managing Technical Debt (MTD 2017), Cologne, Germany, May 22, 2017.
11. Izurieta C., Ozkaya I., Seaman C., and Snipes W. *"Technical Debt: A Research Roadmap,"* Report on the 8th Workshop on Managing Technical Debt (MTD 2016), ACM SIGSOFT Software Engineering Notes. Volume 42, Issue 1, pp. 28-31, March 2017.
12. Izurieta C. *"Integrating Into Enterprise System Management Platforms".* Hewlett-Packard, Ft. Collins, CO, 1996
13. Izurieta C. *"The Flipper Compiler".* Hewlett-Packard, Ft. Collins, CO, 1996
14. Izurieta C. *"Integration of NIS+ And SAM".* Hewlett-Packard, Ft. Collins, CO, 1995
15. Izurieta C. *"DCE Cell Renaming And Hierarchical Cells".* Hewlett-Packard, Ft. Collins, CO, 1994

Abstracts

1. Brock LaMeres, Clemente Izurieta, Colter Barney, Walker Ward, and Tristan Running Crane, "CyberShield - An Approach to Defeat Malware in Edge Computers using Hardware Diversity", *2nd Workshop on Intelligent Vehicle Dependability and Security (IVDS) from the International Federation for Information Processing (IFIP)*, Alexandria, VA, June 24-26, 2022.

2. Payn R., Mohr E., Isaksen-Swensen E., Schlotfeldt T., Poole G., Reinhold A.M., DeGrandpre M., Blazczak J., Hall R., Izurieta C., Valett M., *"Developing Extensible Software to Infer Ecosystem Metabolic Rates in Streams from Multivariate Metabolite Signals,"* Society for Freshwater Science Annual meeting, Salt Lake City, UT, May 12-23, 2019.

3. McEvoy J., Shannahan E., Raile E., Izurieta C., Reinhold AM., Bergmann N., Poole G., Ready R., King H., *"How Views of Dubious Science Affect Public Perception of Floodplain Management along the Yellowstone River, Montana, USA,"* American Association of Geographers, AGG '19, Washington, DC, April 2019.

4. Maxwell B., Bekkerman A., Silverman N., Payn R., Sheppard J., Izurieta C., Davis P., *"Can optimization associated with on-farm experimentation using site-specific technologies improve producer management decisions?,"* 14th International Conference on Precision Agriculture ICPA, June 24-27 2018, Montreal, Canada.

5. Payn R., Maxwell B., Izurieta C., Sheppard J., *"On-farm experimentation in precision agriculture: developing big data technology to improve the odds of agronomic profits in Montana".* 2017 Malt Barley and Sugarbeet Symposium. Great Falls, MT, January 11 2017.

6. Reinhold A.M., Poole G.C., Helton A.M., Izurieta C., Payn, R.A., Bernhardt E.S., *"A constraint-based, compound specific approach to modeling linked biogeochemical cycles,"* SFS, Sacramento, CA, May 21-26, 2016.

7. Reinhold A.M., Poole G.C., Helton A.M., Payn R.A., Izurieta C., Bernhardt E.S., Burgin A.J., *"Simulating concurrent metabolic pathways in biogeochemical systems,"* Society of Freshwater Science Meeting, SFS, Milwaukee, WI, May 17-22, 2015.

8. Reinhold A.M., Poole G.C., Payn R.A., Izurieta C., *"Limits of transient storage assumptions for heat: Using residence time distribution to estimate mean temperature of hyporheic discharge in montane alluvial streams,"* Society of Freshwater Science Meeting, SFS, Milwaukee, WI, May 17-22, 2015.

9. Payn R.A., Izurieta C., Poole G.C., *"An exploration of convergent evolution in academia: Why ecosystem ecologists and biochemists should think about the tools of software engineering,"* Society of Freshwater Science Meeting, SFS, Milwaukee, WI, May 17-22, 2015.

10. Helton A., Poole G.C., Payn R., Izurieta C., Stanford J., Bernhardt E., *"Scaling Hydrologic and Biogeochemical Processes in a Large River Floodplain and Alluvial Aquifer,"* 2014 AGU Fall Meeting, San Francisco, USA, December 15-19 2014.

11. Poole G.C., Helton A., Izurieta C., Payn R., Stanford J., Bernhardt E., Burgin A. *"Simulating the Hydro-Ecology of a Large River Floodplain and Alluvial Aquifer: Progress and Future Directions,"* 2014 JASM, Joint Aquatic Sciences Meeting, May 18-13, Portland, USA.

12. Poole G.C., Helton A., Izurieta C., Payn R., Stanford J., Bernhardt E., Burgin A. *"Progress and Future Directions in Simulating Ground- and Surface-Water Exchange and Biotic Solute Processing in a Large River Alluvial Aquifer,"* 2014 EGU General Assembly, Vol 16, April 22 - May 2 2014, Vienna, Austria.

13. Payn R.A., A.M. Helton, G.C. Poole, C. Izurieta, E.S. Bernhardt, A.J. Burgin, *"A Generalized Model of Aquatic Microbial Metabolism Based on Thermodynamic, Kinetic, and Stoichiometric Theory,"* SFS Society for Freshwater Science, Annual Meeting 2013, Jacksonville Florida, May 19-23, 2013.

14. Payn R.A., A.M. Helton, G.C. Poole, C. Izurieta, E.S. Bernhardt, A.J. Burgin, *"Exploring the controls of soil biogeochemistry in a restored coastal wetland using object-oriented computer simulations of uptake kinetics and thermodynamic optimization in batch reactors,"* 2012 AGU Fall Meeting, San Francisco, USA, December 3-7 2012.

15. Poole G.C., Helton A.M., Izurieta C., Payn R.A., Bernhardt E.S., Burgin A.J., Griffith I., Nix R., Ardon M., Stanford J.A., *"Modeling Functional Heterogeneity of Multiple Interactive Ecological Currencies in Linked Channel, Floodplain, and Aquifer Systems,"* SFS 2012 Annual Meeting, Freshwater Stewardship: Challenges and Solutions. Louisville, KY, May 20-24, 2012.

16. Mason S.J.K., Cleveland S.B., Llovet P., Izurieta C., Poole G.C., *"The Virtual Observatory and Ecological Informatics System (VOEIS): Using RESTful Architecture and an Extensible Data Model to Provide a Unique Data Management Solution,"* 2012 Spring Runoff Conference, Utah State University, Logan Utah, USA, April 3-4 2012. Abstract.

17. Helton A.M., Poole G.C., Bernhardt E.S., Payn R.A., Izurieta C., Burgin A.J., *"Simulating the Influence of Saltwater Intrusion on Coupled Element Cycles in Coastal Plain Wetlands"* 9th Intecol International Wetlands Conference, Society of Wetland Scientists SWS 2012, Orlando, Florida, June 3-8, 2012.
18. Llovet P., Izurieta C., Cleveland S., *"The VOEIS HIS Gateway: A REST Interface for a HydroServer using ODM 1.1"* 2011 CUAHSI Conference on Hydrologic Data and Information Systems, Logan Utah, USA, June 22-24 2011.
19. Izurieta C., Poole G.C., McGlynn B.L., Cross W.F., Marshall L.A., Jacobs G.A., Cleveland S., Judson I., Hauer F.R., Kucera B., *"A Cyber-Infrastructure for a Virtual Observatory and Ecological Informatics System -- VOEIS"* 2010 AGU Fall Meeting, San Francisco, USA, December 13-17 2010.
20. Poole G.C., Izurieta C., Payne R.A., Helton A.M., Bernhardt E.S., Wright M.S, Burgin A.J., Stanford J.A. *"System-Level Hypothesis Testing: A Novel Approach to Developing Parsimonious Models of Complex Ecosystem Dynamics."* 2010 Summer Meeting, Joint Meeting with ASLO, NABS, Aquatic Sciences: Global Changes from the Center to the Edge, Santa Fe, New Mexico, USA, June 6-11 2010.

Grant Support (Current and Past)

- PI. *"Cyber Attack Mitigation for Specialized Systems,"* Department of Homeland Security Science and Technology, in collaboration with Pacific Northwest National Laboratory, $4,000,000, Mar 2024 – Mar 2027.
- Co-PI. *"Security Analysis of Field Programmable Gate Arrays,"* Idaho National Laboratory, $255,000, Jan 2024 - September 2026.
- PI. *"SecureBoot for neXtECU Engine Controller,"* WolfSSL, $28,800, Feb 2023 – December 2023.
- PI. *"LRBAA 18-01-SEC CYB 06-01-0023-VP Type III Research Area: Securing Cyberspace SEC CYB 06-01,"* Department of Homeland Security Science and Technology, $4,469,998, September 2022 – September 2025.
- **Resilient Computing LLC**
  - PI. *"Real-Time Hardware Configurable Coprocessors,"* Resilient Computing, LLC, NASA SBIR II, $170,135, June 2024 – June 2026.
  - PI. *"Real-Time Hardware Configurable Coprocessors,"* Resilient Computing, LLC, NASA SBIR I, $33,999, August 2023 – February 2024.
  - PI. *"Fault Tolerant RISC-V Flight Computer with Coprocessor Support,"* Resilient Computing, LLC, NASA SBIR II, $160,000, July 2023 – December 2025.
  - PI. *"Cyber Resilience at the Edge Using Hardware Obfuscation,"* Resilient Computing, LLC, United States Special Operations Command (SOCOM) STTR I, $45,000, September 2022 – December 2023.
  - PI. *"Fault Tolerant RISC-V Flight Computer with Coprocessor Support,"* Resilient Computing, LLC, NASA SBIR I, $32,634, July 2022 – December 2023.
  - Co-PI *"Cybershield: Malware-Resistant Edge Computing for Critical Applications,"* US Economic Development Administration, $13,450, December 2022 – December 2023.
  - PI. *"Fault Tolerant Computing Based on Reconfigurable Hardware/Software Architectures, with co-processor"* Resilient Computing, LLC, NASA SBIR I, $34,619 May 2021 – December 2022.
- Co-PI. *"VICEROY Northwest Virtual Institute for Cybersecurity Education & Research (CySER),"* Griffiss Institute, Department of Defense, $242,000, July 2021 – September 2024.
- PI. *"Cyber QR Ops: Improving the Quality and Resiliency of Critical Computing Infrastructure,"* Department of Homeland Security Science and Technology, in collaboration with Idaho National Laboratory, $3,100,000, September 2020, August 2023.
- Co-PI. *"Improving Cyber Survivability with Real Time Hardware Diversification,"* Raytheon Systems Company, $300,000, June 2020 – June 2023.
- PI. *"REU Site: Research Experiences in Cybersecurity Algorithms,"* NSF, US$405,000. June 2020 - August 2022.
- Co-PI. *"Initiating a Cybersecurity Research Program within the NACOE,"* Montana State University, $25,000, March 2019 – March 2020.
- PI. *"What To Fix? Refactoring Assistant Project,"* Carnegie Mellon University and Department of the Air Force, $5,000, January 2019 - April 2020.

- PI. *"Electromagnetic Spectrum (EMS) Situational Awareness (SA) & Command and Control (C2) with Wideband Sensors & Data Analytics,"* S2 Corporation, Gift US$75,000. August 2018 – Expiration.
- PI. "*REU Site: Research and Development of Algorithms in a Software Factory,*" NSF, US$288,000. June 2017 - June 2019.
- Co-PI. "*The Impacts of Narratives-based Risk Communication on Hazard Preparedness,*" NSF, US$550,000 (Izurieta $113,315), September 2016 – August 2020.
- **DoD, DLA, Air Force Patterson, US Army Corps of Engineers Research and Development Center, Construction Engineering Research Laboratories (CERL)**
    * PI. "SMS Quality Assurance," US$300,000, February 2025 – February 2026.
    * Co-PI. "SMS Quality Assurance," US$317,308, September 2023 – September 2025.
    * PI. "SMS Quality Assurance," US$330,000, July 2022 – September 2024.
    * PI. *"Software QA of Army CERL legacy BUILDER and Enterprise Sustainment Management Systems,"* US$200,000, May 2022 – September 2023.
    * PI. *"Hierarchical Quality Analysis and Testing of Sustainment Management Systems,"* US$200,000, June 2021 – May 2022.
    * PI. *"Hierarchical Quality Analysis and Testing of Sustainment Management Systems,"* US$330,000, September 2020 – August 2022.
    * PI. *"Software Quality Analysis of Army Construction Engineering Laboratory's Sustainment Management Systems,"* US$201,243, July 2020 – June 2021.
    * PI. *"Software Quality Analysis of Army Construction Engineering Laboratory's (CERL) BUILDER Sustainment Management Systems,"* US$200,000, April 2019 – June 2020.
    * PI. "*AF 2 Software Quality Analysis of Army Construction Engineering Laboratory's (CERL) BUILDER Sustainment Management Systems,"* US$200,000, April 2018 – June 2019.
    * PI. "*Software Quality Analysis of Army Construction Engineering Laboratory's (CERL) FUELER Sustainment Management Systems,"* US$208,421, April 2018 – June 2019.
    * PI. "*Quality Assurance of Lifecycle Management Decision Support Systems,*" US$100,000, August 2017 – March 2018.
    * PI. "*Quality Assurance of Lifecycle Management Decision Support Systems,*" US$200,000, March 2017 – January 2018.
    * PI. "*Quality Assurance of Lifecycle Management Decision Support Systems,*" US$75,000, September 2016 – March 2017.
    * PI. "*Sustainability Management Systems Research and Development,*" US$146,242, October 2015 – December 2016.
    * PI. "*Sustainability Management Systems Research and Development,*" US$150,000, October 2014 – September 2015.
- Co-PI. "*Increasing Profitabiliy by Improving Efficiency of Montana's Farm and Ranch Lands,"* US$2,276,734 (Izurieta $190,000), Montana Research Initiative, State of Montana, August 2015 – June 2017.
- PI. "*Software Quality Assurance in Financial Solutions,*" Zoot Enterprises, US$134,763, January 2015 – December 2018.
- PI. Faculty Excellence Award. US$3600, Montana State University 2015.
- PI. "*Software Factory Initiation,*" Zoot Enterprises, US$9000, October 2014.
- **Institute on Ecosystems, Montana University System**
    * Co-PI. "*Focus 2: A general solution to optimization-based modeling of microbial biogeochemistry: an algorithm to generate user specified models,*" Institute on Ecosystems, Montana State University, US$37,185, September 2015 – August 2016.
    * Co-PI. "*Focus 2: Development and Application of a Simulation Framework,*" Institute on Ecosystems, Montana State University, US$47,856, October 2013 – August 2014.
    * Co-PI. "*Focus 2: Development and Application of a Simulation Framework for Quantifying Uncertainty Across Competing Models of System Complexity,*" Institute on Ecosystems, Montana State University, US$93,862, November 2012 - August 2013.
    * Co-PI. "*Graduate Fellowships Year One,*" Institute on Ecosystems, Montana State University, US$15,000, August 2012 - May 2013.

- Co-PI. "*Projecting climate change in Pacific Rim rivers: Landscape scale influences on salmonid vulnerability using satellite remote sensing and genomics,*" Institute on Ecosystems incubation grant, Montana University System, US$8,000, March - August 2012.
- Co-PI. "*Seasonality and sources of recharge water to the Nyack floodplain in relation to rates of biogeochemical processes and ecosystem function,*" Institute on Ecosystems incubation grant, Montana University System, US$29,500, March - August 2012.

- Co-PI. "*REU Site: Research in Networking and Networks with Applications to Sustainability,*" NSF, US$359,640. June 2012.
- PI. "*VOEIS -- A Virtual Observatory for Ecological Informatics System,*" MT NSF EPSCoR, US$570,000 September 2011. Awarded (Year 3). Collaborative proposal with University of Montana and University of Kentucky. Overall funding $5M.
- Co-PI. "*Collaborative Research: Coupled C, N and S cycling in coastal plain wetlands: how will climate change and salt water intrusion alter ecosystem dynamics,*" NSF. US$424,951. September 2010. Awarded. Collaborative proposal with Duke University and Wright State University. Overall funding $1.2M.
- Co-PI. *"Vehicle Level Reasoning System,"* The Boeing Company/NASA Ames Research Center, Aviation Safety Program Office(ARMD NRA NNH09ZEA001N-IVHM1). US$59,175. Summer 2009.
- Co-PI. *"Measurement and Simulation of Ecosystem Dynamics Across Stream Networks: An Interdisciplinary Multi-scale Approach,"* A proposal to address interdisciplinary research priorities outlined in the NSF's letter to colleagues entitled Multi-scale Modeling (MSM, NSF 09-032) and Emerging Topics in Biogeochemical Cycles (ETBC, NSF 09-030). US$7495. Summer 2009. Awarded
- PI. *"Equipment grant for the IT department at Montana State University,"* Hewlett Packard Co., US$42000. Fall Semester 2008.
- PI. *"Small Grant General Fund for the Association and Computing Machinery (ACM) at Colorado State University,"* Intel Corporation, US$2000. Fall Semester 2007.

Senior Staff

- Software Architect. *"Cyberinfrastructure for a Virtual Observatory and Ecological Informatics System (VOEIS),"* F. Richard Hauer (PI). (MT NSF EPSCoR Grant: M66012/66013 American Recovery and Reinvestment Act. August 2008 – July 2011.

Conferences Service

- Software Engineering (ESEM, ISESE, CibSE, ASE, ICGSE, ICSR, SANER, MALETS, ICSOFT)
  - ESEM (International Conference on Empirical Software Engineering and Measurement)
    - ISERN Steering committee member: 2022 – Present, Chair 2025-2026.
    - Co General Chair: 2023 (USA)
    - PC Member: 2025 (USA), 2024 (Spain), 2021 (Italy), 2018 (Finland), 2017 (Canada), 2014 (Italy)
    - Session Chair: 2015 (China), 2010 (Italy)
    - Publicity Chair: 2016 (Spain)
    - Short Research Papers General Chair: 2013 (USA)
    - Presenter: 2007 (Spain)
  - ISESE (International Symposium on Empirical Software Engineering)
    - Presenter: 2006 (Brazil)
  - CibSE (Congreso Iberoamericano en Ingeniería de Software)
    - PC Member: 2023 (Uruguay), 2022 (Virtual), 2021 (Costa Rica), 2020 (Brazil), 2019 (Cuba), 2018 (Colombia), 2017 (Argentina), 2016 (Ecuador)
  - ASE (International Conference on Automated Software Engineering)
    - PC Member: 2016 (Singapore)
  - ICGSE (International Conference on Global Software Engineering)
    - PC Member: 2014 (China)
  - ICSR (International Conference on Software and Systems Reuse)
    - Industry General Chair: 2019 (USA)

- SANER
  - PC Member: 2020 (Canada), Proceedings Chair: 2021 (USA)
- MALETS (International Workshop on Machine Learning Technologies in Software Engineering)
  - Presenter: 2011 (USA)
- ICSOFT (International Conference on Software Technologies)
  - PC Member: 2021 (on-line)

- Architectural Quality and Technical Debt (TechDebt, MTD, TDA, QoSA, Dagstuhl)
  - TechDebt (International Conference on Technical Debt)
    - **Steering Committee** Member: 2022 - Present
    - PC Member: 2025 (Canada), 2024 (Portugal), 2023 (Australia), 2022 (Virtual), 2021 (Spain-online), 2019 (Canada)
    - Panelist: 2023 (Australia)
    - General Chair: 2020 (Korea-virtual)
    - Tools Track Chair: 2019 (Sweeden)
  - MTD (International Workshop on Managing Technical Debt)
    - Chair, PC Member: 2017 (Germany), 2016 (USA), 2015 (Germany), 2014 (Canada), 2013 (Switzerland)
  - TDA (International Conference on Technical Debt Analytics)
    - Session Chair, Panelist: 2016 (New Zealand)
  - QoSA (International Conference on the Quality of Software Architectures)
    - PC Member: 2015 (Canada)
  - Dagstuhl (International Work series Dagsthul on Managing Technical Debt)
    - Participant: 2016 (Germany)
  - SPLC (26th ACM International Systems and Software Product Line Conference)
    - PC Member: 2022 (Austria)
  - MSR4P&S (2nd International Workshop on Mining Software Repositories for Privacy and Security)
    - PC Member: 2024 (Finland)

- Cybersecurity (CSR, CReSCT)
  - CSR (International Conference on Cybersecurity and Resilience)
    - PC Member: 2021 (on-line), 2022 (on-line), 2023 (Italy), 2024 (London)
  - CReSCT (Cyber Resilient Supply Chain Technologies)
    - PC Member: 2020 (on-line)
  - MSR4P&S (Mining Software Repositories for Privacy and Security)
    - PC Member: 2022

- General Computer Science (EuroMicro-SEAA, SOFSEM, WSESE, IEEE Congress, SIGCSE)
  - EuroMicro (Software Engineering and Advanced Applications)
    - PC Member: 2021 (Italy), 2019 (Greece), 2017 (Austria)
  - SOFSEM (International Conference on Current Trends in Theory and Practice of Computer Science)
    - PC Member: 2021 (Italy), 2020 (Cyprus)
  - WSESE (Methodological Issues with Empirical Studies involving Human Subjects)
    - PC Member: 2018 (Netherlands)
  - IEEE Services Congress
    - PC Member: 2017 (USA)
  - SIGCSE (Computer Science Education)
    - PC Member: 2017 (USA), 2016 (USA)

- Journals (Active Reviewer)
  - Elsevier Information and Software Technology Special Issue "Value and Waste in Software Engineering," **Guest Editor**.
  - ACM Transactions on Reliability http://mc.manuscriptcentral.com/tr-ieee

- ACM Transactions on Software Engineering http://mc.manuscriptcentral.com/tse-cs
- Software Quality Journal http://link.springer.com/journal/11219
- The Journal of Object Technology http://www.jot.fm
- Elsevier's Information and Software Technology Journal http://www.journals.elsevier.com/information-and-software-technology
  - Guest Editor, special issue on Value and Waste in Software Engineering, 2021
- Information Sciences Journal http:// http://www.journals.elsevier.com/information-sciences
- Journal of Software Evolution and Process http://onlinelibrary.wiley.com/journal/10.1002/(ISSN)2047-7481
- Journal of Systems and Software http://www.journals.elsevier.com/journal-of-systems-and-software/
- Empirical Software Engineering Journal http://link.springer.com/journal/10664
- IEEE Access Journal http://ieeeaccess.ieee.org
- IEEE Software Magazine
- IEEE Transactions on Software Engineering

Classes Taught

- Programming with Java (CSCI 111) 2015.
- Programming with C (CSCI 112) 2015.
- Undergraduate Research (CSCI 482R, CSCI 483R) 2009-Present.
- Software Engineering I (ESOF 322) 2008-2020.
  - Lifecycles, design patterns, UML, architecture, prescriptive and agile techniques.
- Software Engineering II (ESOF 422) 2009-Present
  - Formal methods, testing theory, cybersecurity
- Empirical Software Engineering (ESOF 522) 2013-Present
  - Scientific methods, experimentation, case studies, validity threats, empirical methods, data analysis, GQM, measurement theory.

Honors and Awards

- Montana State University College of Engineering Distinguished Professor, May 7, 2024
- Montana State University Provost Distinguished Lecture, September 12, 2023
- Montana State University College of Engineering Lloyd Berg award, April 2020
- Montana State University Gianforte School of Computing "2018 Professor of the Year Award," Selected by Students. Bozeman, MT, April 2018
- Montana State University and Bozeman Chamber of Commerce Faculty/Staff 2018 Award of Excellence. 36th Annual Awards for Excellence 2018. Mentee: Cortney Linder.
- Montana State University College of Engineering "2017 Teacher of the Year Award," Bozeman, MT, 2017.
- Montana State University and Bozeman Chamber of Commerce Faculty/Staff 2017 Award of Excellence. 35th Annual Awards for Excellence 2017. Mentee: Mackenzie O'Bleness.
- Montana State University "Provost's Award for Undergraduate Research and Creativity Mentoring," Bozeman, MT, 2017.
- Assefi M., Liu G., Izurieta C., Wittie M.P., "An Experimental Evaluation of Apple Siri and Google Speech Recognition," 24th International Conference on Software Engineering and Data Engineering, SEDE 2015, San Diego, California, October 12-14, 2015. **Best Conference Paper Runner Up Award**.
- Montana State University Department of Computer Science "2015 Service and Outreach Award," Bozeman, MT, 2015.
- Montana State University Department of Computer Science "2013 Researcher of the Year Award," Bozeman, MT, 2013.
- Montana State University and Bozeman Chamber of Commerce Faculty/Staff 2013 Award of Excellence. 31st Annual Awards for Excellence 2013. Mentee: Rachel Luhr.

- Schuh M., Sheppard J., Strasser S., Angryk R., Izurieta C. <u>"Ontology-Guided Knowledge Discovery of Event Sequences in Maintenance Data."</u> IEEE AutoTestCon Conference 2011, Baltimore, Maryland, USA, September 12-15, 2011. **Best Conference Student Paper Award**.
- Montana State University Department of Computer Science "2010 Professor of the Year Award," Selected by Students. Bozeman, MT, April 2010
- Upsilon Pi Epsilon Honor Society, 2009
- Intel Digital Group Award for Exemplary Performance in Development of a Circuit Recognition Tool, Ft. Collins, CO, 2006
- HP Unix Development Laboratories "Drive the Future Award" for creative engineering. Ft. Collins, CO, 1996, 1998
- Achievement Award, Student Poster Competition. ACM Computer Science Conference. Indianapolis, IN, 1993
- Honorable mention and award of distinction at the "WestPac Australian Mathematics Competition." Sydney, Australia, 1983

Graduate Students (Graduated and Current)

- Travis Schanz, MS Computer Science
  - Graduated 2011. Thesis: A Taxonomy of Modular Grime in Design Patterns
- Melissa Dale, MS Computer Science
  - Graduated 2014. Thesis: Impacts of Modular Grime on Technical Debt
- Isaac Griffith, MS Computer Science
  - Graduated 2014. Thesis: Technical Debt Management in Release Planning –A Decision Support Framework
- Rachael Luhr, MS Computer Science
  - Graduated 2015. Thesis: The Application of Technical Debt Mitigation Techniques to a Multidisciplinary Software Project
- Killian Smith, MS Computer Science
  - Graduated 2018. Thesis: Exploratory Study on the Effectiveness of Type Level Complexity Metrics
- Derek Reimanis, PhD Computer Science
  - Graduated 2019. Dissertation: The Identification, Characterization, and Evaluation of Model-Based Behavioral Decay in Design Patterns
- Henry King, MS Computer Science
  - Graduated 2019. Thesis: Informing the Construction of Narrative-Based Risk Communication
- David Rice, MS Computer Science
  - Graduated 2020. Thesis: An Extensible, Hierarchical Architecture for Analysis of Software Quality Assurance
- Isaac Griffith, PhD Computer Science
  - Graduated 2021. Dissertation: Design Pattern Decay -A Study of Design Pattern Grime and its Impact on Quality and Technical Debt
- Andrew Johnson, MS Computer Science
  - Graduated 2021. Thesis: The Analysis of Binary File Security Using a Hierarchical Quality Model
- Payton Harrison, MS Computer Science
  - Graduated 2022. Thesis: Analyzing the Security Of C# Source Code Using A Hierarchical Quality Model
- Faqeer Rehman, PhD Computer Science
  - Graduated 2022. Dissertation: Improving the Confidence of Machine Learning Models Through Improved Software Testing Approaches
- Susan McCartney, MS Computer Science
  - Graduated 2022. Thesis: A Framework to Assess Bug-Bounty Platforms based on Potential Attack Vectors
- Reese Pearsall, MS Computer Science

- * Graduated 2023. Thesis: An Evaluation of Graph Representation of Programs for Malware Detection and Categorization Using Graph-Based Machine Learning Methods
- Batuhan Mekiker, PhD Computer Science (co-Chaired)
  - * Graduated 2023. Dissertation: Enabling Real Time Communications in Resource Constrained Networks.
- Prashanta Saha, PhD Computer Science.
  - * Graduated 2024. Dissertation: Improving the Effectiveness of Metamorphic Testing Using Systematic Test Case Generation.
- Eric O'Donoghue, MS Computer Science.
  - * Graduated 2024. Thesis: Using SBOM For Software Supply Chain Security and Its Generation Impact on Vulnerability Detection.
- Zach Wadhams, MS Cybersecurity
  - * Graduated 2024. Thesis: On Improving the Adoption, Usability and Retention of Static Application Security Testing (SAST) Tools.
- Karishma Rahman, PhD Computer Science.
  - * Graduated 2025. Dissertation: Automating Metamorphic Testing By Predicting Metamorphic Relations For Complex and Vulnerability-Prone Applications.
- Christine Johnson, MS Computer Science.
  - * Graduated 2025. Thesis: Verification Tool For Securing RISC-V FPGA-Based Process Control Systems.
- Garrett Perkins, MS Computer Science.
  - * Graduated 2025. Thesis: Providing Secure Boot of Obfuscated Opcodes For Cybershield Using a Trusted Execution Environment.
- Grant Nelson, PhD Computer Science. Current.
- Gerard Shu Fuhnwi, PhD Computer Science. Current.
- Ernesto Ortiz, PhD Computer Science. Current.
- Zach Wadhams, PhD Computer Science. Current.

Undergraduate Student Research

- Rory Myer, *"Improvements to Programmable Logic Controller Security,"* August 2021 – August 2022.
- Blake Stanger, Walker Ward, *"Improving Cyber Survivability with Real Time Hardware Diversification,"* Raytheon Systems, July 2020 – Present.
- Marie Morin, *"A Longitudinal Study of Technical Debt in Gaming Systems,"* Undergraduate Scholars Program award recipient ($1800) Academic year 2017-2018.
- Xuying Wang, *"Prospective Computer Science Student Outreach Trough a Practical Software Development Project in the Software Factory Environment,"* Undergraduate Scholars Program award recipient ($1800) Academic Summer 2016.
- Ryan Darnell, *"Prospective Computer Science Student Outreach Trough a Practical Software Development Project in the Software Factory Environment,"* Undergraduate Scholars Program award recipient ($1800) Academic Summer 2016.
- MacKenzie O'Bleness, *"Prospective Computer Science Student Outreach Trough a Practical Software Development Project in the Software Factory Environment,"* Undergraduate Scholars Program award recipient ($1800) Academic Summer 2015.
- Mike Trenk, *"Prospective Computer Science Student Outreach Trough a Practical Software Development Project in the Software Factory Environment,"* Undergraduate Scholars Program award recipient ($1800) Academic Summer 2015.
- Rachel Luhr, *"Visualizing Structural and Behavioral Change in Software Systems,"* Undergraduate Scholars Program award recipient. ($1500) Academic Year 2012-2013.
- Derek Reimanis, *"Developing the Input/Output Module of a Multi-Disciplinary System Modeling Framework."* Undergraduate Scholars Program award recipient. ($1500) Fall 2012.
- Renee Cross, Derek Remainis, Rachel Luhr, *"Using Planetarium Software for Data Visualization of the Natural and Physical Sciences."* EPSCoR ($7200), Summer 2012.

- Michael Poulson, *"Particle Tracking Software for Ecosystems Modeling."* Undergraduate Scholars Program award recipient ($1500) Summer 2010
- Isaac Griffith, *"Ecosystems Modeling."* Undergraduate Scholars Program award recipient. ($1500) Summer 2010

Activities/Memberships

- Director of the Montana State University Software Factory. In collaboration with Zoot Technologies. 2014 – Present.
  - http://bobcatsoftwarefactory.com
- Director of the Software Engineering Laboratory SEL. 2011 – Present.
  - International Software Engineering Research Network (ISERN) member since 2015
- Created the Computational Ecology Research Group. A collaborative effort with the Land Resources and Environmental Sciences department. 2009 – 2015.
- Member ACM, IEEE Senior Member, AGU (American Geophysical Union)
- Member of the Numerical Intelligent Systems Laboratory (NISL), a collaborative laboratory between Montana State University and Johns Hopkins University. 2009 – Present. http://www.cs.montana.edu/sheppard/NISL/index.html
- Member of the Computer Science Advisory Board at Montana State University. 2007 – 2009.
- Member of the Electrical and Computer Engineering Advisory Board at Montana State University. 2002 – 2007.
- Member of the Montana State University Employer Relations Advisory Board. 2005 – 2009.
- Recruiter and Campus Manager for Intel Corporation at Montana State University. 2004 – 2007.
- Recruiter and Campus Manager for Hewlett-Packard at Montana State University. 1994 – 2009.
- Member of the Association for Computing Machinery.
- Volunteer. Greater Gallatin Watershed Coalition, Gallatin Valley Land Trust. 2008 – 2011.

References

Dr. James Bieman
Colorado State University
Department of Computer Science
bieman@cs.colostate.edu
(970)491-7096

Dr. Geoffrey Poole
Montana State University
Land Resources and Environmental Sciences
gpoole@montana.edu
(406) 994-5564

Dr. John Paxton
Montana State University
Department of Computer Science
paxton@cs.montana.edu
(406) 994-4780