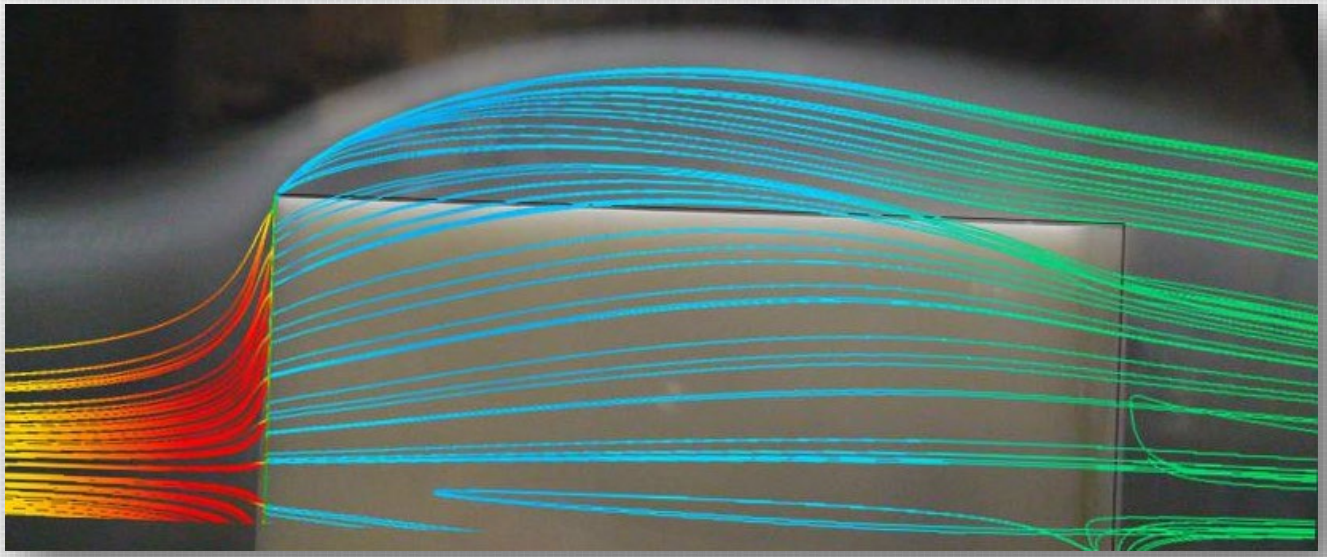
National Security Engineering Research



National Security Engineering Research

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Engineering security systems are an important area of research to the State of Nevada and the nation.

UNLV researchers address many challenges related to security engineering, including blast containment, shock mitigation, and smart grid security. Our researchers have been funded by various federal and state agencies as well as industrial partners.

We would like to introduce you to some of our faculty. Please contact us if we can help with future collaboration.

Graphics on Slide 1: Computational fluid dynamics visualization of truck body aerodynamic drag reduction technology (Dr. William Culbreth).

National Security Engineering Research Areas of Expertise

- Computational radiation transport
- Nuclear systems design and analysis
- Interconnection networks
- Pulsed power and plasma physics
- Radiation detectors
- Active neutron interrogation and non-destructive assay of materials and safeguards
- Nuclear nonproliferation
- Pulsed-ray radioscopy to detect nuclear materials
- Development of detection algorithms and adaptive signal processing
- Wireless communications and security
- GaN semiconductors and devices
- Radiation-hard electronics, optoelectronics, and imaging systems
- Electroactive polymers
- Digital search warrants
- Secure protocol development for software and network applications
- Wireless mesh network routing and security
- Open-source algorithm implementation
- Geologic nuclear reactor modeling
- Structural analysis, failure analysis, experimental mechanics
- Structural dynamics, explosives, and impact analysis
- Computational simulation of highly dynamic events
- Material characterization, custom component testing
- Progressive collapse resistance of structures
- Simulation of structures subjected to normal and extreme loading events
- Earthquake engineering
- Smart use of randomization
- Man-In-The-Middle (MITM) attack with tempered SSL certificate detection

National Security Engineering Research

Why UNLV?

- Las Vegas is a dynamic and growing city with a population that includes multiple ethnicities and age groups.
- UNLV has a strong team of researchers who collaborate on various areas of security engineering studies.
- UNLV researchers also have developed strong collaboration ties with key industrial partners including:
  - **Mission Support and Test Services, LLC (MSTS)**
    MSTS manages operations at the Nevada National Security Site (NNSS) – formerly known as the Nevada Test Site – and its related facilities and laboratories for the Department of Energy's National Nuclear Security Administration.
  - **Varian Medical Systems**
    Varian's Security and Inspection Products group, based in Las Vegas, provides cargo screening systems with linear accelerators for X-ray imaging for cargo screening operations.

Faculty Involved in National Security Engineering Research

- **Dr. Alexander Barzilov**
  Associate Professor, Department of Mechanical Engineering
- **Dr. Wolfgang Bein**
  Professor, Department of Computer Science
  Co-Director, Center for Information Technology and Algorithms (CITA)
- **Dr. William Culbreth**
  Associate Professor, Department of Mechanical Engineering
- **Dr. Yingtao Jiang**
  Professor, Associate Dean for Undergraduate Programs
- **Dr. Ju-Yeon Jo**
  Associate Professor, Department of Computer Science
- **Dr. Kwang J. Kim**
  Distinguished Professor, ASME Fellow, NAI Fellow, Department of Mechanical Engineering
  Director of Active Materials and Smart Living Laboratory
- **Dr. Yoohwan Kim, CISSP**
  Associate Professor, Department of Computer Science
- **Dr. Shahram Latifi, P.E.**
  Professor, Department of Electrical and Computer Engineering
  Director, Center for Information Technology and Algorithms (CITA)

Faculty Involved in National Security Engineering Research

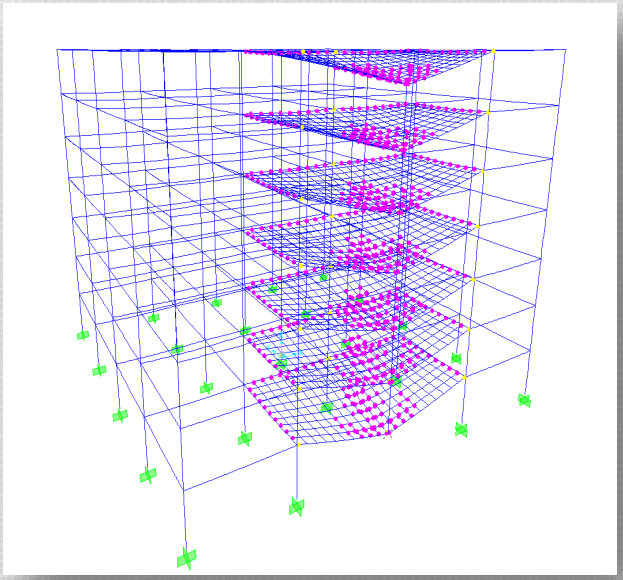
- **Dr. Brendan J. O'Toole**
  Professor and Chair, Department of Mechanical Engineering
  Director, Center of Materials and Structures
- **Dr. Emma Regentova**
  Professor, Department of Electrical and Computer Engineering
- **Dr. Robert Schill**
  Professor, Department of Electrical and Computer Engineering
  Director, Energy Materials Interaction Technology Initiative of Nevada (EMITION) Center
- **Dr. Ke-Xun (Kevin) Sun**
  Professor, Department of Electrical and Computer Engineering
- **Dr. Ying Tian, P.E.**
  Associate Professor, Department of Civil and Environmental Engineering and Construction
- **Dr. Mohamed Trabia**
  Professor, ASME Fellow, Department of Mechanical Engineering
  Associate Dean for Research, Graduate Studies, and Computing
- **Dr. Mei Yang**
  Professor, Department of Electrical and Computer Engineering

National Security Engineering Research

Additional Resources
Center for Materials and Structures
Energy Materials Interaction Technology Initiative of Nevada (EMITION) Center
Center for the Advanced Study of Algorithms (CASA)
Center for Information Technology and Algorithms (CITA)

National Security Engineering

Research Highlights



National Security Engineering Research

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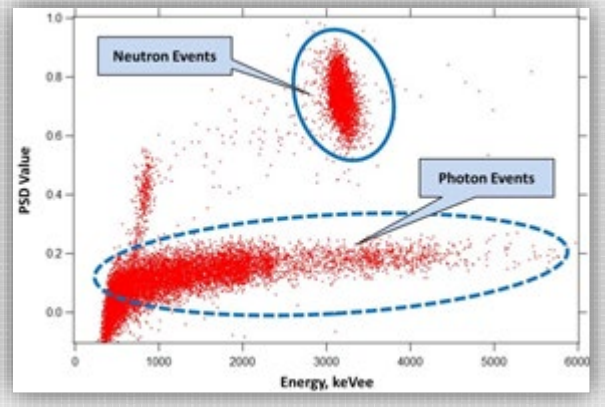
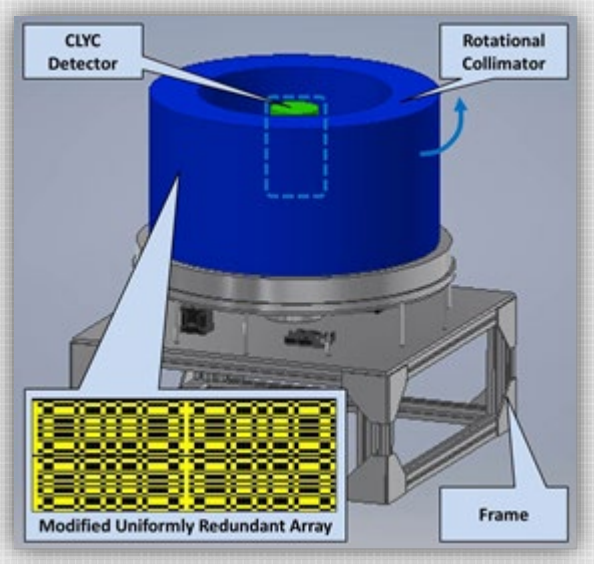


- Expertise
  - Radiation detection methods
  - Active neutron interrogation and non-destructive assay of materials
  - Prompt gamma neutron activation analysis
  - Gamma ray spectral analysis and radiation source identification
  - Computational radiation transport
  - Design and analysis of nuclear reactors
  - Nuclear safeguards and nonproliferation
  - Remote sensing of radiation using aerial and ground robotic systems



National Security Engineering Research

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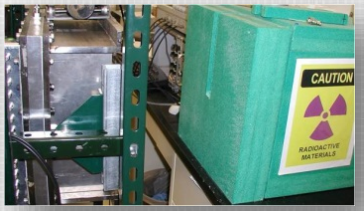
Associate Professor,
Department of Mechanical Engineering



Recent Publications

- A. Barzilov, A. Guckes, P. Guss, "Directional Detection of Neutrons and Photons using Elpasolites: Computational Study," *Radiation Measurements* 124, 127-131 (2019).
- W. Yim, Z. Cook, M. Kazemeini, A. Barzilov, "Low-Altitude Contour Mapping of Radiation Fields Using UAS Swarm," *Intelligent Service Robotics* 12, 219-230 (2019).
- M. Kazemeini, A. Barzilov, W. Yim, J. Lee, "Gamma Ray and Neutron Sensors for Remote Monitoring Using Aerial Robotic Platforms," *Sensors & Transducers* 229(1), 47-54 (2019).
- A. Barzilov, A. Guckes, "Time Encoded Imaging of Neutrons and Photons Using CLYC Detector Equipped with a Dual Mode Collimator," *Sensors & Transducers* 229(1), 78-83 (2019).
- D. Blyth, J. Fry, N. Fomin, R. Alarcon, L. Alonzi, E. Askanazi, S. Baeßler, S. Balascuta, L. Barrón-Palos, A. Barzilov, J.D. Bowman,et al., "First Observation of P-odd Gamma Asymmetry in Polarized Neutron Capture on Hydrogen," *Physical Review Letters* 121, 242002 (2018).
- M. Kazemeini, Z. Cook, J. Lee, A. Barzilov, and W. Yim, "Plug-and-Play Radiation Sensor Components for Unmanned Aerial System Platform," *Journal of Radioanalytical & Nuclear Chemistry* 318, 1797 (2018).
- A. Pour Yazdanpanah, J. Hartman, E. Regentova, A. Barzilov, "Sparse-View Neutron-Photon Computed Tomography: Object Reconstruction and Material Discrimination," *Applied Radiation & Isotopes* **132**, 122-128 (2018).
- J. Fry, R. Alarcon, R. Allen, E. Askanazi, S. Balascuta, L. Barron-Palos, S. Baeßler, A. Barzilov, C. Blessinger, D. Blyth, J. D. Bowman, et al., "Status of the NPDGamma Experiment," *Hyperfine Interactions* 238, 11 (2017).
- M. Hodges, A. Barzilov, Y. Chen, D. Lowe, "Characterization of a 6 MeV Accelerator Driven Mixed Neutron/Photon Source," *Physics Procedia* 90, 164 (2017).
- M. Hodges, A. Barzilov, Y. Chen, D. Lowe, "Characterization of the Radiation Environment at the UNLV Accelerator Facility During Operation of the Varian M6 Linac," *Radiation Physics & Chemistry* 127, 72-77 (2016).

National Security Engineering Research

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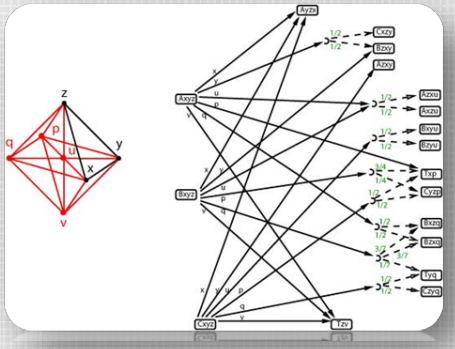
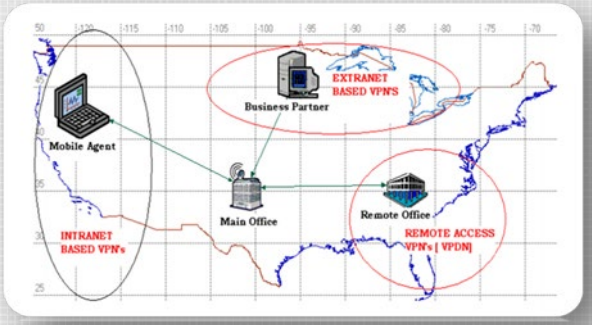
- Expertise
  - Sensor networks
  - Open source algorithm implementation
  - Survey articles on issues in security
  - Design of highly competitive online algorithms against different adversaries
  - Smart use of randomization
  - Approximations for hard combinatorial optimization problems



Design of a competitive randomized online algorithm using knowledge states.



Communication network design for the U.S.

National Security Engineering Research

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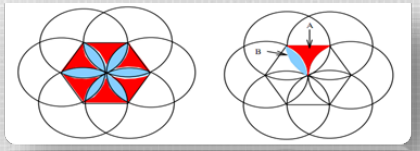
Co-Director, Center for Information Technology and Algorithms



Coverage models for sensor networks.

Recent Publications

- Bang L, Bein W, Larmore LL. R-LINE: A Better Randomized 2-Server Algorithm on the Line. *Theoretical Computer Science*, 609: 106-118, 2015.
- Chen J, Han X, Bein W, Ting H. Black And White Bin Packing Revisited, Proceedings of *the 9th Annual International Conference on Combinatorial Optimization and Applications* (COCOA 15), LNCS, Springer, 2015.
- Andro-Vasko J, Bein W, Ito H, Nyknahad D. Evaluation of Online Power-Down Algorithms, Proceedings of the *12th International Conference on Information Technology*, IEEE, 473-478, 2015.
- Bein D, Bein W, Madan B, Karki A. Optimizing Border Patrol Operations Using Unmanned Aerial Vehicles, Proceedings of the *12th International Conference on Information Technology*, IEEE, 479-484, 2015.
- Bein W, Advanced Techniques for Dynamic Programming. In Pardalos P, Du D, Graham R, Editors, *Handbook of Combinatorial Optimization*, 2nd Edition, Springer Verlag, 41 – 91, 2013.
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- Bein W, Hatta N, Hernandez-Cons N, Ito H, Kasahara S, and Kawahara J, An Online Algorithm Optimally Self-Tuning to Congestion for Power Management Problems, Proceedings of the *9th Workshop on Approximation and Online Algorithms* (WAOA 2011), LNCS, Springer, 7164, pp. 35-48, 2012.
- Bein W, Larmore LL, Noga J, Knowledge State Algorithms. *Algorithmica,* 60(3): 653 – 678, 2011.
- Bein W, Iwama K, Kawahara J, Larmore L, Oravec J. A Randomized Algorithm for Two Servers in Cross Polytope Spaces. *Theoretical Computer Science*. 412 (7): 563 –572, 2011.
- Bein D, Bein W, Venigella S. Cloud Storage and Online Bin Packing, *Proceedings of the 5th International Symposium on Intelligent Distributed Computing (IDC 2011),* Studies in Computational Intelligence, 63- 68, 2012.

National Security Engineering Research

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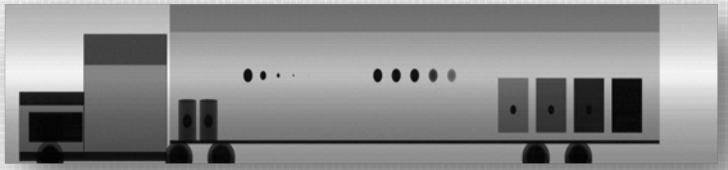
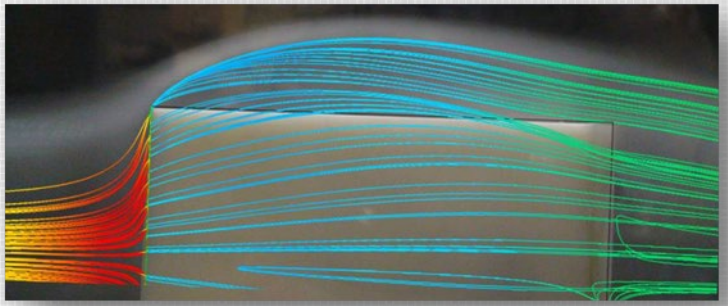


Above: MCNPX calculations provide a visual image of shipping container contents using a Varian x-ray accelerator.

- Expertise
  - Computational modeling of radiation transport and nuclear criticality problems
  - Experimental assessment of radiation detectors
  - Active neutron interrogation and detection of Special Nuclear Material
  - Dense Plasma Focus accelerator development for neutron production
  - Design of alpha detectors for airflow measurements
  - UAV flights and novel radiation detector development for UAVs
  - Geologic nuclear reactor modeling



Above: UNLV unmanned aerial vehicle (UAV) flights at the Nevada National Security Site (NNSS) to test heavy diesel fuel engines.
Left: Computational fluid dynamics visualization of truck body aerodynamic drag reduction technology.

National Security Engineering Research

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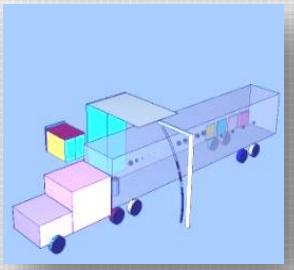
Department of Mechanical Engineering

Cargo scanning system to identify actinides in shipping containers.



Recent Publications

- Lawdensky, V., Culbreth, W. "Overview of computational analysis of nuclear thermal propulsion rocket (ntpr) fuel and prospective coating". Pages 125-128, Nuclear and Emerging Technologies for Space, NETS 2018; Las Vegas; Code 136640.
- Barzilov, A., Beller, D., and Culbreth, W. "Development of the graduate certificate program in nuclear security and safeguards at UNLV" Transactions of the American Nuclear Society, Volume 110, Pages 17-202014, NSFM (2014); Reno, NV; Code 106586.
- O'Brien, R, Culbreth, W. "Radiation therapy method using a short lived beta-decay source" Transactions of the American Nuclear Society, Volume 108, (2013), Pages 32-34, Atlanta, GA; Code 105779.
- Culbreth, W., Lowe, D., O'Brien, R. "Real-time alpha detection for the monitoring of actinides in an airflow" Transactions of the American Nuclear Society Volume 105 (2011), Pages 347-348 Washington, DC; Code 96603.
- Culbreth, W., Wilcox, T. "Energy and position of a large explosion in an urban environment" (2011) *Transactions of the American Nuclear Society*, 105, pp. 137-138.
- Wilcox, T., Culbreth, W. "Modeling of transient reactor behavior within a geologic repository" Transactions of the American Nuclear Society, Volume 101 (2009), Pages 422-424; Washington, DC; Code 96306.
- Wilcox, T., Culbreth, W. "Disposition of plutonium and uranium wastes in rock fractures." *Transactions of the American Nuclear Society*, Volume 101 (2009), Washington, DC; Pages 265-266; Code 96306.
- Viggato, J.C., Culbreth, W.G. "Thermohydraulic and nuclear modeling of natural fission reactors" (2007) *ACS Symposium Series*, 945, pp. 131-141.

National Security Engineering Research

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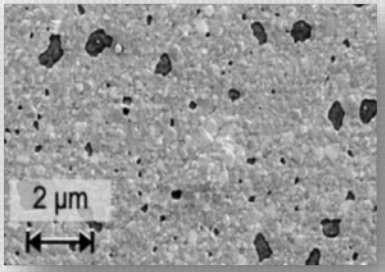
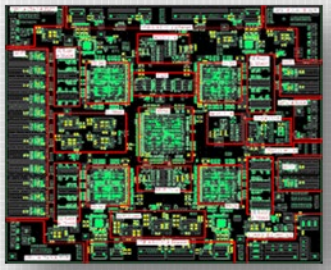
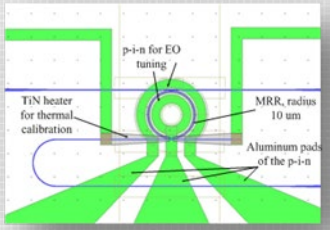
- Expertise
  - Sensors and instrumentation
  - Signal processing, instrumentation, and medical informatics
  - Semiconductor/microelectronics/integrated circuits
  - Wireless communications and security
  - Computer/microprocessor architectures
  - Renewable energy



Yttria Stabilized Zirconia (YSZs) O_2 sensor for monitoring nuclear reactor coolant



22-layer PCB board (NoC emulator)



An MRR with E/O tuning circuit

National Security Engineering Research

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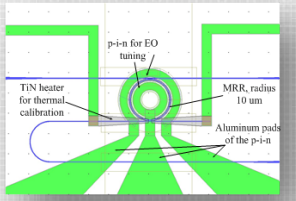

Recent Publications

- X. Ma, Z. Fu, Yingtao Jiang, M. Yang, Haroon Stephen, "Cyberinfrastructure as a Service to Empower Multidisciplinary, Data-Driven Scientific Research," *International Journal of Computer Science and Information Technologies*, vol. 9, no. 3, June 2017.
- L. Wang, H. Li, and Yingtao Jiang, "AO-Aloha: A MAC protocol for UAV-WSN systems," *Journal of Distributed Sensor Networks*, vol. 12, no. 8, pp. 1-11, Dec. 2016.
- L. Yi, W. Jiao, K. Wu, L. Qian, X. Yu, Q. Xia, K. Mao, S. Yuan, S. Wang, and Yingtao Jiang, "Nanoparticle monolayer-based flexible strain gauge with ultrafast dynamic response for acoustic vibration detection," *Nano Research*, vol. 8, no. 9, pp. 2978-2987, Sept. 2015.
- S. Zhai, Yingtao Jiang, H. Zhao, and B. Das, "Direct Writing of Metallic Nanoparticle Concentric Multi-Ring Structures by Template-directed Convective Self-assembly Processes," *Advanced Optical Materials*, vol. 2, no 7, pp. 632-635, July 2014.
- X. Tan, M. Yang, L. Zhang, X. Wang, and Yingtao Jiang, "A Hybrid Optoelectronic Networks-on-Chip Architecture," *IEEE/OSA Journal of Lightwave Technology*, vol. 32, no. 5, pp. 991-998, March 2014.
- X. Wang, T. Mak, M. Yang, and Yingtao Jiang, "Efficient Multicasting Schemes for 3-D Networks-on-Chip," *Journal of System Architectures*, vol. 59, no. 9, pp. 693-708, Oct. 2013.
- T. Moazzeni, A. Amei, J. Ma, and Yingtao Jiang, "On a New Approach to SNR Estimation of BPSK Signals," *International Journal of Electronics and Communications*, vol. 58, no. 3, pp. 273-278, Sept. 2012.
- T. Moazzeni, J. Ma, Yingtao Jiang, and N. Li, "Flow Rate Measurement in a High Temperature, Radioactive, and Corrosive Environment," *IEEE Transactions on Instrumentation and Measurement* vol. 60, no. 6, pp. 2062-2069, June 2011.
- L. Wang, C. Ding, J. Zhang, and Yingtao Jiang, "A High Performance, Low Area Reconfiguration Controller for Network-on-Chip-based Partial Dynamically Reconfigurable SoC Designs," *International Journal of Electronics*, vol. 97, no. 10, pp. 1207-1225, Oct. 2010.
- Y. Jin, L. Wang, J. Jo, Y. Kim, M. Yang and Yingtao Jiang, "EECCR: an Energy Efficient m-Coverage and n-Connectivity Routing Algorithm under Border Effects in Heterogeneous Sensor Networks," *IEEE Transactions on Vehicular Technology*, vol. 58, no. 3, pp. 1429-1442, March 2009.

National Security Engineering Research

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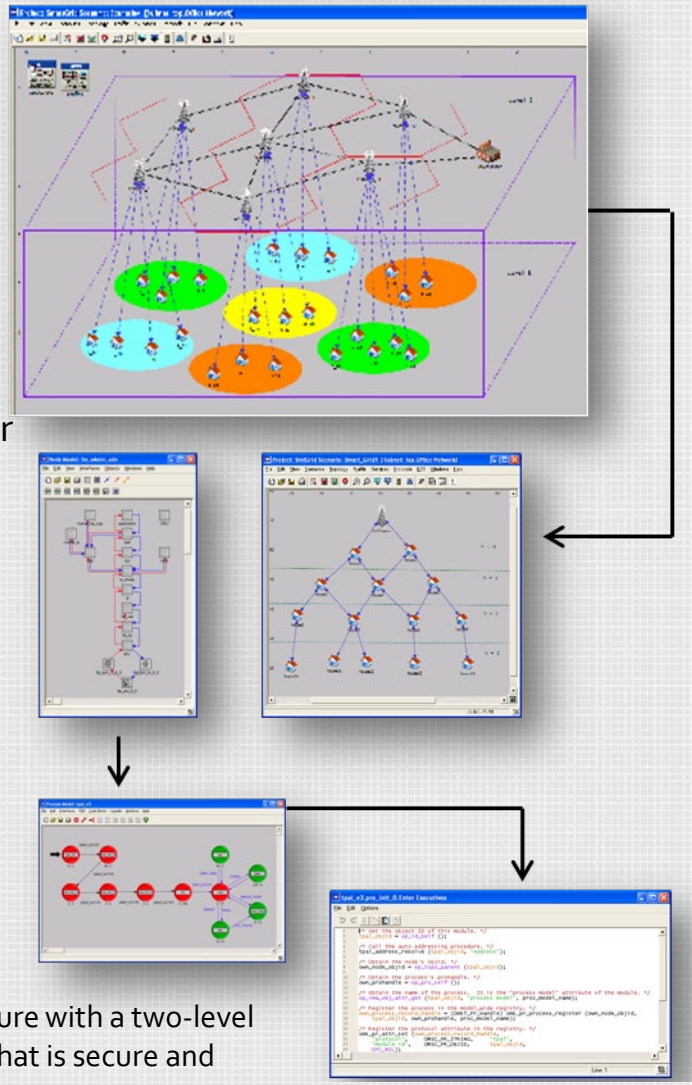
- Expertise
  - Secure and reliable communication protocol for unmanned aerial vehicles (UAVs)
  - Critical infrastructure / smart grid security
  - Man-in-the-middle (MITM) attack with a tempered SSL certificate detection
  - Thwarting distributed denial of service (DDoS) attacks
  - Digital search warrant
  - Transportation security imaging and secure communication software development



A communication architecture with a two-level wireless mesh network that is secure and scalable.

National Security Engineering Research

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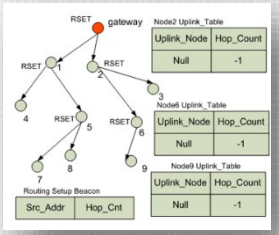
Routing Table Population Process



Recent Publications

- Kim Y., Jo J. "Binary Blockchain: Solving the Mining Congestion Problem by Dynamically Adjusting the Mining Capacity". In: Lee R. (eds) *Applied Computing & Information Technology*. ACIT 2017. *Studies in Computational Intelligence*, vol. 727. Springer, Cham, 2018.
- Yoohwan Kim, Ju-Yeon Jo, Sungchul Lee, "ADS-B Vulnerabilities and a Security Solution with a Timestamp," *IEEE Aerospace and Electronic Systems Magazine*, Volume: 32, Issue: 11, DOI: 10.1109/MAES.2018.160234, Page(s): 52 - 61, November 2017.
- Sungchul Lee, Ju-Yeon Jo, and Yoohwan Kim, "Authentication System for Stateless RESTful Web Service", *Journal of Computational Methods in Science and Engineering* (JCMSE), vol. 17, no. S1, pp. S21-S34, 2017.
- Candace Suh-Lee, Ju-yeon Jo, and Yoohwan Kim, "Text Mining for Security Threat Detection Discovering Hidden Information in Unstructured Log Messages", *IEEE Conference on Communications and Network Security* (CNS), Oct. 2016.
- Yoohwan Kim, Ju-yeon Jo, and Sungchul Lee, "A Secure Location Verification Method for ADS-B", IEEE/AIAA 35th *Digital Avionics Systems Conference* (DASC), Sep. 2016.
- Sungchul Lee, Ju-yeon Jo, and Yoohwan Kim, "Secure and Stateless RESTful Web Service Using ID-Based Encryption", 28th *International Conference on Computer Applications in Industry and Engineering*, October 2015.
- Sungchul Lee, Ju-Yeon Jo, and Yoohwan Kim, "Method for secure RESTful web service", IEEE/ACIS 14th *International Conference on Computer and Information Science* (ICIS), June 2015.
- Yoohwan Kim, Ju-yeon Jo and Monetta Shaw, "A Lightweight Communication Architecture for Small UAS Traffic Management (sUTM)", *ICNS*, April 2015.
- Ju-yeon Jo and Yoohwan Kim, US Patent App. 14/591,208, 2015, "Obscuring Usernames During a Login Process", filed in 2014.
- Ju-yeon Jo, Yoohwan Kim, and Sungchul Lee, "Mindmetrics: Identifying users without their login IDs", *IEEE International Conference on Systems, Man and Cybernetics* (SMC), Oct. 2014.

National Security Engineering Research

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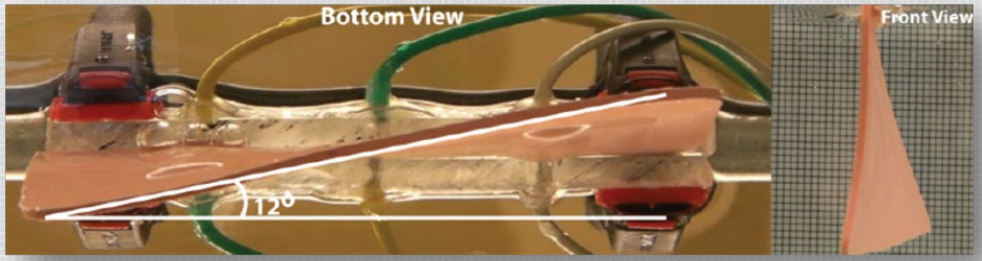
Youtube: http://www.youtube.com/user/kwangkimlab
Publications: http://scholar.google.com/citations?user=VX3wtWEAAAAJ&hl=en

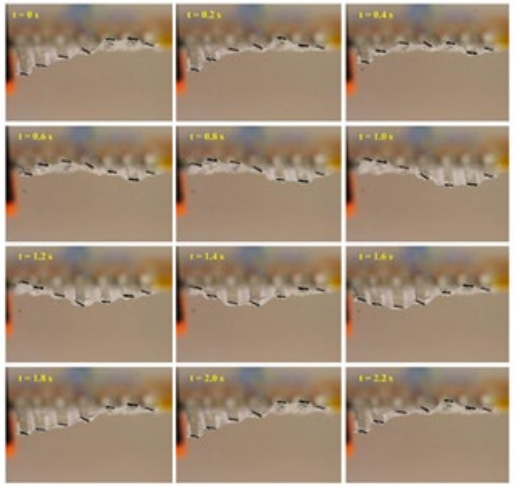
- Expertise
  - Electroactive polymers for underwater applications
  - Electroactive polymers for aerospace applications
  - Electroactive polymers for ground applications



A bio-inspired fin using electroactive polymers, designed for underwater applications.
Source: *Smart Mater. Struct.* 22 (2013) 014003.

National Security Engineering Research

Dr. Kwang J. Kim
Distinguished Professor, ASME Fellow, NAI Fellow,
Department of Mechanical Engineering
Director of Active Materials and Smart Living Laboratory



Recent publications

- T. Stalbaum, T. Hwang, S. Trabia, Q. Shen, R. Hunt, Z. Olsen, and K. J. Kim, "Bioinspired Travelling Wave Generation in Soft-Robotics using Ionic Polymer-Metal Composites," *Intelligent Journal of Intelligent Robotics and Applications* (DOI 10.1007/s41315-017-0015-9, 2017)
- K. J. Kim, V. Palmre, T. Stalbaum, T. Hwang, Q. Shen, and S. Trabia, "Promising Developments in Marine Applications with Artificial Muscles: Electrodeless Artificial-cilia Microfibers, *Marine Technology Society (MTS) Journal* (accepted for publication)
- Q. Shen, S. Trabia, T.Stalbaum, V. Palmre, K. Kim, and I.-K. Oh, "A Multiple-Shape Memory Polymer-Metal Composite Actuator Capable of Programmable Control, Creating Complex 3D Motion of Bending, Twisting, and Oscillation," *Scientific Reports*, Vol. 6, 24462 (2016; DOI: 10.1038/srep24462)
- M Kotal, J. Kim, K. J. Kim, and I.-K. Oh, "Sulfur and Nitrogen Co-Doped Graphene Electrodes for High-Performance Ionic Artificial Muscles", *Advanced Materials*, Vol. 28(8), pp. 1610-1615 (2016; DOI: 10.1002/adma.201505243)

National Security Engineering Research

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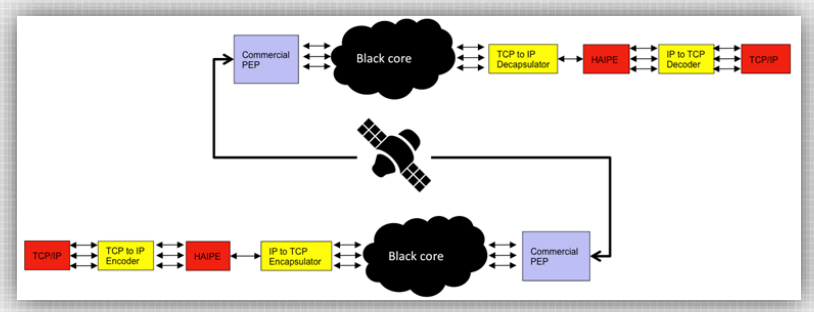
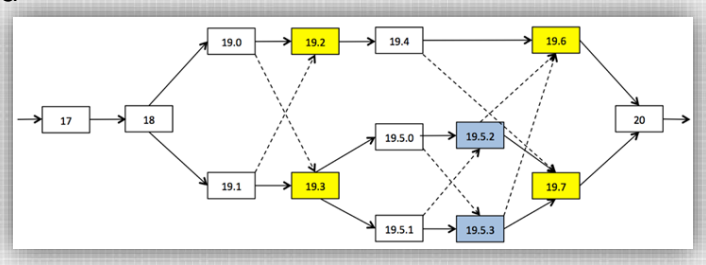
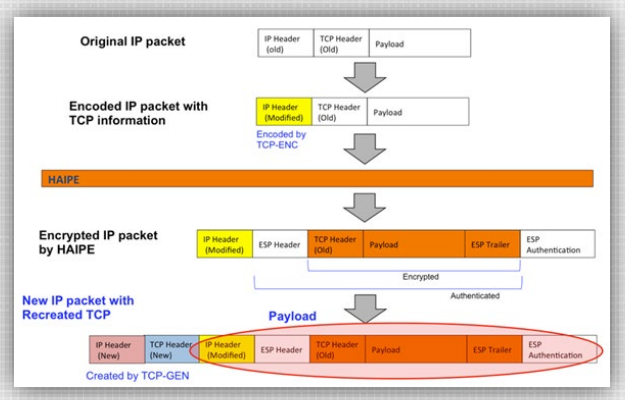


- Expertise
  - Secure protocol development for software and network applications
  - Critical infrastructure / smart grid / SCADA security and privacy
  - Wireless mesh network routing and security
  - Distributed denial of service (DDoS) attack prevention
  - Secure and reliable communication scheme for unmanned aerial vehicles (UAVs)
  - Cybersecurity data analytics
  - Security for cryptocurrency and blockchain

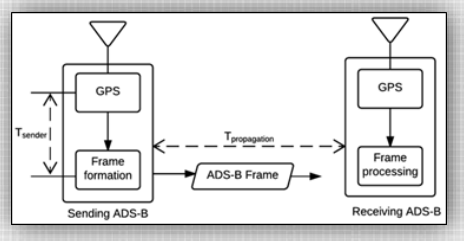




National Security Engineering Research

Dr. Yoohwan Kim, CISSP, CISA, CEH, CPT
Associate Professor,
Department of Computer Science

Recent Publications



- A. Hoffman, E. Becerril-Blas, K. Moreno and Y. Kim, "Decentralized Security Bounty Management on Blockchain and IPFS," 2020 IEEE 10th Annual Computing and Communication Workshop and Conference (CCWC)
- B. Dahal and Y. Kim, "AutoEncoded Domains with Mean Activation for DGA Botnet Detection," 2019 IEEE 12th International Conference on Global Security, Safety and Sustainability (ICGS3)
- R. Harkanson and Y. Kim, "Applications of elliptic curve cryptography: a light introduction to elliptic curves and a survey of their applications." In Proceedings of the 12th Annual Conference on Cyber and Information Security Research (CISRC '17).
- Yoohwan Kim, Ju-Yeon Jo, Sungchul Lee, "ADS-B Vulnerabilities and a Security Solution with a Timestamp," *IEEE Aerospace and Electronic Systems Magazine*, Volume: 32, Issue: 11, DOI: 10.1109/MAES.2018.160234, Page(s): 52 - 61, November 2017.
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- Candace Suh-Lee, Juyeon Jo, and Yoohwan Kim, "Text Mining for Security Threat Detection Discovering Hidden Information in Unstructured Log Messages", IEEE Conference on Communications and Network Security (CNS), Oct. 2016.
- Sachiko Sueki and Yoohwan Kim, "Vulnerabilities and Mitigation Methods in the NextGen Air Traffic Control System", 13th International Conference on Information Technology: New Generations (ITNG), April 2016.
- Haysam Selim, Shahab Tayeb, Yoohwan Kim, Justin Zhan, and Matin Pirouz, "Vulnerability Analysis of Iframe Attacks on Websites", The *3rd Multidisciplinary International Social Networks Conference on Social Informatics*, Aug. 2016.
- Sungchul Lee, Juyeon Jo, and Yoohwan Kim, "Secure and Stateless RESTful Web Service Using ID-Based Encryption", 28th International Conference on Computer Applications in Industry and Engineering, October 2015.
- Amritha Premnath, Juyeon Jo, and Yoohwan Kim, "Application of NTRU Cryptographic Algorithm for SCADA Security", 11th International Conference on Information Technology: New Generations (ITNG), April 2014.

National Security Engineering Research

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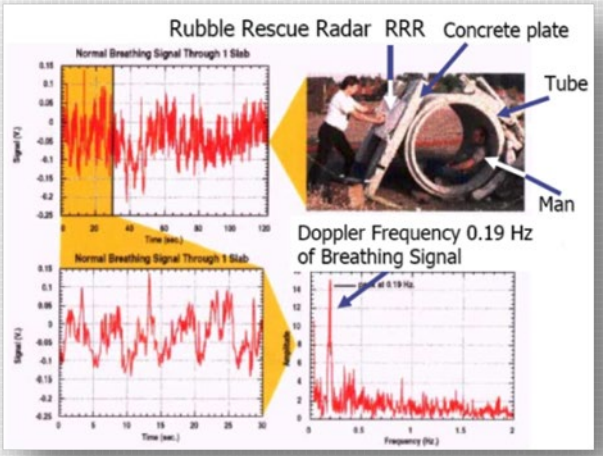
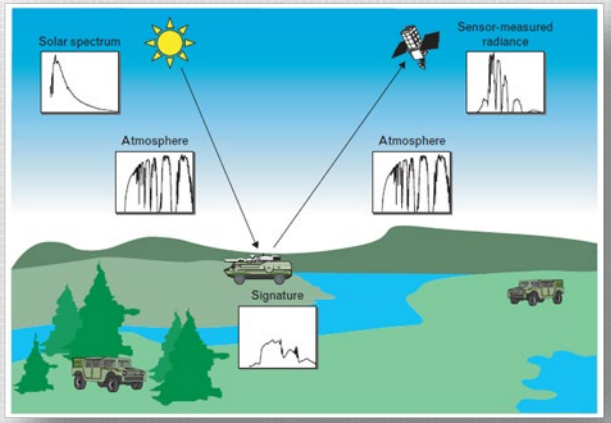
- Expertise
  - Search and rescue
  - Disaster relief
  - Homeland security
  - Nuclear non-proliferation
  - Biometrics





National Security Engineering Research

Dr. Shahram Latifi, P.E.

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Recent Publications

- Tayeb, S., Raste, N., Pirouz, M., Latifi, S. (2018). A Cognitive Framework to Secure Smart Cities. *MATEC Web of Conferences, 208* 1-6.
- S Tayeb, M Pirouz, G Esguerra, K Ghobadi, J Huang, R Hill, D Lawson, S Latifi, et al. Securing the positioning signals of autonomous vehicles (2017) *IEEE International Conference on Big Data* (Big Data), 4522-4528.
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- S Latifi, Information Technology-New Generations, *Springer International Publishing*, doi: 10.1007/978-3-319-32467-8 (2016).
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- Chato, L., Latifi, S. (2016). Improving the Classifier Performance in Detecting People Based on Denoising Wavelet Transform (pp. 56-61). *IEEE: 2016 6th International Conference on IT Convergence and Security* (ICITCS).
- Tayeb, S., Mirnabibaboli, M., Latifi, S. (2016). Load Balancing in WSNs using a Novel Markov Decision Process Based Routing Algorithm (1st ed., pp. 1-5). *IEEE: 2016 6th International Conference on IT Convergence and Security* (ICITCS).
- E. Sharifahmadian, Y. Choi, and S. Latifi, A Simulation Study of Detection of Weapon of Mass Destruction based on Radar. *SPIE Conference on Chemical, Biological, Radiological, Nuclear, and Explosives* (CBRNE) Sensing XIV, Vol. 8710, USA (2013), pp. 87100Y1—87100Y12.

National Security Engineering Research

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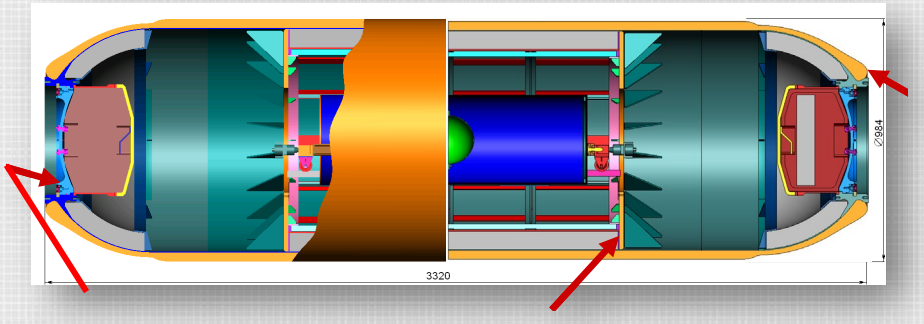
- Expertise
  - Structural analysis, failure analysis, experimental mechanics
  - Structural dynamics, explosives, and impact analysis
  - Computational simulation of highly dynamic events
  - Material characterization, custom component testing



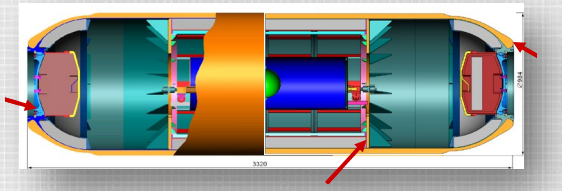
High Strength Steel for Endcaps

Internal Baffling to Distribute Blast Wave

Light Composite for Containment Strength

National Security Engineering Research

Dr. Brendan O'Toole
Chair and Professor,
Department of Mechanical Engineering



Recent Publications

- D. Somasundaram, P. Shojaeishahmirzadi, M. Trabia, B. O'Toole, "Shock Propagation Through a Bolted Joint Structure under Impact Loading", 26th International Congress on Sound & Vibration, Montreal, CA, July 7-11 (2019).
- X. Zhang, B. Mao, R. Histed, M. Trabia, B. O'Toole, P. Shojaeishahmirzadi, R. Jennings, Y. Liao, "Selective Laser Melting of Ti/SiC Nanocomposite Coating towards Enhanced Surface Performance of Ti64", Proc. Mat. Science and Tech., Portland OR, 2019.
- S. Nelson, B. O'Toole, "Computational Analysis of Blast Loaded Composite Cylinders", *International Journal of Impact Engineering*, Volume 119, pp 26-39 (2018).
- M Pena, J McDonald, S Satapathy, B O'Toole, M Trabia. Surface Waves Generated by Projectile Impact on a Glass Surface, *Nevada Test Site/National Security Technologies, LLC* (United States) (2017).
- J Limido, M Trabia, S Roy, B O'Toole, R Jennings, WL Mindle, M Pena, et al. Modeling of Hypervelocity Impact Experiments Using Gamma-SPH Technique. *ASME 2017 Pressure Vessels and Piping Conference*, V004T04A021-V004T04A021 (2017).
- Melissa Matthes, Brendan O'Toole, Mohamed Trabia, et al., "Comparison of Failure Mechanisms Due to Shock Propagation in Forged, Layered, and Additive Manufactured Titanium Alloy," *Dynamic Behavior of Materials*, Volume 1, Springer Verlag (2017), pp. 131-138.
- S. Roy, M. B. Trabia, B. O'Toole, R. Hixson, S. Becker, M. Pena, R. Jennings, D. Somasundaram, M. Matthes, E. Daykinand E. Machorro, "Study of Hypervelocity Projectile Impact on Thick Metal Plates", *Shock and Vibration*, vol. 2016, Article ID 4313480, 11 pages (2016).
- D. Somasundaram, S. Roy, M. Trabia, B. O'Toole, & R. Hixson, "Parametric Sensitivity Comparison of Simulation Models for Flyer Plate Impact Experiments", *International Journal of Computational Methods and Experimental Measurement*, Vol. 3, Issue 4, pp 305-315 (2015).
- J. Thota, M. Trabia, B. O'Toole, "Computational Prediction of Low Impact Shock Propagation in a Lab-Scale Space Bolted Frame Structure", *Int. J. Computational Methods and Experimental Measurements*, v3 n2, pp 139 –149 (2015).
- B. O'Toole, M. Trabia, R. Hixson, S. Roy, M. Pena, S. Becker, E. Daykin, E. Machorro, R. Jennings, M. Matthes, "Modeling Plastic Deformation of Steel Plates in Hypervelocity Impact Experiments", *Procedia Engineering* 103 (2015) pp458 -465.

National Security Engineering Research

Dr. Emma Regentova
Professor, Department of Electrical and Computer Engineering
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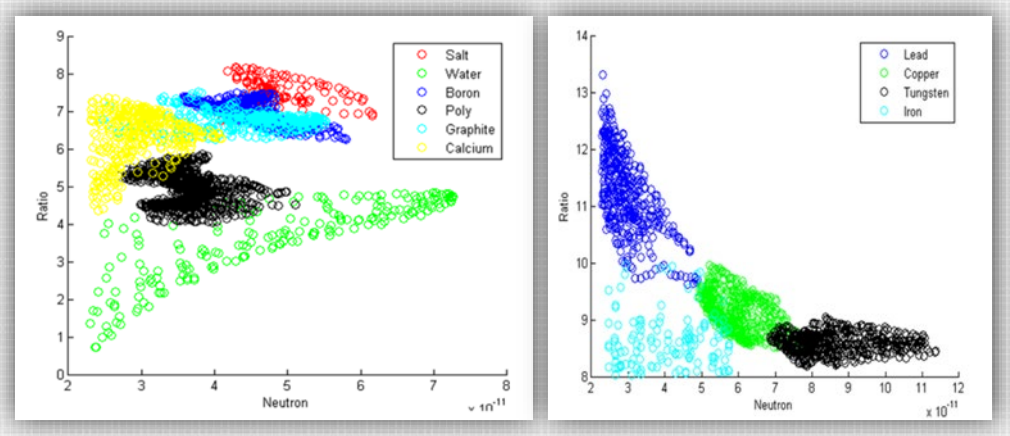
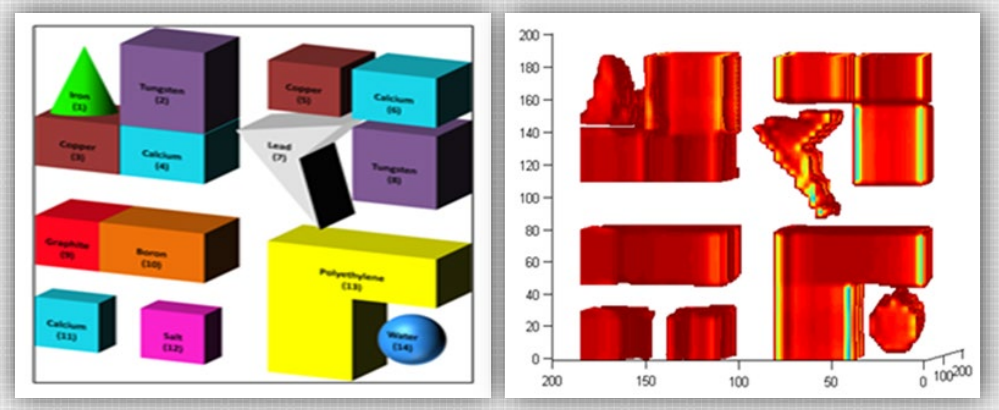
Expertise

- Object reconstruction and material discrimination in sparse-view photon-neutron computed tomography
- Pulsed-ray radioscopy to detect nuclear materials
- Radioscopic cargo screening using mega-voltage energy barriers



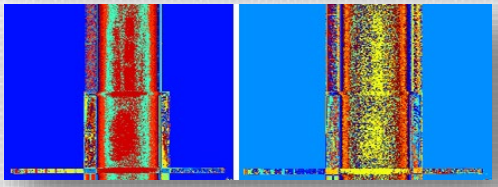
Material discrimination by 2D signatures: Ratio of Photon/Neutron transmission vs. Neutron transmission for various materials.



Left: Container under interrogation.
Right: CT reconstruction from the neutron source: 18 views.

National Security Engineering Research

Dr. Emma Regentova
Professor, Department of Electrical and Computer Engineering



Recent Publications

- Ali P., Yazdanpanah, J. Hartman, E. E. Regentova, A. Barzilov, Object Reconstruction and Material Discrimination in Sparse-View Photon-Neutron Computed Tomography, submitted to *IEEE Transactions on Nuclear Science (TNS),* Nov. 2015.
- E. E. Regentova, L. Zhang, V. K.Mandava, A.K. Mandava et al. , Advances and Challenges of Radioscopic Detection of Nuclear Materials in Cargo Containers with Two Megavoltage Energy Barriers, *American Nuclear Society, Radiation Protection and Shielding Division, 2010 Topical Meeting*, Las Vegas, April 18-23, 2010.
- Lei Zhang, Ajay K. Mandava, Emma E. Regentova, Zane Wilson, Gongyin Chen, Radioscopic inspection of cargo containers with megavoltage energy barriers, *IEEE International Conference on Systems, Man and Cybernetics*, 2009. SMC 2009, 11-14 Oct. 2009, Page(s):3510 – 3515.
- L. Zhang, E. E. Regentova, A. Mandava, V. Mandava, S. Curtis, Radioscopic Cargo Screening for Detecting Nuclear Materials with Megavoltage Dual Energy Barriers, *HPS 2009 Midyear Proceedings, Recent Advances in Planning and Response to Radiation Emergencies*, San Antonio, January 31st, 2009, pp.31-39.

National Security Engineering Research

Dr. Robert Schill
Professor, Department of Electrical and Computer Engineering
Director, Center for the Energy Materials Interaction Technology Initiative (EMITION)
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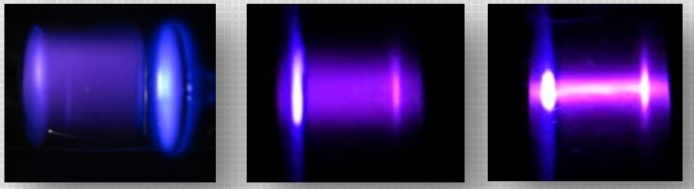
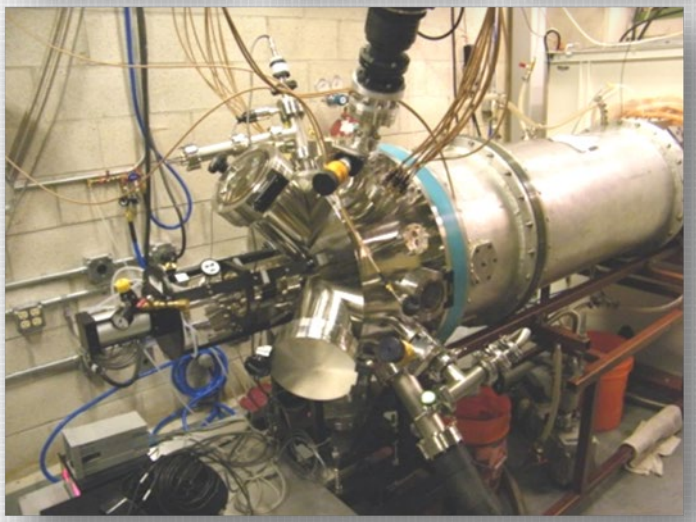
Email: robert.schill@unlv.edu

- Expertise
  - Electromagnetics
  - Pulsed power and plasma physics
  - Microwaves and optics
  - Materials science
  - Dense and dynamic plasmas





The Nevada Shocker is a pulse-power device used to study material in a harsh electromagnetic environment.

National Security Engineering Research

Dr. Robert Schill
Professor, Department of Electrical and Computer Engineering
Director, Center for the Energy Materials Interaction Technology Initiative (EMITION)

Recent Publications

- Sean Andersen and Robert A. Schill, Jr., "Nonlinear Theory Modeling Electron Beam Constriction in a Pulsed Power Discharge," *IEEE Transactions on Plasma Science* vol.43, no. 6, June 2015, pp.2011-2020.
- A. Al Agry, R.A. Schill, Jr., "Calibration of Electromagnetic Dot Sensor - Part 1: B-Dot Mode," *IEEE Sensors Journal*, Vol. 14, no. 9, September 2014, pp. 3101-3110.
- A. Al Agry, R.A. Schill, Jr., "Calibration of Electromagnetic Dot Sensor - Part 2: D-Dot Mode," *IEEE Sensors Journal*, Vol. 14, no. 9, September 2014, pp. 3111-3118.
- Shaoru Garner, Robert A. Schill, Jr., and Gopi Krishna Ari, Electron Stimulated Secondary Electron Emission from a Warm Metal Surface, *2009 International Conference of Plasma Science*, San Diego, California, May 31 - June 5, 2009.
- A. Al Agry, R.A. Schill, Jr., S. Garner, S. Andersen, and K. Buchanan, Electromagnetic Dot Sensor – Calibration, 2009 17th *IEEE Int. Pulsed Power Conf.* (PPC 2009), Washington DC, June 28- July 2, 2009, pp. 1348-1353.

Patents

- Diminishing Detonator Effectiveness Through Electromagnetic Effects - US Patent Number: US 9,448,042 B2 (September 20, 2016)
- High Current, High Energy Beam Focusing Element – US Patent Number: US 9,105,434 B2 (August 11, 2015)
- Patented UNLV EM-Dot – US Patent Number: 7,482,814 (1/27/2009) and subject to International Patent Application No.: PCT/US2006/033453 based on U.S. Patent Application No.: 11/213,628.

National Security Engineering Research

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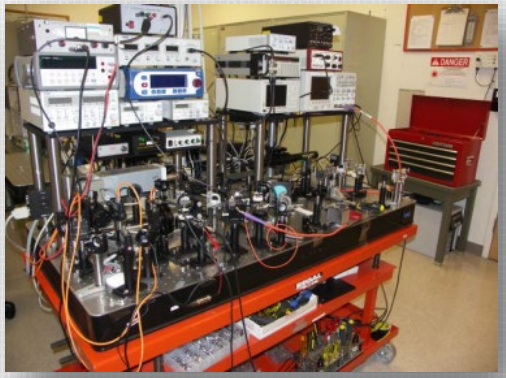
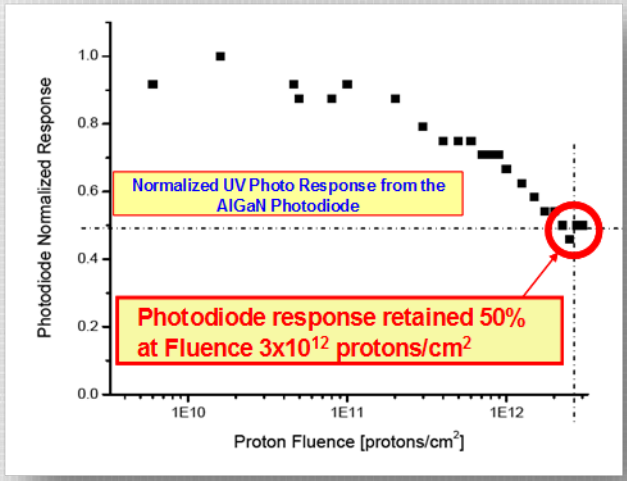
- Expertise
  - GaN semiconductors and devices
  - Radiation-hard electronics, optoelectronics, and imaging systems
  - Optics and diffractive optics
  - Ultrafast lasers and electronics
  - Image analysis
  - High Energy Density Physics (HEDP) diagnostics
  - CubeSats and formation flight
  - Science payload instruments





National Security Engineering Research

Dr. Ke-Xun (Kevin) Sun

Professor,

Department of Electrical and Computer Engineering

Recent Publications

- Sun KX, Valles M, Valencia H, Nelson RO, "Gallium nitride (GaN) devices as a platform technology for radiation hard inertial confinement fusion diagnostics." *Rev Sci Instrum*. 2018 Oct; 89(10):10K113. doi: 10.1063/1.5039407.
- K. Sun, "High-Sensitivity Fiber Optic Magnetic Field Sensor with Balanced Single Fiber Interferometric Readout," in *Advanced Photonics 2018 (BGPP, IPR, NP, NOMA, Sensors, Networks, SPPCom, SOF)*, OSA Technical Digest (online) (Optical Society of America, 2018), paper SeTh1E.1.
- Ke-Xun Sun , "Radiation Hard GaN Devices: LANSCE High Fluence Neutron Tests and NIF High Yield Shot Tests", 2016 *National Space & Missile Materials Symposium (NSMMS) & the Commercial and Government Responsive Access to Space Technology Exchange (*CRASTE).
- Ke-Xun Sun, "Applications of Robust, Radiation Hard AlGaN Optoelectronic Devices in Space Exploration and High Energy Density Physics," Invited paper at *CLEO* 2011, May 2011, Baltimore.
- Ke-Xun Sun, Lawrence MacNeil, Karthik Balakrishnan, Erik Hultgren, John Goebel, Yuri Bilenko, Jinwei Yang, Wenhong Sun, Max Shatalov, Xuhong Hu, Remis Gaska. "Extreme Radiation Hardness and Space Qualification of AlGaN Optoelectronic Devices". *Late Breaking News, International Workshop on Nitride Semiconductors*, Tampa, FL, October 2010.
- Ke-Xun Sun, N. Leindecker, S. Higuchi, et al, "UV LED Operation Lifetime and Radiation Hardness Qualification for Space Flights," *Journal of Physics CS*, vol. 154, no. 1 (2009).
- Ke-Xun Sun, W. Nishimura, T. Perry and S. Compton, "A second generation of X-ray Streak Camera with True Large Formats, High Dynamic Range, and High Resolution", *Invited Paper, Proceedings of SPIE Vol. 5920 Ultrafast X-Ray Detectors, High-Speed Imaging, and Applications,* 592008-1-592008-16 (2005).

Patents

- Ke-Xun Sun et. Al., "Grating Angle Magnification Enhanced Angular and Scanners," US Patent 7,599,074 B2.

National Security Engineering Research

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Associate Professor,
Department of Civil and Environmental Engineering and Construction

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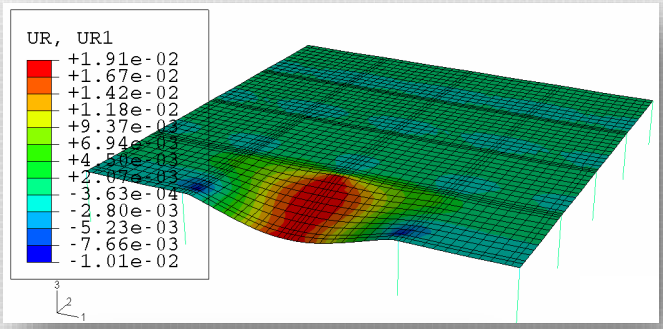
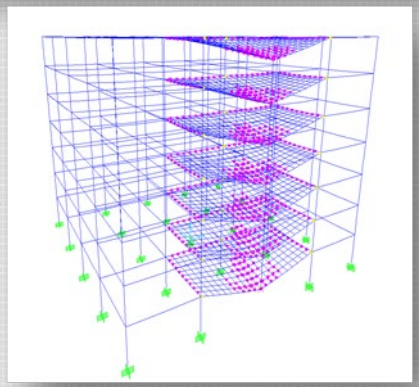
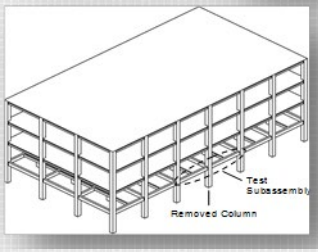


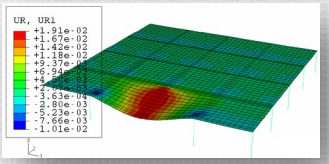
- Expertise
  - Progressive collapse resistance of structures
  - Large-scale testing of structural components and systems
  - Simulation of structures subjected to normal and extreme loading events
  - Earthquake engineering





National Security Engineering Research

Dr. Ying Tian, P.E.
Associate Professor,
Department of Civil and Environmental Engineering and Construction



Recent Publications

- Jawdhari, A., Orton, S., Al-Zuheriy, A., and Tian, Y. (2019). "Response of Flat-Plate Slab-Column Connections under Dynamic Loads during Collapse," *ACI Structural Journal*, accepted.
- Wang, L., Tian, Y., Luo, W., Li, G., Zhang, W., Liu, S., and Zhang, C. (2019). "Experimental Study of Seismic Performance of Axially Restrained Reinforced Concrete Frame Beams," *Journal of Structural Engineering*, ASCE, 145(5), 04019019.
- Zhang, C. and Tian, Y. (2019). "Simplified Performance-Based Optimal Seismic Design of Reinforced Concrete Frame Buildings," *Engineering Structures*, 185, 15-25.
- Li, X., Zhou, X., Tian, Y., and Li, M. (2019). "A Modified Cyclic Constitutive Model for Engineered Cementitious Composites," *Engineering Structures*, 179, 398-411.
- Peng, Z., Orton, S. L., Liu, J., and Tian, Y. (2018). "Experimental Study of Dynamic Progressive Collapse in Flat-Plate Buildings Subjected to an Interior Column Removal", *Journal of Structural Engineering*, accepted for publication.
- Xue, H., Gilbert, B. P., Guan, H., Lu, X., Li, Y., and Tian, Y. (2018). "Load Transfer and Collapse Resistance of RC Flat Plates under Interior Column Removal Scenario," *Journal of Structural Engineering*, accepted for publication.
- Wu, L., Tian, Y., Su. Y., and Chen, H. (2018). "Seismic Performance of Precast Composite Shear Walls Reinforced by Concrete-Filled Steel Tubes," *Engineering Structures*, 162, 72-83.
- Peng, Z., Orton, S. L., Liu, J., and Tian, Y. (2017). "Experimental Study of Dynamic Progressive Collapse in Flat-Plate Buildings Subjected to an Exterior Column Removal, *Journal of Structural Engineering*.
- Peng, Z., Orton, S. L., Liu, J., and Tian, Y. (2017). "Effects of In-plane Restraint on Progression of Collapse in Flat-Plate Structures," *Journal of Performance of Constructed Facilities*, 31(3), 04016112.
- Peng, Z., Orton, S. L., and Tian, Y. (2016). "Post-Punching Capacity of Flat-Plate Floor Systems," *ACI Special Publication*.

National Security Engineering Research

Dr. Mohamed Trabia
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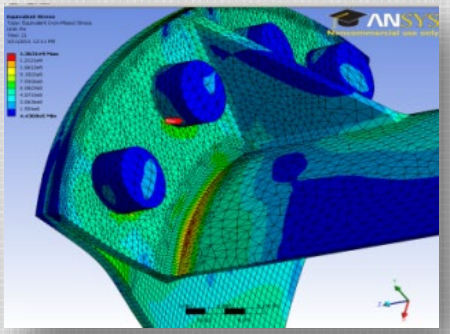
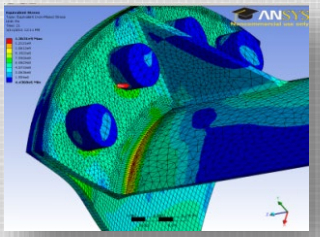
- Expertise
  - Structural analysis, failure analysis, experimental mechanics
  - Structural dynamics, explosives, and impact analysis
  - Computational simulation of highly dynamic events
  - Material characterization, custom component testing



Light composite for containment strength

National Security Engineering Research

Dr. Mohamed Trabia
Professor, ASME Fellow, Department of Mechanical Engineering
Associate Dean for Research, Graduate Studies, and Computing



Recent Publications

- Pouya Shojaeishahmirzadi, Mohamed Trabia, Brendan O'Toole, "Effect of Bolted Joints on Shock Propagation across Structures under Medium Impact Loading" ASME IMECE, Salt Lake City, Utah, November 2019.
- Xing Zhang, Bo Mao, Rebecca Histed, Mohamed Trabia, Brendan O'Toole, Richard Jennings, Pouya Shojaei, Yiliang Liao "Selective Laser Melting of Ti/SiC Nanocomposite Coating towards Enhanced Surface Performance of Ti64," Materials Science & Technology 2019 (MS&T19), Portland, Oregon, September 2019.
- M Pena, J McDonald, S Satapathy, B O'Toole, M Trabia. "Surface Waves Generated by Projectile Impact on a Glass Surface," Nevada Test Site/National Security Technologies, LLC (United States) (2017).
- J Limido, M Trabia, S Roy, B O'Toole, R Jennings, WL Mindle, M Pena, et al. "Modeling of Hypervelocity Impact Experiments Using Gamma-SPH Technique." ASME 2017 Pressure Vessels and Piping Conference, V004T04A021-V004T04A021 (2017).
- Melissa Matthes, Brendan O'Toole, Mohamed Trabia, et al., "Comparison of Failure Mechanisms Due to Shock Propagation in Forged, Layered, and Additive Manufactured Titanium Alloy," Dynamic Behavior of Materials, Volume 1, Springer Verlag (2017), pp. 131-138.
- S. Roy, M. Trabia, B. O'Toole, R. Hixson, S. Becker, M. Pena, R. Jennings, D. Somasundaram, M. Matthes, E. Daykin, and E. Machorro, "Study of Hypervelocity Projectile Impact on Thick Metal Plates," Shock and Vibration, Volume 2016 (2016), Article ID 4313480.
- D. Somasundaram, M. Trabia, and B. O'Toole, "Parametric Sensitivity Comparison of Simulation Models for Flyer Plate Impact Experiments," International Journal of Computational Methods and Experimental Measurements, Vol. 3, Issue 4, pp. 305 - 315 (2015).
- B. O'Toole, M. Trabia, R. Hixson, S. Roy, M. Pena, S. Becker, E. Daykin, E. Machorro, R. Jennings, M. Matthes, "Modeling Plastic Deformation of Steel Plates in Hypervelocity Impact Experiments," Procedia Engineering 103 (2015), pp. 458-465.
- D. Somasundaram, M. Trabia, and B. O'Toole, "A Methodology for Predicting High Impact Shock Propagation within Bolted-Joint Structures," International Journal of Impact Engineering (2014).

National Security Engineering Research

Dr. Mei Yang
Professor, Department of Electrical and Computer Engineering
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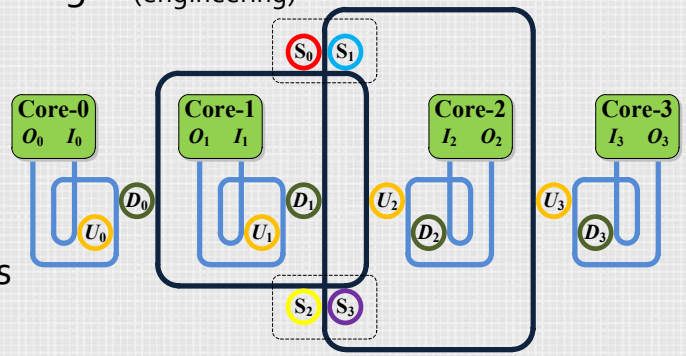
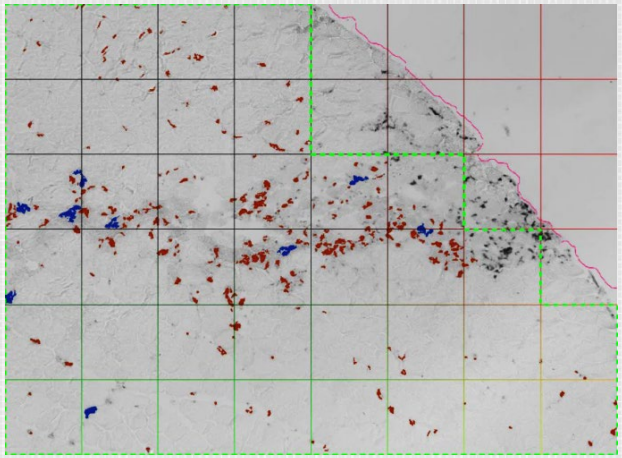
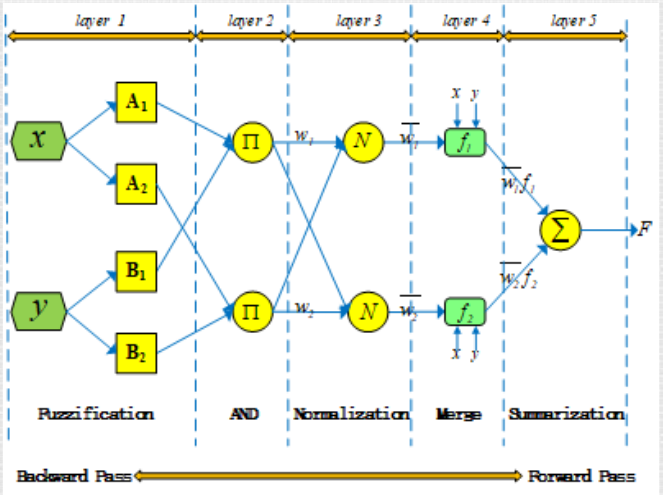
- Expertise:
  - Computer architecture, multi/many-core systems
  - Interconnection networks, photonic interconnects
  - Networks-on-chip
  - Wireless sensor networks
  - Biometrics, image analysis
  - Machine learning

Collaboration with Dr. Jiang (engineering)



Collaboration with Drs. Regentova (engineering) & Schneider (nursing)



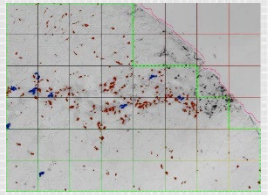


Collaboration with Drs. Batista & Jiang (engineering)

National Security Engineering Research

Dr. Mei Yang

Professor, Department of Electrical and Computer Engineering



Recent Publications

- L Zhang, X Wang, Y Jiang, M Yang, T Mak, AK Singh. "Effectiveness of HT-assisted sinkhole and blackhole denial of service attacks targeting mesh networks-on-chip." *Journal of Systems Architecture* 89, 84-94 (2018).
- Y. Jiang and Mei Yang, "Hardware design of parallel switch setting algorithm for Benes networks," *Journal of High Performance System Architecture*, vol. 7, no. 1, pp. 26-40, (2017).
- Y. Jiang, M. Yang, "Circuit design of Clos-based on-chip interconnection networks," *Microprocessors and Microsystems*, vol. 46-B, pp. 184-192, (2016).
- X. Wang, B. Zhao, T. Mak, M. Yang, Y. Jiang, and M. Daneshtalab, "An efficient runtime power allocation scheme for many-core system inspired from auction theory," vol. 50, *Integration, the VLSI Journal*, pp. 147-157, (2015).
- X. Tan, M. Yang, L. Zhang, X. Wang, and Y. Jiang, "A hybrid optoelectronic networks-on-chip architecture," *IEEE Journal of Lightwave Technology*, vol. 32, no. 5, pp. 991-998, (2014).
- L. Zhang, Y. Man, X. Tan, M. Yang, T. Hu, J. Yang, and Y. Jiang, "On reducing insertion loss in wavelength-routed optical network-on-chip architecture," *IEEE/OSA Journal of Optical Communications and Networking*, vol. 6, no. 10, pp. 879-889, (2014).
- T. Hu, H. Shao, L. Yang, C. Xu, M. Yang, H. Yu, X. Jiang, J. Yang, "Four-port silicon multi-wavelength optical router for photonic networks-on-chip," *IEEE Photonics Technology Letters*, vol. 25, no. 23, pp. 2281-2284, (2013).
- T. Hu, P. Yu, C. Qiu, H. Qiu, F. Wang, M. Yang, X. Jiang, H. Yu, and J. Yang, "Tunable fano resonances based on two-beam interference in microring resonator," *Applied Physics Letters*, vol. 102, no. 011112 (2013).