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.

Dr. Rama Venkat
Dean, College of Engineering
Phone: (702) 895-1094
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Dr. Mohamed Trabia
Associate Dean, College of Engineering
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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 modeling of radiation transport and nuclear criticality problems
- Nuclear systems design and analysis
- Nuclear applications of accelerators
- Radiation detectors
- Active neutron interrogation and detection of special nuclear material
- Nuclear non-proliferation
- Nano-material-enhanced radiation shielding
- Development of detection algorithms and adaptive signal processing
- High-speed, high-frequency microelectronics
- GaN semiconductors and devices
- Radiation-hard electronics, optoelectronics, and imaging systems
- Ultrafast lasers and electronics
- High Energy Density Physics (HEDP) diagnostics
- Synthesis and characterization of advanced nuclear fuels and materials
- Synthesis and properties of novel ceramic waste forms to immobilize radioactive high-level waste
- Crystal structure characterization by X-ray fine structure analysis and Rietveld structure refinement
- Determination of phase transitions by high-temperature X-ray diffraction
- High resolution electron microscopy using an analytical FE-TEM on irradiated and radioactive metals and ceramics
- Novel accelerator-based method to determine radiolytic product formation within the near-field of a generic geological repository

April 2018
National Security Engineering
Research Areas of Expertise

- Sensor technologies and instrumentation for safety monitoring and process control
- Transportation security imaging and secure communication software development
- Biometrics
- Image analysis
- Pulsed-ray radioscopy to detect nuclear materials
- Pulsed power and plasma physics
- Radioscopic cargo screening using mega-voltage energy
- Novel radiation detector development for UAVs
- Secure, reliable communication protocols for UAVs
- Design of highly competitive online algorithms against different adversaries
- Critical infrastructure / Smart Grid security
- Thwarting Distributed Denial of Service (DDoS) attacks
- Digital search warrants
- Secure protocol development for software and network applications
- Wireless mesh network routing and security
- Airport security inspection software design and DICOS standard development
- Insider threat detection
- 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
- Dense and dynamic plasmas
- Man-In-The-Middle (MITM) attack with tempered SSL certificate detection

April 2018
National Security Engineering Research

Why UNLV?

- Las Vegas is a dynamic 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.
  - UNLV is in the process of acquiring a linear accelerator, K9, used for various applications, including cargo imaging for Homeland Security and U.S. Customs; we are also involved in radio-pharmaceutical production and medium-to-high dose rate research.
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. Thomas Hartmann  
  Associate Professor, Department of Mechanical Engineering
- Dr. Yingtao Jiang  
  Chair/Professor, Department of Electrical and Computer Engineering
- Dr. Ju-Yeon Jo  
  Associate Professor, Department of Computer Science
- Dr. Kwang J. Kim  
  NV Energy Professor of Energy and Matter, Department of Mechanical Engineering
- Dr. Yoohwan Kim, CISSP  
  Associate Professor, Department of Computer Science
- Dr. Shahram Latifi, P.E.  
  Professor, Department of Electrical and Computer Engineering  
  Co-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. Ryan Sherman, P.E.  
  Assistant Professor, Department of Civil and Environmental Engineering and Construction
- 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, 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

Dr. Alexander Barzilov
Associate Professor,
Department of Mechanical Engineering

Phone: (702) 895-4325
Email: Alexander.Barzilov@unlv.edu

- Expertise
  - Radiation detection and spectroscopy
  - Active neutron interrogation and non-destructive assay of materials
  - Prompt gamma neutron activation analysis
  - Gamma ray spectral analysis and radiation source identification
  - Computational modeling of radiation transport and nuclear systems design and analysis
  - Nuclear applications of accelerators
National Security Engineering Research

Dr. Alexander Barzilov
Associate Professor,
Department of Mechanical Engineering

Recent Publications

National Security Engineering Research

Dr. Wolfgang Bein
Professor, Department of Computer Science
Co-Director, Center for Information Technology and Algorithms (CITA)
Phone: (702) 895-1477
Email: Wolfgang.Bein@unlv.edu

- 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.

April 2018
Recent Publications

National Security Engineering Research

Dr. William Culbreth
Associate Professor,
Department of Mechanical Engineering
Phone: (702) 895-3426
Email: William.Culbreth@unlv.edu

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

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

Dr. William Culbreth
Associate Professor,
Department of Mechanical Engineering

Recent Publications


National Security Engineering Research

Dr. Thomas Hartmann
Associate Professor,
Department of Mechanical Engineering
Phone: (702) 895-1934
Email: Thomas.Hartmann@unlv.edu

• Expertise
  • Synthesis and characterization of advanced nuclear fuels and materials.
  • Synthesis and properties of novel ceramic waste forms to immobilize radioactive high-level waste.
  • Crystal structure characterization by X-ray fine structure analysis and Rietveld structure refinement.
  • Determination of phase transitions by high-temperature X-ray diffraction.
  • High resolution electron microscopy using an analytical FE-TEM on irradiated and radioactive metals and ceramics.
  • Novel accelerator-based method to determine radiolytic product formation within the near-field of a generic geological repository.

Top to bottom: Novel superconductors from high-level radioactive waste and high burn-up fuel; advanced $^{99}\text{Tc}$ waste forms; and key instrumentation, including high-resolution XRD, FE-TEM, PPMS
National Security Engineering Research

Dr. Thomas Hartmann
Associate Professor,
Department of Mechanical Engineering

Recent Publications

National Security Engineering Research

Dr. Yingtao Jiang
Chair and Professor,
Department of Electrical and Computer Engineering

Phone: (702) 895-2533
Email: Yingtao.Jiang@unlv.edu

- 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) O₂ sensor for monitoring nuclear reactor coolant

22-layer PCB board (NoC emulator)

An MRR with E/O tuning circuit
National Security Engineering Research

Dr. Yingtao Jiang
Chair and Professor,
Department of Electrical and Computer Engineering

Recent Publications

National Security Engineering Research

Dr. Ju-Yeon Jo
Associate Professor,
Department of Computer Science
Phone: (702) 895-5873
Email: Juyeon.Jo@unlv.edu

• 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.
Dr. Ju-Yeon Jo  
Associate Professor,  
Department of Computer Science  

Recent Publications  

- Yoohwan Kim, Ju-yeon Jo and Monetta Shaw, "A Lightweight Communication Architecture for Small UAS Traffic Management (sUTM)", ICNS, April 2015.  
National Security Engineering Research

Dr. Kwang J. Kim
NV Energy Professor of Energy and Matter
Department of Mechanical Engineering
Phone: (702) 774-1419
Email: kwang.kim@unlv.edu
Web: www.kwangjinkim.org
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.
Recent publications


- 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)

Dr. Yoohwan Kim, CISSP
Associate Professor,
Department of Computer Science
Phone: (702) 895-5348
Email: Yoohwan.Kim@unlv.edu

• Expertise
  • Secure protocol development for software and network applications
  • Critical infrastructure / smart grid 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)
  • Airport security inspection software design and DICOS standard development
  • Insider threat detection
Security Engineering Research

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

Recent Publications

Security Engineering Research

Dr. Shahram Latifi, P.E.
Professor, Department of Electrical and Computer Engineering
Co-Director, Center for Information Technology and Algorithms (CITA)
Phone: (702) 895-4016
Email: Shahram.Latifi@unlv.edu

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

Dr. Shahram Latifi, P.E.
Professor, Department of Electrical and Computer Engineering
Co-Director, Center for Information Technology and Algorithms (CITA)

Recent Publications

• Shahab Tayeb; Matin Pirouz; Brittany Cozzens; Richard Huang; Maxwell Jay; Kyle Khembunjong; Sahan Paliskara; Felix Zhan; Mark Zhang; Justin Zhan; Shahram Latifi; Toward data quality analytics in signature verification using a convolutional neural network, 2017 IEEE International Conference on Big Data. Pp. 2644 - 2651.
Security Engineering Research

Dr. Brendan O’Toole
Chair and Professor,
Department of Mechanical Engineering
Phone: (702) 895-3885
Email: Brendan.Otoole@unlv.edu

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

Internal Baffling to Distribute Blast Wave
Thin High Strength Steel for High Deformation
Lightweight Composite for Containment Strength

High Strength Steel for Endcaps
Internal Baffling to Distribute Blast Wave
Light Composite for Containment Strength

April 2018
Security Engineering Research

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

Recent Publications


Security Engineering Research

Dr. Emma Regentova
Professor, Department of Electrical and Computer Engineering
Phone: (702) 895-3187
Email: emma.regentova@unlv.edu

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

Recent Publications


Security Engineering Research

Dr. Robert Schill
Professor, Department of Electrical and Computer Engineering
Director, Center for the Energy Materials Interaction Technology Initiative (EMITION)
Phone: (702) 895-1526
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.
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**


**Patents**

Security Engineering Research

Dr. Ryan Sherman
Assistant Professor,
Department of Civil & Environmental Engineering & Construction
Phone: (702) 895-4869
Email: ryan.sherman@unlv.edu

- Expertise
  - Fatigue and fracture of steel structures
  - Retrofit design and testing
  - Fitness-for-service evaluation
  - Large-scale structural testing
  - Field monitoring and testing of structures
  - Redundancy of structural systems
  - Bridge design, fabrication, construction, and performance
  - Evaluation and preservation of historic structures
Security Engineering Research

Dr. Ryan Sherman
Assistant Professor,
Department of Civil & Environmental Engineering & Construction

Recent publications


- Sherman, R. (2016). "Standards to Control Fracture in Steel Bridges Through the Use of High-Toughness Steel and Rational Inspection Intervals." Purdue University. West Lafayette, IN.


Security Engineering Research

Dr. Ke-Xun (Kevin) Sun
Professor,
Department of Electrical and Computer Engineering
Phone: (702) 774-1486
Email: Ke-Xun.Sun@unlv.edu

• 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
Security Engineering Research

Dr. Ke-Xun (Kevin) Sun
Professor,
Department of Electrical and Computer Engineering

Recent Publications


Patents

Dr. Ying Tian, P.E.
Associate Professor,
Department of Civil and Environmental Engineering and Construction
Phone: (702) 895-4917
Email: Ying.Tian@unlv.edu

- 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
Security Engineering Research

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

Recent Publications

Security Engineering Research

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

Phone: (702) 895-0957
Email: Mohamed.Trabia@unlv.edu

• 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
Recent Publications


Security Engineering Research

Dr. Mei Yang
Professor, Department of Electrical and Computer Engineering
Phone: (702) 895-2364
Email: mei.yang@unlv.edu

- Expertise:
  - Computer architecture, multi-/many-core systems
  - Interconnection networks, photonic interconnects
  - Networks-on-chip
  - Wireless sensor networks
  - Biometrics, image analysis
  - Machine learning

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

Collaboration with Dr. Jiang (engineering)

Collaboration with Drs. Batista & Jiang (engineering)
Security Engineering Research

Dr. Mei Yang
Professor, Department of Electrical and Computer Engineering

Recent Publications


