Faculty Research Expertise at a Glance

Computing Technologies

Areas include cybersecurity, high-assurance software, cyber-physical systems, sensors, computing engineering, and data science and artificial intelligence.

One Health

Areas include biomedical engineering systems, disease transport modeling, ecosystem service analysis, environmental health, sensors and controls, water, logistics and scheduling.

Secure Platforms

Areas include radiation sensing and detection, cybersecurity, sensor and controls, and network analysis.

Sustainable Infrastructure

Areas include bioenergy, power systems, transportation systems, communication networks, advanced materials and processing, cyber-physical systems and environmental engineering.

Kansas State University

Faculty Research Expertise
Computing Technologies

| Name	Expertise
Caragea, Doina	Machine learning and data mining, with applications to data intensive problems in recommender systems, text analytics, security informatics, and bioinformatics
Hatcliff, John	Software engineering, software verification, safety-critical systems, security, cyber-physical systems, embedded systems, medical devices, unmanned vehicles
Hitzler, Pascal	Semantic web, artificial intelligence, neuro-symbolic integration, knowledge representation and reasoning, machine learning, deep learning, data management, data science, ontologies, knowledge graphs
McGinty, Hande	Food, agriculture and bio-ontologies and their applications for artificial intelligence and machine learning; designing and implementing semantic web technologies and ontologies; generating methods and implementing tools for knowledge acquisition and representation
Munir, Arslan	Embedded and cyber-physical systems, secure and trustworthy systems, hardware-based security, computer architecture, parallel computing, artificial Intelligence, computer vision, data analytics, fault tolerance
Neilsen, Mitchell	Cyber-physical systems, real-time embedded systems, scientific computing, distributed systems, high performance computing
Peterson, Garrett	Radar technologies
Prabhakar, Pavithra	Formal analysis of cyber-physical systems with emphasis on both foundational and practical aspects related to automated and scalable techniques for verification and synthesis of hybrid control systems
Shamir, Lior	Data science in machine learning, soft computing, and computational statistics

KANSAS STATE
U N I V E R S I T Y

[Doina Caragea](mailto:dcaragea@ksu.edu), Computer Science, Professor, dcaragea@ksu.edu

## Academic / Industry Experience

B.S.	1996	University of Bucharest	Computer Science
M.S.	1997	University of Bucharest	Computer Science
Ph.D.	2004	Iowa State University	Computer Science

- Asst., Assoc. & Full Professor (with tenure), Computer Science, Kansas State University, 2006 - present
- Director, Machine Learning & Data Science Laboratory, Kansas State University, 2006 - present
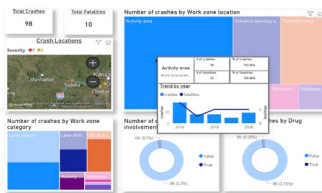
Selected Applications

Crisis informatics
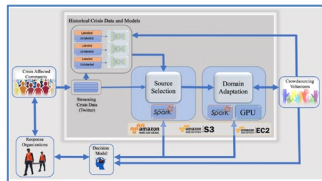
Estimating Diving Risk
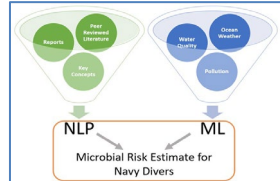
Heavy Truck Crash Analytics

Digital Agriculture

Laboratory Capabilities

Predictive Analytics: Artificial Intelligence (AI), Machine Learning (ML), Deep Learning (DL)

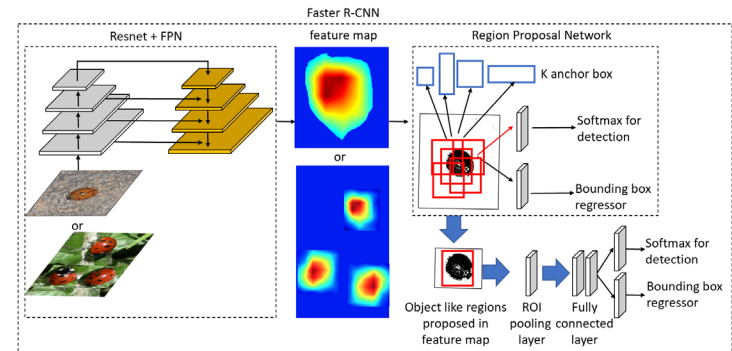***Types of Data:*** Relational data, sequence data (e.g., text, DNA sequences), graph data (e.g., knowledge graphs), image data.

Research Interests

- Machine learning for problems with big (unlabeled) data and small labeled data
  - Self-supervised learning
  - Semi-supervised learning
  - Domain adaptation
  - Transfer learning
- Deep learning
  - Convolutional neural networks
  - Recurrent neural networks
  - Sequence-to-sequence networks
  - Generative adversarial networks
  - Object detection/counting networks

Research Sponsors

# John Hatcliff, Computer Science, University Distinguished Professor, hatcliff@ksu.edu

Academic / Industrial Experience

Ph.D.   1994   Kansas State University   Computer Science

- University Distinguished Professor, 2011 - present
- Extensive history of industry collaborations including NASA, Boeing, Lockheed Martin, Collins Aerospace, Adventium Labs
- Extensive DoD funding and collaborations include Homeland Security, DARPA, U.S. Army, Air Force Research Labs

Selected Industrial Applications

Model-Driven Development for high-assurance software for DoD Programs
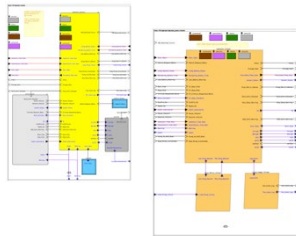
Micro-kernel-based Secure Platform for Medical Devices (Dept Homeland Security)

Verified Microkernel
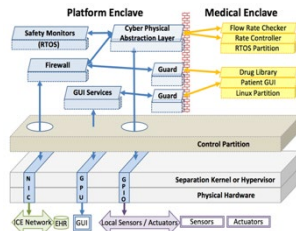
Research Interests

- Software Assurance (with formal verification and testing)
- Model-based, automated system hazard analysis and risk management
- Microkernel and virtualization-based guarantees of software partitioning
- Software certification
- Security / Secure information flow / guaranteed information flow partitioning
- Assurance cases
- Requirements engineering
- Product-line and platform-based development
- Cyber-Assured Systems Engineering

Research Sponsors

11-2022

Pascal Hitzler, Computer Science, Professor, hitzler@ksu.edu

Academic / Industrial Experience

Ph.D.	2001	National University of Ireland, Cork
Postdoc	2001-2004	TU Dresden, Germany
Post doc	2004-2009	Akademischer Rat, University of Karlsruhe, Germany

- Tenure Track (Assistant to Full Professor), Wright State University, Ohio, 2009-2019
- Professor, Kansas State University, 2019 - present
- Director, Center for Artificial Intelligence and Data Science, K-State, 2020 - present

Selected Industrial Applications

- Patent in Secure Authentication using AI
- Industrial knowledge graphs (various)
- Information and content management Systems (various)
- Industry consulting in Neurosymbolic AI

Laboratory Capabilities

- Data Integration and Management
- Knowledge Graphs
- Ontologies
- Artificial Intelligence
- Deep Learning
- Knowledge Representation and Reasoning
- Explainable Artificial Intelligence

Research Interests

- Semantic Web: Foundations and applications of ontologies and knowledge graphs for data sharing, integration, discovery, and re-use
- Neurosymbolic AI: Combining deep learning with symbolic computation for advanced deep learning, explainable AI, etc.

Research Sponsors

NSF

U.S. DEPARTMENT OF ENERGY

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USDA

KANSAS STATE UNIVERSITY

03-2023

Hande McGinty, Computer Science, Assistant Professor, hande@ksu.edu

Academic / Industrial Experience

B.S.   2007   Bilkent University   Computer Engineering
M.S.   2010   E. Michigan University   Computer Science
Ph.D. 2018   University of Miami   Computer Science
- Research Assoc. Prof., Ohio University & USDA, 2020-2022
- Research Scientist, Collaborative Drug Discovery, 2017-2020
- Researcher, Max Planck Institute for Informatics, 2010-2011
- Asst. Professor, Computer Science, 2022 - present

Selected Industrial Applications

- Standardization of Representation of Chemical Mixtures (MInChI)
- BioAssay Express (rebranded as BioHarmony Annotator)
- BioAssay Ontology (BAO)
- Drug Target Ontology (DTO)

Laboratory Capabilities
- Using compound microscope.
- Applying techniques for anesthetizing model organisms (e.g. Drosophila melanogaster) and preparing stocks for D. melanogaster mutants.
- Extracting DNA from a single Caenorhabditis elegans. (model organism)
- cDNA synthesis from total RNA by using degenerate primers
- Comparing expression profiles between tissues and species.
- Species diagnosis using expression profiles.

Research Interests

- Generating food, agriculture, chemical and bio-medical ontologies using semi-automated methodologies

- Use of artificial intelligence and machine learning applications generate methods to try bridging the gap between the bio-medical research, food, and agriculture research and global food systems.

Research Sponsors

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CMS

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Arslan Munir, Computer Science, Associate Professor, amunir@ksu.edu

Academic / Industrial Experience

B.S.   2004   Univ. of Engineering & Technology, LaHore   Elec. Engg.
M.S.   2007   University of British Columbia   Elec. & Computer Engg.
Ph.D. 2012   University of Florida   Elec .& Computer Engg.

- Software Development Engineer, Mentor Graphics, 2007-2008
- Postdoctoral Research Associate, ECE, Rice Univ., 2012-2014
- Assistant Position, Computer Science & Engineering, Univ. of Nevada, Reno, 2014-2017
- Asst. & Assoc. Professor, Computer Science, Kansas State University, 2017 - present

Selected Industrial Applications

Agriculture

Materials Science

Autonomous vehicles

Defense:
Surveillance
Authentication and key establishment
Situational awareness

Space

Laboratory Capabilities

- Embedded systems: FPGA, hardware design, HW/SW co-design, deep learning accelerators design, cryptoprocessor design, fault-tolerant design
- Cybersecurity: Authentication, secret key establishment, HW-based security, image encryption, AI safety and security
- Artificial Intelligence: Computer vision, deep learning, deep reinforcement learning
- Computing: Parallel computing, heterogeneous computing, high-performance computing, edge computing

Research Interests

- Embedded and cyber-physical systems
- Computer architecture
- Secure and trustworthy systems
- Cognitive architectures and deep learning accelerators
- Artificial intelligence
- Computer vision
- Parallel computing
- Edge computing
- Fault tolerance
- Autonomous vehicles

Research Sponsors

[Mitchell Neilsen](), Computer Science, Professor, neilsen@ksu.edu

Academic / Industrial Experience

B.S.   1982   University of Nebraska   Mathematics
M.S.   1987   Kansas State University   Mathematics
M.S./Ph.D. 1989/92 Kansas State University   Computer Science

- Nebraska Army National Guard, 1978-1984, 13E20 Sect. Sgt.
- Asst Professor, Oklahoma State University, 1992-1996
- Asst/Assoc/Full Professor and Grad. Program Director, Computer Science, Kansas State University, 1996 - present

Industrial Applications
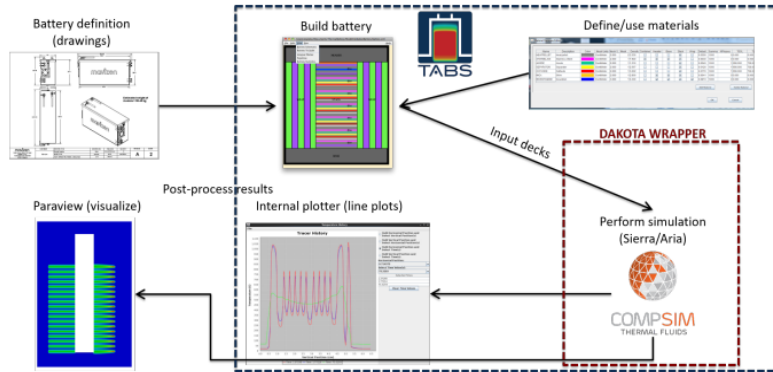
Sandia TABS: Thermally-activated battery simulator

Laboratory/Field Capabilities

Computational Engineering: Parallel/distributed high-performance computing, modeling and simulation (Sierra/Aria), dam safety software

AI: ML/CNN models and mobile apps for high-throughput phenotyping

Field Equipment: HPC cluster (Beocat), embedded development platforms (Nvidia Jetson Nano, etc.)

04-2022

Research Interests

- Machine learning, support vector machines, convolutional neural networks, computer vision, image analysis and modeling for both embedded and mobile apps (#phenoApps)   **Prospector: mobile NIR spectroscopy app**

- Computational material science and computational fluid dynamics, modeling and interface development using FEM, CFD, etc.
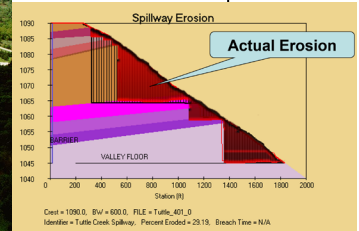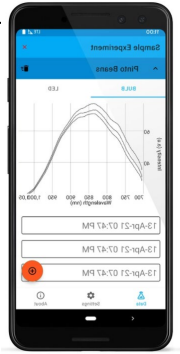
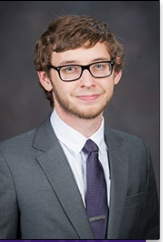**Tuttle Creek Spillway after flood and predicted erosion using WinDAM software**

Research Sponsors

Garrett Peterson, Electrical and Computer Engineering, Senior Instructor, gpete@ksu.edu

## Academic / Industrial Experience
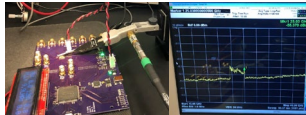
B.S.   2015   Kansas State University Electrical Engineering
M.S.   2020   Kansas State University Electrical & Computer Engineering

- RF Design Engineer, Garmin International, 2015
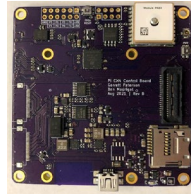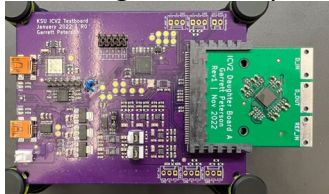- Instructor/Senior Instructor, Kansas State University, 2016 - present

Selected Industrial Applications

RF/Mixed Signal IC Design and Test

- TowerJazz 180nm
- GlobalFoundries 45nm
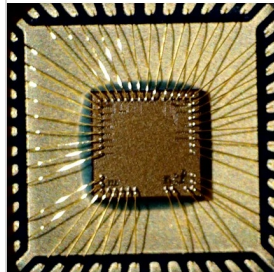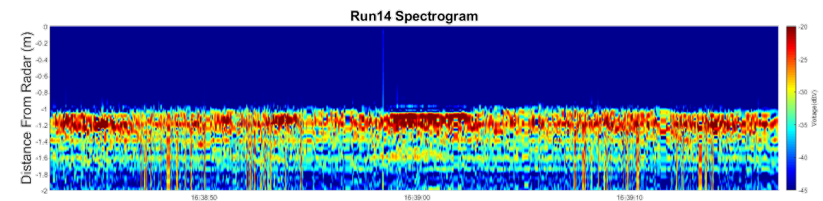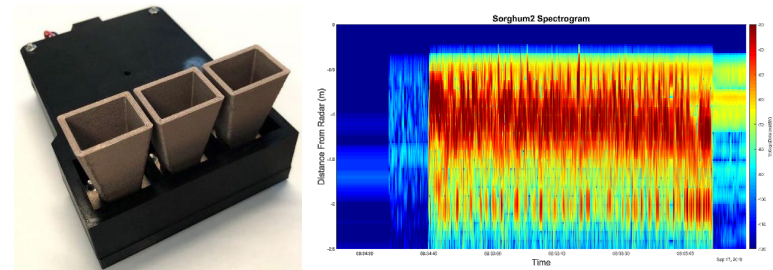

PCB Design/Assembly for IC Test

Laboratory Capabilities

- **IC/RF Design/Simulation Software**: Cadence/ADS
- **Electronics Testing**: Network Analyzers, Spectrum Analyzers, High Speed Oscilloscopes, Signal Generators, Meters, and Power Supplies
- **PCB Design, Assembly**: KiCAD, Through-hole and SMD capabilities
- **3D Printing**: Traditional FDM and SLA
- **Embedded Software**: FPGA and Microcontrollers

Research Interests

- RF/Mixed Signal IC Design
- Digital Phased Array Radar Systems
- Radar Signal Processing
- Novel Additive Manufacturing
- Agricultural Remote Sensing

KANSAS STATE UNIVERSITY

03-2023

[Pavithra Prabhakar](), Computer Science, Professor, pprabhakar@ksu.edu

Academic / Industrial Experience

B.S.	2004	Nat. Inst. Tech. Warangal (NITW)	Computer Science
M.S.	2006	Indian Institute of Science (IISc)	Computer Science
M.S.	2010	Univ. of Illinois (UIUC)	Applied Math.
Ph.D.	2011	Univ. of Illinois (UIUC)	Computer Science

- Assistant Professor, IMDEA Software Institute, 2011-2015
- Visiting Scientist, Toyota Technical Center, Ann Arbor, MI, Summer 2017
- Satish Dhawan Visiting Chair Professor, (IISc) 2021-2022
- Visiting Researcher, Univ. of Cal. Berkeley, Spring 2021
- Asst., Assoc. & Full Professor, Kansas State Univ., 2015 – present
- Program Director, National Science Foundation, 2022 - present

Selected Industrial Applications

- Automotive Systems (e.g. driverless Cars)
- Aerospace control systems (fixed wing systems)
- Robotics (aerial, ground and underwater)
- Agricultural automation (field coverage)
- Additive manufacturing (3D printing)

Laboratory Capabilities

- 1200 sq.ft. indoor robotics lab facility in the Unger complex
- Optitrack Motion Capture System
- Turtlebot2 and Turtlebot3 Waffle PI (ground robots)
- Crazyflie, COEX Clover (aerial robots)
- Duckietown (robotic platform imitating a city environment)
- F1/10 Car (autonomous vehicle with LIDAR, RGBD cameras)
- Prusa 3D printer

03-2023

Research Interests

The main research focus of our group is in the design of robust, intelligent software systems which interact with uncertain and dynamics physical environments, that arise in applications such as driverless cars. Our research spans both theory and practical problems in the fields of **formal methods, artificial intelligence, robotics and cyber-physical systems.**

| Physical System | Environments | Disturbances | Control |

- *Theoretical research:* Mathematical techniques for proving correctness based on automata and game theory, logic, dynamical and hybrid systems theory, planning and control.
- *Practical research:* Algorithm development for formal analysis and synthesis of robust, intelligent systems; software tool prototyping, evaluation on benchmarks and experimentation on robotic test beds.

Selected Projects:
- Formal verification of AI-controlled Cyber-Physical Systems, **NSF**
- Conformance Checking of Evolving Machine Learning Systems
  Amazon Research Award
- Formal Verification of Robust Cyber-Physical Systems (CPS)
  NSF CAREER Award
- Formal Synthesis of Robust Optimal Controllers
  ONR young investigator award
- Planning and coverage in agricultural automation, **USDA**

Research Sponsors

Lior Shamir, Computer Science, Associate, lshamir@ksu.edu

Academic / Industrial Experience

| B.S. | 1998 | Tel Aviv University | Computer Science |
| M..S/P.hD. | 2006 | Michigan Technological University | Computational Science |

- Programmer/team, Vision Controls Ltd., 1996 to 1999
- CTO, C4U Ltd, 1999-2001
- VP R&D, G-Wiz Ltd., VP R&D, 2001-2003
- Research Fellow, NIH, 2006-2010
- Asst./Assoc. Professor, Lawrence Technological University, 2010-2019
- Asst. Dean for Research, Lawrence Technological University, 2017-2019
- Associate Professor, Kansas State University, 2019 - present

Selected Industrial Applications

WND-CHARM – open source tool for image informatics.

UDAT – open source tool for data science, including image, audio, text, and more.

CHLOE – open source tool for repetitive outlier detection.

Laboratory Capabilities

Data science (turning data into knowledge), machine learning, unsupervised learning, outlier detection, applied machine learning, computational statistics, soft computing, fuzzy logic, crowdsourcing, bias analysis.

Research Interests

- Data science – the development and application of methods for turning large, complex, diverse data into robust reliable knowledge.

- Identifying and characterizing biases in data sets and in data analytics methods.

- Bioinformatics: Analysis and analytics of large biomedical databases (e.g., high-content screening).

- Astroinformatics: analysis of very large astronomical databases collected by robotic telescopes.

- Crowdsourcing: Collecting, cleaning, and analyzing crowdsourcing data and data contributed and generated by humans to turn them into robust reliable knowledge.

- Quantitative analysis of human-created data, including visual art, music, cinema, and more.

Research Sponsors

Faculty Research Expertise
One Health

Name	Expertise
Bahadori, Amir	Radiation protection, radiation transport, radiation dosimetry, space radiation, radiation risk, radiation effects on electronics, radiation imaging, bioheat transfer
Duan, Chuancheng	Advanced materials for energy conversion and storage, membrane reactors, electrochemical reactors, electrosynthesis, catalysis, fuel cells, electrolyzers and sustainable chemical manufacturing
Fan, Scott	Microfluidics, electromicrofluidic (EMF), electrowetting-on-dielectric (EWOD), dielectrophoresis (DEP)
Hansen, Ryan	Design of novel synthetic biological interfaces for characterizing microbial populations in microfabrication, polymer science, and surface chemistry; high avidity, high specificity capture and enrichment of bacterial pathogens to aid rapid, culture-free detection methods; platforms for high-throughput screening, discovery, and characterization of pathogenic bacterial interactions occurring in root-associated microbiomes
Im, Jeongdae	Environmental engineering, mechanisms and control of greenhouse gas emissions
Liu, Bin	Computational catalysis to advance fundamental knowledge for catalyst development and catalytic process innovation; building a cascade of molecular-level modeling system, encompassing mechanistic investigation, catalytic trends based catalyst screening and first-principles-based kinetic modelings.
Prakash, Punit	Precise image-guided medical interventions, (i) development of electromagnetic (microwave/RF) and acoustic devices for controlled delivery of therapeutic energy; (ii) integration of therapeutic/diagnostic instrumentation with MRI to enable imaging-based feedback-controlled interventions; and (iii) model-based predictive planning of cancer thermal therapy (ablation and hyperthermia)
Thompson, David	Electrical and biomedical engineering, measuring neural signals, load cells and film sensors for sleep studies

KANSAS STATE UNIVERSITY

Faculty Research Expertise
One Health

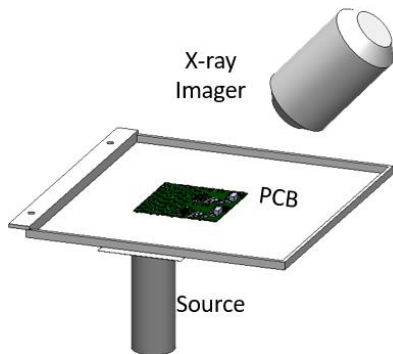| Name	Expertise
Wang, Donghai	Bioconversion of renewable materials into biofuels and chemicals; biomaterials including protein adhesives, resins, and biodegradable composites, and near-infrared technology for analysis of physical and chemical properties of biomaterials
Warren, Steve	Plug-and-play medical monitoring systems that use interoperability standards, wearable sensors and signal processing techniques to determine human/animal health
Wilken, Lisa	Fundamental separation challenges impeding recovery of biomolecules from biological sources using experimental design, process simulation, and high throughput screening methods; technologies and novel strategies for recovery and purification of pharmaceuticals, food and feed proteins, industrial proteins and is currently developing an enzyme-assisted extraction process for microalgae as a commercially-viable, scalable, and environmentally friendly algae lipid-protein separation technique

KANSAS STATE
UNIVERSITY

Amir Bahadori, Mechanical and Nuclear Engineering, Associate Professor, bahadori@ksu.edu

Academic / Industrial Experience

B.S.	2008	Kansas State Univ.	Mech. Eng. with NE Option
B.S.	2008	Kansas State Univ.	Mathematics
M.S.	2010	Univ. of Florida	Nuclear Eng. Sci. (Med. Phys.)
Ph.D.	2012	Univ. of Florida	Biomedical Eng. (Med. Phys.)

- Radiation Scientist, Univ. of Houston, 2010-2013
- Physical Scientist, NASA Johnson Space Center, 2013-2015
- Asst. & Assoc. Professor, Mechanical and Nuclear Engineering, Kansas State University, 2015-present

Selected Industrial Applications

Plant Directed R&D PDRD

Simulating X Ray Inspection

X-ray Imager

PCB

Source

Photon + Neutron Imaging
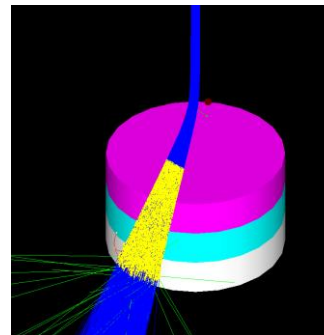

Laboratory Capabilities

- **Dedicated Beocat HPC Resources** (MPI/OMP parallelization, MCNP6, PHITS, COMSOL, GPU computing)
- **Radioactive sources** (^{241}Am and access to various other alpha, beta, gamma, and neutron sources)
- **Timepix-based radiation detectors**
- **Radiation survey instrumentation**
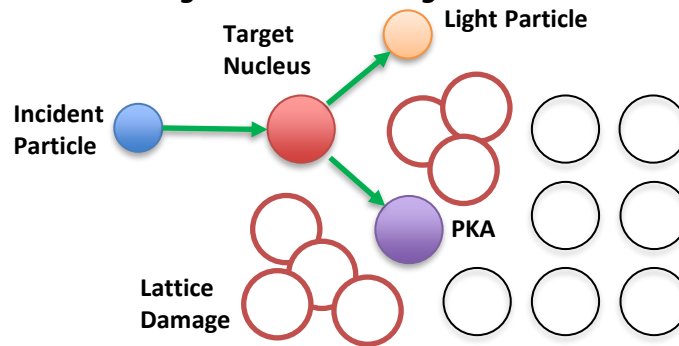
Research Interests

Radiation Protection

Radiation Imaging (x ray, CT, neutron radiography)

Radiation Transport in Matter and Electromagnetic Fields

Characterizing Radiation Damage in Materials

Target Nucleus

Light Particle

Incident Particle

PKA

Lattice Damage

Research Sponsors

U.S.NRC

NASA

Honeywell

RADIATION DETECTION TECHNOLOGIES, INC.

U.S. DEPARTMENT OF ENERGY

NICRP — National Council on Radiation Protection and Measurements

KANSAS STATE UNIVERSITY

01-2023

Chuancheng Duan, Chemical Engineering, Assistant Professor, cduan@ksu.edu

Academic / Industrial Experience

B.S.　2013　Dalian University of Technology　Materials Science
Ph.D.　2018　Colorado School of Mines　Materials Science

- Postdoc, Colorado School of Mines, Materials Science, 2018-2019
- Assistant Professor, Chemical Engineering, Kansas State University, 2020-present

Selected Industrial Applications

Clean H$_2$ production

Sustainable chemical manufacturing

CO2 capture and utilization

Fuel cells

Natural gas upgrading

Fuel cell for vehicles

Laboratory Capabilities:

(1) Comprehensive electrochemical characterization at -30-1100 °C with controlled atmosphere **(2)** Raman microscope with in situ high-temperature chamber and electrochemical cel **(3)** FRIR equipped with in situ high-temperature diffuse reflectance infrared Fourier transform spectroscopy (DRIFT) **(4)** BET surface area and temperature-programmed reduction/oxidation/chemisorption. **(5)** High-temperature materials processing (up to 1700 °C) **(6)** High-precision ultrasonic coating **(7)** Fabrication of ceramic and oxide materials **(8)** Four GCs with TCD, FID, MSD **(9)** Roll-to-roll tape casting **(10)** Lab-scale packed bed reactors for catalysts testing **(11)** Solid oxide fuel cell fabrication and characterization **(12)** Anion exchange membrane electrolyzer fabrication and testing **(13)** Hydrogen production technologies. **(14)** Catalysts and electrocatalyst synthesis **(15)** Dilatometer

Research Interests

Advanced Energy Materials Design, Synthesis, and Characterization
- Defect Chemistry and Transport Properties of Solid State Ionic Conductors
- Ceramic Processing

Power Generation, Fuels Production, Energy Storage
- Fuel Cells, Electrolysis Cells, Electrochemical Reactors
- Hydrogen
- High-Efficiency Reversible Electrochemical Cells for Long-term Energy Storage

Sustainable Manufacturing, Electrification of Chemicals Production
- Sustainable Fertilizer Production (Water + Air + Renewable Electricity = Ammonia / Biomass + Air = Ammonia)
- Sustainable Commodity Chemicals Manufacturing (e.g., light olefins, aromatics)

CO2 Capture and Utilization
- Membrane Reactors for CO2 Capture and Utilization
- CO2 + H2O + Solar Energy/Renewable Electricity = CxHyOz

Catalysis
- Natural Gas Upgrading (MDA, OCM)
- Electrochemical Promotion of Catalysis

Solar Energy
- Solar Thermal Energy Storage
- Integration of Solar Energy with Chemicals Production

Research Sponsors

Shih-Kang "Scott" Fan, Mechanical and Nuclear Engineering, Professor, skfan@ksu.edu

Academic / Industrial Experience

B.S.	1996	National Central University	Mechanical Engineering
M.S.	2001	UCLA	Mechanical Engineering
Ph.D.	2003	UCLA	Mechanical Engineering

- Assist. & Assoc. Professor, Nanotechnology, Material Sciences and Engineering, National Chiao Tung University, 2004-2012
- Assoc. & Full Professor, Mechanical Engineering, National Taiwan University, 2012-2019
- Full Professor, Mechanical and Nuclear Engineering, Kansas State University, 2019-present

Selected Industrial Applications

Lab Chip, 2020, **20**, 1705

- Electrowetting Digital Microfluidics for assay automation, Lab-on-a-Chip, molecular diagnosis, immunoassay, DNA sequencing, newborn screening
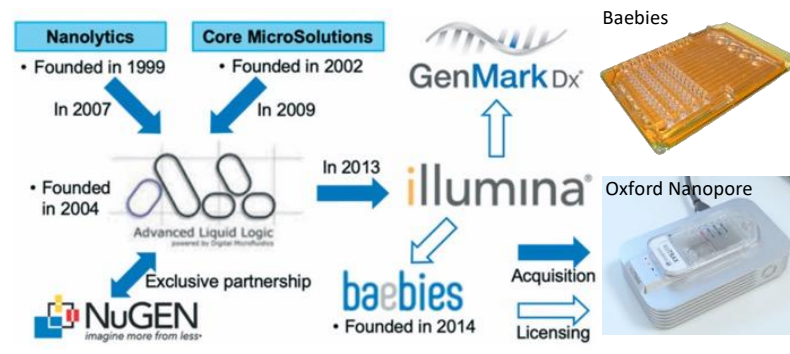

Laboratory Capabilities

- **Chip fabrication:** photolithography, etching, and packaging of (droplet-based) microfluidic chips
- **Instrument development:** in-house assay automation
- **Microfluidics testing/characterization:** chemical bench, micropumps, fluorescent microscopes, electric amplifiers
- **Biomaterials:** hydrogel synthesis, preparation, optimization
- **Cell culture:** primary cells, cell lines, organoids, 3D tissue
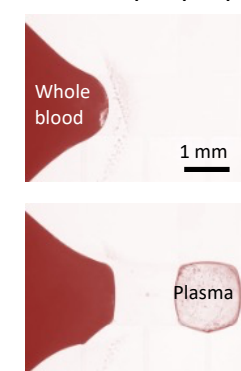- **Microfluidic 3D bio-printing**

Research Interests

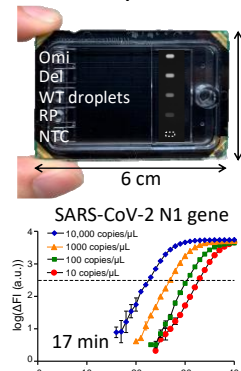- Point-of-Care Chip & Instrument
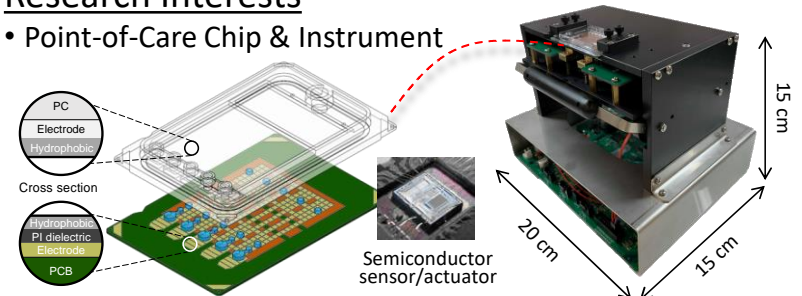
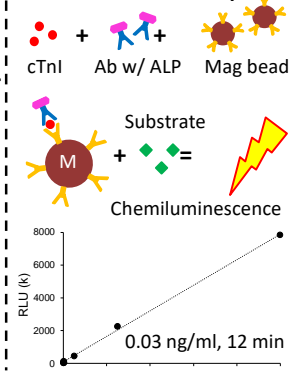- Assay automation and optimization; single-cell multi-omics

Raw sample prep | RT-qPCR | Immunoassay
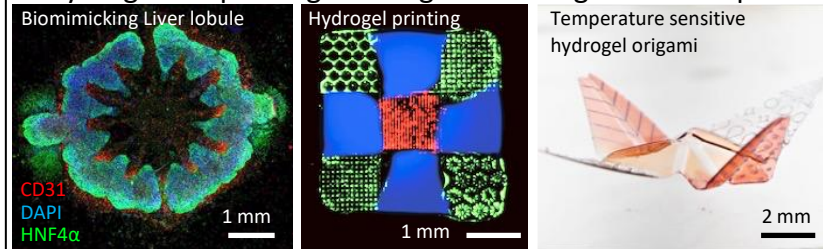

SARS-CoV-2 N1 gene
- 10,000 copies/μL
- 1000 copies/μL
- 100 copies/μL
- 10 copies/μL

17 min

0.03 ng/ml, 12 min

- Hydrogel bio-printing and origami for "organ-on-a-chip"

Biomimicking Liver lobule
CD31
DAPI
HNF4α
1 mm

Hydrogel printing
1 mm

Temperature sensitive hydrogel origami
2 mm

Research Sponsors

BioNexus KC — Catalyst for Innovation in Animal & Human Health

Johnson Center for Basic Cancer Research — KANSAS STATE UNIVERSITY

NASA

KANSAS STATE UNIVERSITY

Ryan Hansen, Chemical Engineering, Associate Professor, rrhansen@ksu.edu

Academic / Industrial Experience

B.S.   2001   Colorado School of Mines   Chemical Engineering
Ph.D.   2008   Univ. of Colorado, Boulder   Chemical Engineering

- Postdoctoral Research Associate, Colorado School of Mines, 2009-2012
- Postdoctoral Research Associate / Research Scientist, Oak Ridge National Laboratory, 2012-2015
- Asst. & Assoc. Professor, Kansas State University, 2015-present

Selected Industrial Applications

- Soil bio-inoculants for agriculture

- Cell screening and cell separation technologies

- Biocompatible and biofunctional surface coatings

Microbes for corn production

Laboratory Capabilities

Facilities: BSL-1 and BSL-2 laboratory spaces

Capabilities: Live cell microscopy, image analysis, microfluidic device design and implementation, photopatterning, microbial cell culture, plant culture

Microfluidics

Microscopy

Instrumentation: Inverted and upright fluorescence microscopes, patterned illumination system, microplate reader
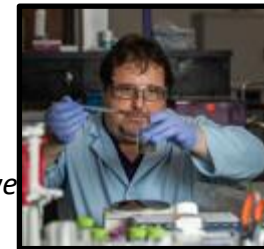
Research Interests

The Hansen Lab develops materials and devices for new bioseparation and biological measurement capabilities and develops microbial-based technologies that provide sustainable solutions to food, energy, and water systems.
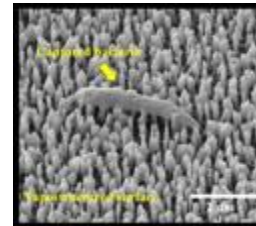
Projects:
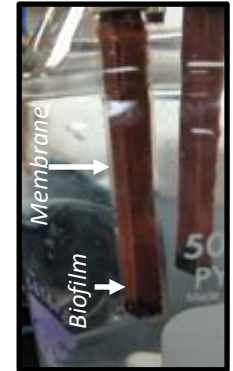

Stimulus-responsive (smart) hydrogels for cell isolation

Microbial inoculants for soil-water retention

Biofunctional surfaces for bacteria capture

Bioprospecting for novel plant growth promoting bacteria

Membrane

Biofilm

Membranes for microbial electrolysis cells

Research Sponsors

Jeongdae Im, Civil Engineering, Assistant Professor, jeongdaei@ksu.edu

Academic / Industrial Experience

B.S.	2001	Seoul National University	Civil Engineering
M.S.	2003	Seoul National University	Civil Engineering
Ph.D.	2011	University of Michigan	Civil Engineering

- Research Associate, Daewoo E&C, 2004-2006
- Postdoc fellow, UT-ORNL, 2011-2015
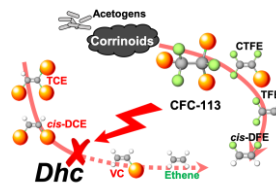- Assistant Research Professor, Univ. of Massachusetts, 2015-2017

Selected Industrial Applications

Bioremediation

Eco-friendly silage inoculant development

Environmental Microbiology

Environmental fate of chemicals

Plant-Microbe Interactions

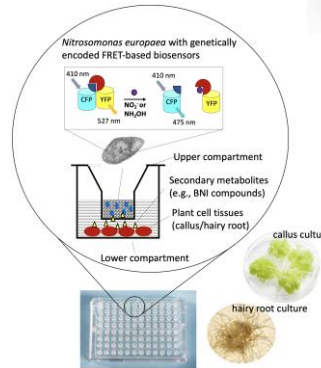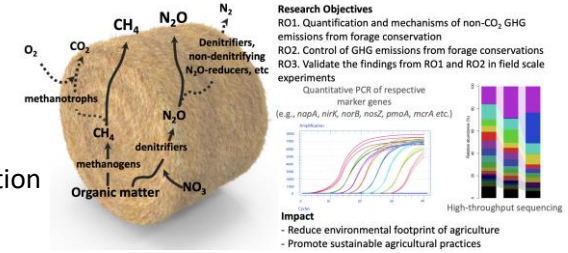**Climate-smart agriculture**
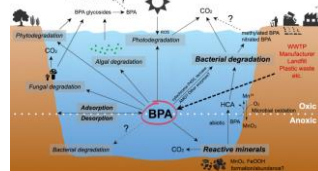
Research Interests

- Mechanisms and Control of Greenhouse Gas Emissions from Forage Conservation

- Development of HTS Approach for Plant-Microbe Interactions

- Understanding the Role of Biological Nitrification Inhibition in Controlling Greenhouse Gas Emissions

- Survival mechanisms of Dehalococcoides in elevated salinity conditions

- Chemical/microbial aspects of marine plastic pollution: Impacts on global carbon and sulfur cycle

Laboratory Capabilities

Analytical: GC-FID/ECD with HS autosampler, IC, HPLC-DAD/FID with AFC, Plate Reader
Microbial: Fermenters, Anaerobic Glove Box, Hungate Gassing Station, Biosafety Cabinet, PCR, BioRad CFX96 Real Time PCR, Bead Mill Homogenizer, DNA concentrator, Autoclave, -80 freezer, Walk-in incubator

Research Sponsors

NSF · USDA · American Chemistry Council · DUPONT · CORTEVA agriscience · KANSAS STATE UNIVERSITY

Bin Liu, Chemical Engineering, Associate Professor, binliu@ksu.edu

Academic / Industrial Experience

B.S.   2003   Dalian Univ. of Technology   Chemical Engineering
Ph.D.   2008   Colorado School of Mines   Chemical Engineering

- Postdoc, Chemical and Biological Engineering, Colorado School of Mines, 2009
- Postdoc, Center for Nanoscale Mater/Argonne National Lab, 2010-2012
- Postdoc, Chemical Engineering, Carnegie Mellon University, 2013
- Asst. & Assoc. Professor, Chemical Engineering, Kansas State University, 2013-present

Selected Industrial Applications

- Ammonia synthesis
- Hydrogen production based on heterogenous catalysis (example: steam/dry reforming of methane), and electrocatalysis (example: electrolyzer)
- Semiconductor manufacturing (example: hexagonal boron nitride, boron-rich inorganic compounds)

Laboratory Capabilities

Liu's group owns a total of 29 nodes on Beocat (i.e., Elves, Heroes, Dwarfs, Warlocks). These nodes support most of our modeling works. Our group also has access to external computing modes from National Energy Research Scientific Computing Center managed by Lawrence Berkeley National Lab.
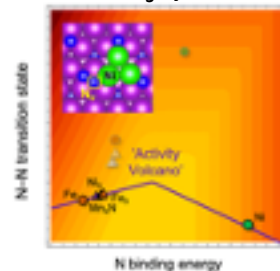

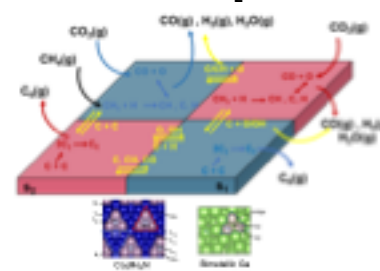
Beocat computing cluster

Research Interests

- **Computational catalysis for renewable energy and fuels production**

Modeling dual-site catalysts for NH_3 synthesis
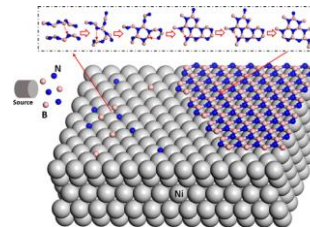

Liu et al. JPC Lett (2021)

Developing novel catalyst materials for H_2 production
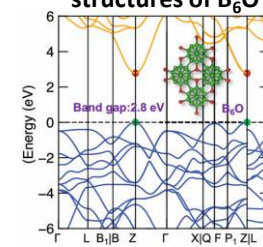

- **Molecular simulation of nucleation of semiconductor crystals**

Molecular dynamics simulation of hBN nucleation

Liu et al. ACS Nano (2017)

Predicting electronic structures of B_6O

Liu et al. JPC C (2022)

Research Sponsors

Punit Prakash, Electrical and Computer Engineering, Professor, prakashp@ksu.edu

Academic / Industrial Experience

B.S.   2004   Worcester Polytech. Inst.   Electrical & Computer Engg
M.S.   2006   U. Wisconsin-Madison   Biomedical Engineering
Ph.D. 2008   U. Wisconsin-Madison   Biomedical Engineering

- Postdoctoral Scholar, Univ. California San Francisco, 2008-9
- Research Specialist, Univ. California San Francisco, 2009-12
- Sabbatical visitor, phenoMapper LLC, San Jose, CA, 2021-22
- Asst., Assoc. & Full Professor, Electrical and Computer Engineering, Kansas State University, 2012-- present

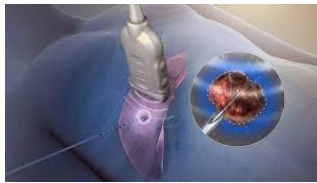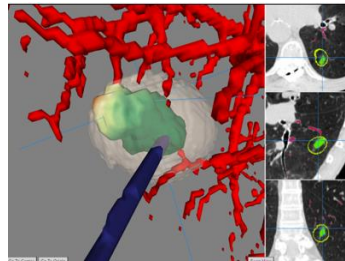## Selected Industrial Applications

Image-guided tissue ablation

Personalized image-based modeling of medical interventions

Laboratory Capabilities

- Multi-physics computational model of medical device – tissue interactions
- Medical device design, fabrication, benchtop characterization, small/large animal assessment in vivo, translation
- Medical-imaging based computational modeling
- Tissue thermal and electrical property characterization
- Integrated platform for thermal therapy delivery with high-field MRI

Research Interests
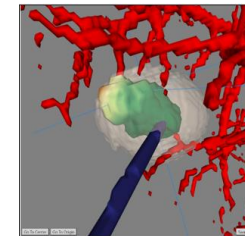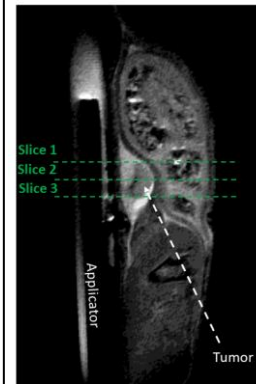
Medical device design

Tissue physical property measurement

Experimental platforms integrated with imaging

Medical-image based predictive modeling of interventions

National Institute of Biomedical Imaging and Bioengineering
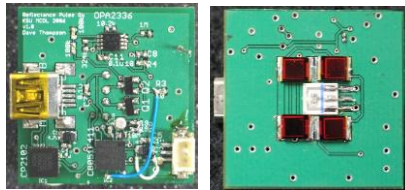Creating Biomedical Technologies to Improve Health

Research Sponsors

Medical device industry

NSF   NIH NATIONAL CANCER INSTITUTE   KANSAS STATE UNIVERSITY

David Thompson, Electrical and Computer Engineering, Associate Professor, davet@ksu.edu

Academic / Industrial Experience

B.S.	2006	Kansas State University	Electrical Engg.
M.Sc.Eng.	2011	University of Michigan	EE:Systems
M.S	2009	University of Michigan	Biomedical Engg.
Ph.D.	2012	University of Michigan	Biomedical Engg.

- Intern, Honeywell FM&T, 2003-2004
- Post-doctoral Fellow, University of Michigan, 2012-2013
- Asst./Assoc. Professor (with tenure), Kansas State University, 2014 - present

Research Interests

- Human Emotion and Decision Making

- Embedded Systems Design

- National Defense

Selected Industrial Applications

Embedded Design

User Experience/ Training Evaluation

Code Compliance

MATLAB & SIMULINK

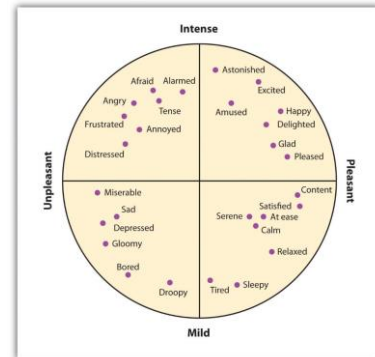## Laboratory Capabilities

EEG: Emotion estimation, communication
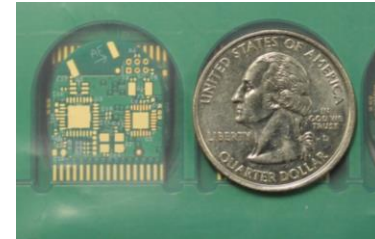
Embedded Systems: FPGA, drivers, system integration

[Sensor, Decision] Support: Embedded DAQ and associated software design, including signal processing and machine learning

Research Sponsors

U.S. DEPARTMENT OF ENERGY

NSF

Sandia National Laboratories

KANSAS STATE UNIVERSITY

Donghai Wang, Biological and Agricultural Engineering, Professor, dwang@ksu.eud

Academic / Industrial Experience

B.S.   1982   Northeast Agric. University   Agricultural Engineering
M.S.   1994   University of Illinois   Agricultural Engineering
Ph.D.   1997   Texas A&M University   Agricultural Engineering

- Postdoc, USDA-CGAHR, Manhattan, KS, 1997-1999
- Project Engineer, AgRenew Inc., Manhattan, KS 1999-2000
- Asst., Assoc. & Full Professor (with tenure), Biological and Agricultural Engineering, Kansas State Univ., 2001 – present

Selected Industrial Applications
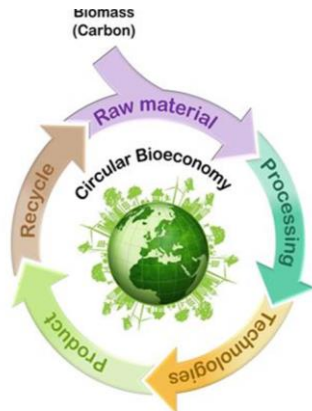
Protein-based binder material suitable for "environmental friendly" fiberglass product applications.

Laboratory Capabilities

- **Analytical**: HPLCs, Karl Fisher, CHNS analysis, IKA Calorimeter
- **Fermentation**: fermenters, incubator, shakers, incubator shakers, bioreactors with different sizes, biohood
- **Material characterization**: FTIR, DSC, NIR system, rheometer

Research Interests

Biofuels, chemicals, food and feed ingredients from fermentation process:

- Properties of cellulosic biomass
- Biomass pretreatment
- Biofuels and chemicals
- Food beverage
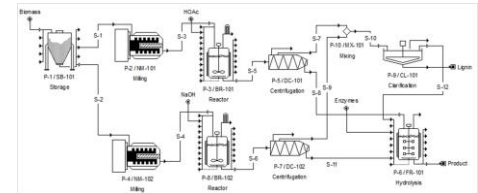
Biobased materials

- Plant protein based biodegradable adhesives
- Lignin-protein co-polymers for biobased adhesives
- Development of biofilms from plant materials

Development of fast methods

- Physical properties
- Chemical properties
- Quality control
- Product yield
- Using Near-infrared (NIR) spectroscopy

04-2022

[Steve Warren](), Electrical & Computer Engineering, Professor, swarren@ksu.edu
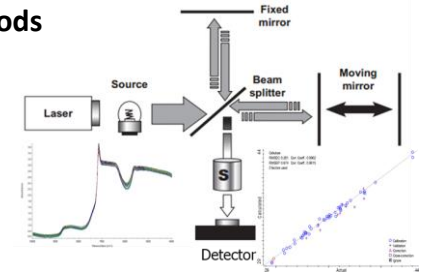
Academic / Industrial Experience

B.S.	1989	Kansas State University	Electrical Engg.
M.S.	1991	Kansas State University	Electrical Engg.
Ph.D.	1994	The University of Texas at Austin	Electrical Engg.

- Post-Doctoral/Senior/Principal Member of the Technical Staff, Sandia National Laboratories, 1994-1999
- Assistant Professor, Kansas State University, 1999-2002
- Associate Professor, Kansas State University, 2002-2017
- Professor, Kansas State University, 2017-present

Selected Industrial Applications

- Medical device design
- Software development
- Medical device interoperability
- Clinical health monitoring
- Nighttime wellness
- Home health care
- Disability monitoring/assistance
- Animal measurements
- Disaster response
- Engineering Education

Laboratory Capabilities

Wearable medical device design, biomedical sensors/circuitry, computational methods, signal processing, 3D printing, reflectance analysis, human subject research, telemetry, and learning assessment
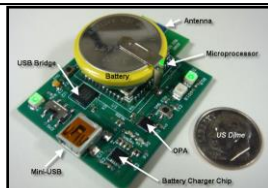
Research Interests

- Biomedical instrumentation and devices
- Biosensors
- Portable data acquisition
- Biosignal analysis and processing
- Light transport in tissue
- Biomedical optics
- Radiation transport,
- Fluorescence
- Spectroscopy
- Monte Carlo methods
- Ultrasound
- Pulse oximetry photoplethysmographic data analysis
- Fourier analysis
- Wearable wireless devices
- Body area networks
- Motion artifact
- Ballistocardiography
- Electrocardiography
- Electromyography
- Accelerometry
- Pulse wave velocity
- Human/animal telemedicine
- Telehealth
- Home care
- Aging, ambulatory monitoring
- Plug-and-play device interoperability
- Autism
- Assistive technology
- Numerical methods
- Engineering education

Desired Populations of Interest

Vulnerable populations, including the elderly, children with disabilities, companion/ food animals, military personnel, first responders, and individuals in under-resourced environments

Research Sponsors

NSF · NASA · NIH · 3DS SPATIAL · Heartspring · Sandia National Laboratories · FDA · ni · BEEF USA.org · CIMIT (Consortia for Improving Medicine with Innovation & Technology) · Cerner · KANSAS STATE UNIVERSITY

Lisa Wilken, Biological and Agricultural Engineering, Associate Professor, lwilken@ksu.edu

Academic / Industrial Experience

B.S.   2003   Kansas State University   Biological & Agricultural Engg.
Ph.D. 2009   Texas A&M University   Biological & Agricultural Engg.

- Assistant & Associate Professor, Biological & Agricultural Engineering, Kansas State University, 2012 – present
- Consultant, Biotechnology Patent Litigation, 2021-2022
- Lecturer & Assistant Research Scientist, Biological & Agricultural Engg, Texas A&M University, 2009-2012

Selected Industrial Applications

- Design of scale-able primary recovery and purification processes for biopharmaceutical, food, feed, specialty-chemical, and bioenergy industries
- Downstream processing and analysis of recombinant proteins including immunotoxins, industrial enzymes, monoclonal antibodies, and other therapeutic biomolecules
- Process design and scale-up for value-added coproducts for bioenergy and food industries
- Bioprocess simulation and economic modeling
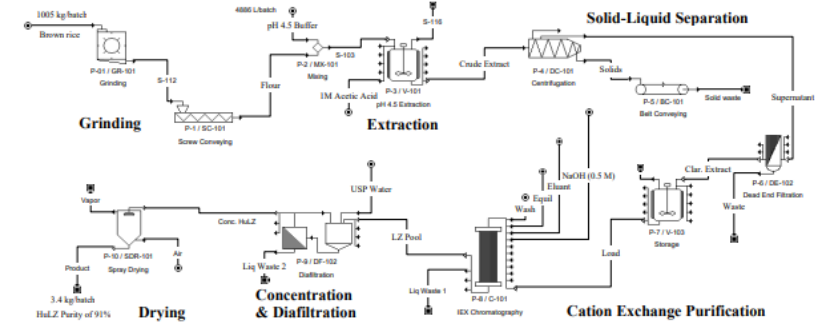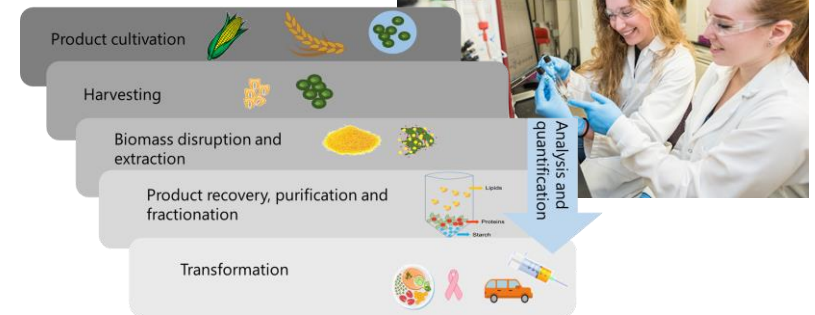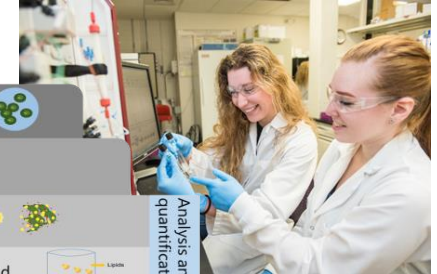

Laboratory Capabilities

Bioprocessing and bioseparations equipment: Chromatography system, high shear homogenizer, sonicator, cross flow (hollow fiber) membrane filtration, solid-liquid separations
Culture: Clean hood, incubator, buffer/media preparation and sterile filtration, autoclave, cell density
Analysis and quantification: gel electrophoresis, Western blot, microplate reader, fluorescence analysis, microscopy, microplate assays (total soluble protein, ELISAs, enzymatic assays, etc.), bioprocess simulation and modeling

Research Interests

- Primary recovery and purification of recombinant proteins for biopharmaceutical and nutraceutical industries
- Identification of critical impurities of transgenic plants and microalgae and development of mitigation strategies
- Biology-inspired design and refining of biomaterials and products
- Plant molecular pharming

Research Sponsors

Faculty Research Expertise
Secure Platforms

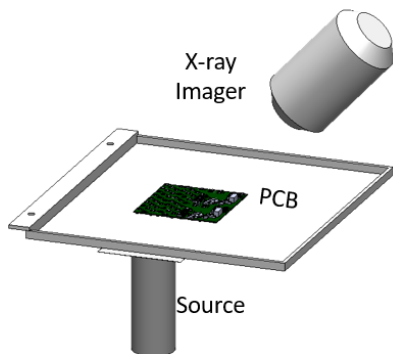| Name	Expertise
Bahadori, Amir	Radiation protection, radiation transport, radiation dosimetry, space radiation, radiation risk, radiation effects on electronics, radiation imaging, bioheat transfer
Guo, Xiaolong	Hardware security, third-party IP protection, formal verification and program analysis, as well as language-based security
McGregor, Douglas	Radiation measurements and detection methods, radiation detector development, solid-state device theory, semiconductor device theory
McNeil, Walter	Radiation sensing technology, semiconductor neutron sensors, CdZnTe gamma-ray spectrometers, silicon device fabrication, neutron sensing with optical crystal properties, MEMS fabrication and material purification processes
Munir, Arslan	Embedded and cyber-physical systems, secure and trustworthy systems, hardware-based security, computer architecture, parallel computing, artificial Intelligence, computer vision, data analytics, fault tolerance
Sharda, Ajay	Develop, analyze and experimental validation of control systems for agricultural machinery systems with emphasis on automation; sensor testing/development; mechatronic systems; develop automated test setups for hardware-in-the-loop simulations; high speed imaging; image analysis; unmanned vehicles, thermal infrared imaging
Vasserman, Eugene	Security for medical cyber-physical systems, security usability and user education

KANSAS STATE
UNIVERSITY

Amir Bahadori, Mechanical and Nuclear Engineering, Associate Professor, bahadori@ksu.edu

Academic / Industrial Experience

B.S.	2008	Kansas State Univ.	Mech. Eng. with NE Option
B.S.	2008	Kansas State Univ.	Mathematics
M.S.	2010	Univ. of Florida	Nuclear Eng. Sci. (Med. Phys.)
Ph.D.	2012	Univ. of Florida	Biomedical Eng. (Med. Phys.)

- Radiation Scientist, Univ. of Houston, 2010-2013
- Physical Scientist, NASA Johnson Space Center, 2013-2015
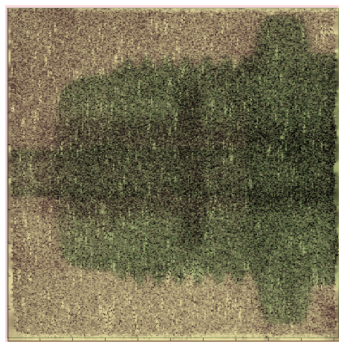- Asst. & Assoc. Professor, Mechanical and Nuclear Engineering, Kansas State University, 2015-present

Selected Industrial Applications

PDRD Plant Directed R&D

Simulating X Ray Inspection

X-ray Imager

PCB

Source

Photon + Neutron Imaging
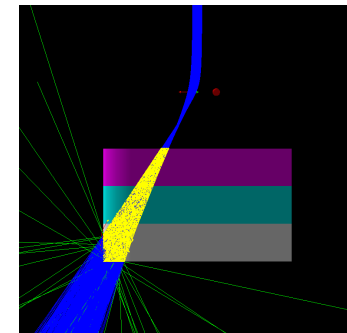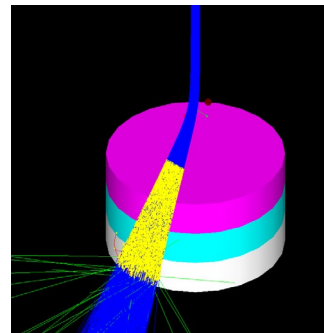
Laboratory Capabilities

- **Dedicated Beocat HPC Resources** (MPI/OMP parallelization, MCNP6, PHITS, COMSOL, GPU computing)
- **Radioactive sources** (^{241}Am and access to various other alpha, beta, gamma, and neutron sources)
- **Timepix-based radiation detectors**
- **Radiation survey instrumentation**
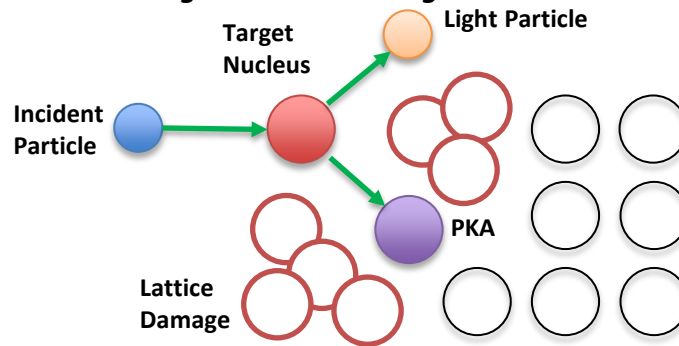
Research Interests

Radiation Protection

Radiation Imaging (x ray, CT, neutron radiography)

Radiation Transport in Matter and Electromagnetic Fields

Characterizing Radiation Damage in Materials

Target Nucleus

Light Particle

Incident Particle

PKA

Lattice Damage

Research Sponsors

U.S.NRC

NASA

Honeywell

RADIATION DETECTION TECHNOLOGIES, INC.

U.S. DEPARTMENT OF ENERGY

NICRP — National Council on Radiation Protection and Measurements

KANSAS STATE UNIVERSITY

01-2023

Xiaolong Guo, Electrical and Computer Engineering, Assistant Professor, guoxiaolong@ksu.edu

Academic / Industrial Experience

B.S.   2010   University of London   Electrical Engineering
M.S.   2013   Beijing University of P&T, Electrical Engineering
Ph.D.   2019   University of Florida, Electrical and Computer Engineering

- Asst. Professor, Electrical and Computer Engineering, Kansas State University, 2019 - present

Selected Industrial Applications

- **Internet-of-Things System Trustworthy Assurance**
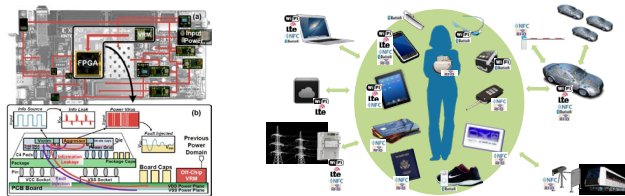
- **AI-based Security Assertions Generation and Results Interpretation**
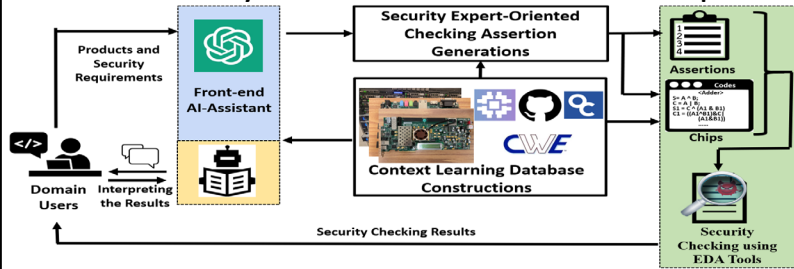

Laboratory Capabilities

Self-developed and Open-source ToolChain: we developed RTL_InfoTrack, PCHIP_PCC, IF-Tracker to automate the hardware security analysis/verification (released on Github).

Commercial Software: Synopsys RTL toolset, Cadence JasperGold Toolset

Computation Equipment: Dell PowerEdge R740 with dual Xeon Gold 6230R 26-core CPUs and an Nvidia Tesla T4 16GB GPU; Xilinx Virtex-7 FPGA VC707 Evaluation Kit

Research Interests

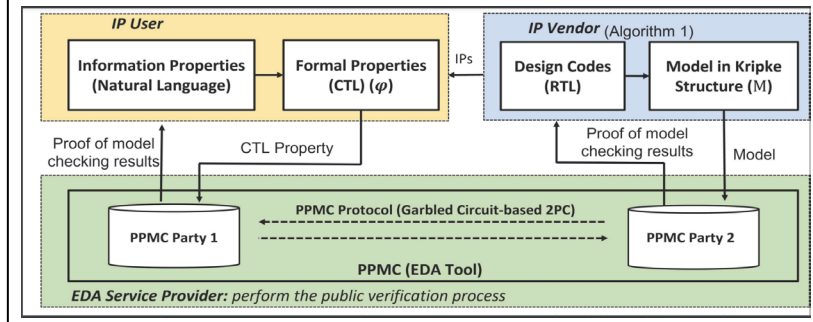- ### Hardware SoC/IP Protection
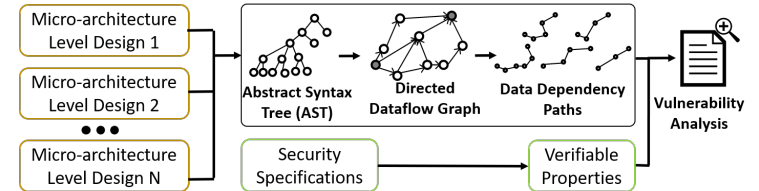
- ### Hardware and Software Co-Security Verification/Analysis

Hardware Layers — **Hardware-Software Boundary** — **Software Layers**

- ### Zero Trust Third-Party IPs Privacy-preserving

Research Sponsors

[Douglas S. McGregor](), Mechanical and Nuclear Engineering, University Distinguished Professor, [mcgregor@ksu.edu]()

Academic / Industrial Experience

B.S.	1985	Texas A&M University	Electrical Engineering
M.S.	1989	Texas A&M University	Electrical Engineering
M.S.	1992	University of Michigan	Nuclear Engineering
Ph.D.	1993	University of Michigan	Nuclear Engineering

- Asst. Research Professor, University of Michigan, 1997-2002
- Assoc. Professor, Kansas State University, 2002-2008
- Professor, Kansas State University, 2008 -2016
- University Distinguished Professor, Kansas State U., 2016 - present

Selected Industrial Applications

- Radiation detection and measurement
- In-core reactor power sensors
- SNM mitigation
- Gamma radiation spectroscopy
- Neutron detection and localization
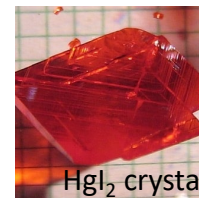
Laboratory Capabilities

The KSU Semiconductor Materials and Radiological Technologies (SMART) Laboratory is a fully functional detector development laboratory with two clean rooms (class 100), a dry room, and an electron microscopy lab. Equipment includes: Dicing saws, lapping/polishing systems, metallization equipment, plasma etching/coating equipment, two scanning electron microscopes, Auger electron analysis system, x-ray diffractometers, IV/CV analysis systems, ellipsometer, mask aligners, optical microscopes, clean room ovens, grinders, scribers, and over 80 processing and growth furnaces for annealing, sintering, diffusions, oxidations and crystal growth. See: http://smartlab.mne.ksu.edu/

Research Interests

Some examples:

Radiation measurements and detection methods

Radiation detector development including design and construction

- Semiconductor materials and detectors
- Gas-filled detectors
- Scintillation materials and detectors
- Neutron detectors
- Gamma-ray spectrometers
- Wearable devices
- Nuclear reactor instruments

Solid-state device theory

Semiconductor device theory

HgI_2 crystal
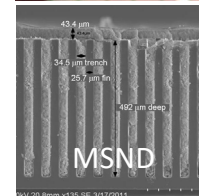
MSND

Wearable n/γ devices

MPFD

Research Sponsors

SAINT-GOBAIN

INL Idaho National Laboratory

NSF

U.S. DEPARTMENT OF ENERGY

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03-2023

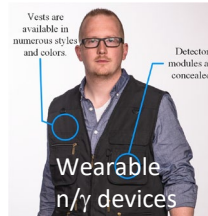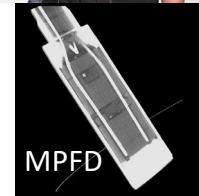# Walter McNeil, Mechanical and Nuclear Engineering, Associate Professor, wmcneil@ksu.edu

Academic / Industrial Experience

B.S.   2004   Kansas State University   ME with Nuclear Option
Ph.D.   2010   Kansas State University   Nuclear Engineering

- Assoc. Prof., Research Scholar, Kansas State Univ., 2016 - present
- Director, Radiological Systems Integration Lab (RSIL)
- Physicist/Eng., Naval Information Warfare Center

Industrial Applications

Countering Weapons of Mass Destruction (CWMD)

Emergency response
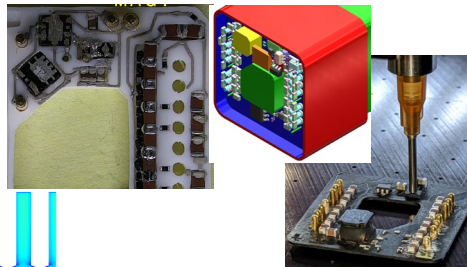Non-proliferation
Consequence management
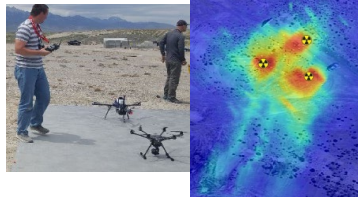
Portal monitoring
Digital manufacturing

Laboratory Capabilities

Additive Manufacture of Discrete Electronics

Device Fabrication
- Semiconductor/MEMS
- Vacuum devices
- Photosensitive films
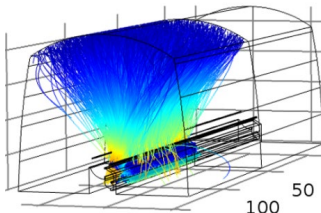
Simulation/Modeling
- Device Physics

Irradiation Facilities
- Nuclear Reactor
- 3x Neutron Generators
- 5 MeV Betatron
- Industrial X-ray

Research Interests

Mobile instrumentation integration
- Portable/wearable cryogenic sensors
- Micro-power electronics
- Dispersible sensor arrays

Space hardware

Extreme system performance
- Harsh environment capabilities

Photomultiplier and photon sensing devices
- Radiation hard amplification devices
- Radiation damage modeling and simulation
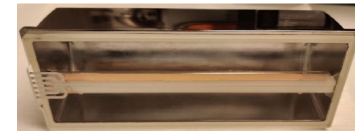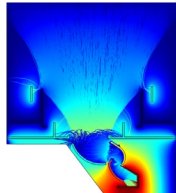
Active interrogation & imaging
- Portable machine neutron generators
- Associated particle imaging (API)
- Thinned silicon devices neutron and particle sensing

Detector   Target   N-gen

Research Sponsors

NNSA
DEFENSE THREAT REDUCTION AGENCY
DEPARTMENT OF DEFENSE · UNITED STATES OF AMERICA
U.S. DEPARTMENT OF ENERGY
KANSAS STATE UNIVERSITY

03-2022

Arslan Munir, Computer Science, Associate Professor, amunir@ksu.edu

Academic / Industrial Experience

B.S.   2004   Univ. of Engineering & Technology, LaHore   Elec. Engg.
M.S.   2007   University of British Columbia   Elec. & Computer Engg.
Ph.D. 2012   University of Florida   Elec .& Computer Engg.

- Software Development Engineer, Mentor Graphics, 2007-2008
- Postdoctoral Research Associate, ECE, Rice Univ., 2012-2014
- Assistant Position, Computer Science & Engineering, Univ. of Nevada, Reno, 2014-2017
- Asst. & Assoc. Professor, Computer Science, Kansas State University, 2017 - present

Selected Industrial Applications

Agriculture

Materials Science

Autonomous vehicles

Defense:
Surveillance
Authentication and key establishment
Situational awareness

Space

Laboratory Capabilities

- Embedded systems: FPGA, hardware design, HW/SW co-design, deep learning accelerators design, cryptoprocessor design, fault-tolerant design
- Cybersecurity: Authentication, secret key establishment, HW-based security, image encryption, AI safety and security
- Artificial Intelligence: Computer vision, deep learning, deep reinforcement learning
- Computing: Parallel computing, heterogeneous computing, high-performance computing, edge computing

Research Interests

- Embedded and cyber-physical systems
- Computer architecture
- Secure and trustworthy systems
- Cognitive architectures and deep learning accelerators
- Artificial intelligence
- Computer vision
- Parallel computing
- Edge computing
- Fault tolerance
- Autonomous vehicles

Research Sponsors

03-2022

[Ajay Sharda](), Biological and Agricultural Engineering, Professor, asharda@ksu.edu

Academic / Industrial Experience

B.S.	1998	Punjab Agricultural University	Agricultural Engg
M.S.	2001	Punjab Agricultural University	Agricultural Engg
Ph.D.	2011	Auburn University	Biosystems Engg

- Post-Doc: CPAAS, Washington State University
- Graduate Research Assistant: Auburn University
- Assistant Professor: Punjab Agricultural University, India
- Asst/Assoc/Full Professor, Kansas State University, 2013-present

Selected Industrial Applications

- Sensing solution development and integration for agricultural machine systems
- Intelligent application systems for autonomous ag vehicles

Laboratory Capabilities

- Hardware-in-the-loop Machine Simulation
- High speed imaging and data acquisition
- Computer vision system development and applications
- Sensing system development and validation
- Data analytics

Research Interests

- Agricultural machine systems development and verification
- Sensing and automation
- Data analytics for digital agriculture
- Computer vision systems for intelligent control
- Autonomous systems for intelligent sense and spray
- Remote sensing for crop health and machine performance metrics

Research Sponsors

NSF · USDA NIFA · USB UNITED SOYBEAN BOARD · TeeJet TECHNOLOGIES · AGCO Your Agriculture Company · JOHN DEERE · CNH INDUSTRIAL · TOPCON Precision Agriculture · Mahindra Rise. · osb ENGINEERING & IT · KANSAS STATE UNIVERSITY

Eugene Vasserman, Computer Science, Associate Professor, eyv@ksu.edu

Academic / Industrial Experience

B.S.   2003   University of Minnesota   Biochemistry
M.S.   2008   University of Minnesota   Computer Science
Ph.D.   2010   University of Minnesota   Computer Science

- Assistant Professor, Computer Science, KSU, 2010-16
- Senior Staff Fellow, U.S. Food and Drug Administration, 2018-20
- Director, Center for Cybersecurity and Trustworthy Systems, Kansas State University, 2015-present
- Associate Professor, Computer Science, Kansas State University, 2016-present

Selected Industrial Applications

Systems-of-systems security

Private communication

Industrial control and medical systems security

Fine-grained access control and emergency operation
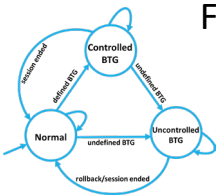
Laboratory Capabilities

Protocol and System Design:

- Security and privacy
- Use case-specific performance tuning
- Usability
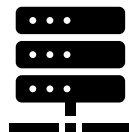
Distributed System Analysis:

- Safety, security, and privacy
- Regulatory alignment

Research Interests

Privacy and anonymity

Censorship resistance

Secure communication

High-performance secure distributed systems

Cyber-physical systems (CPS) and Internet of Things (IoT)

Security of low-power and embedded systems

Security education

Usable security
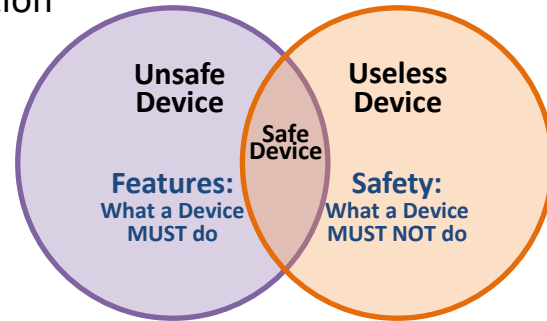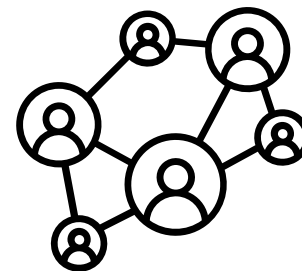
Unsafe Device

Useless Device

Safe Device

Features: What a Device MUST do

Safety: What a Device MUST NOT do

Sustainable Infrastructure

Name	Expertise
Beck, Terry	Laser velocimetry and optical measurements (LDV, PIV, PLIF), heat transfer, fluid mechanics, and two-phase flow
Das, Suprem	Additive manufacturing, energy applications, energy storage and conversion
Lei, Shuting	Femtosecond laser micro/nano machining and surface texturing of various materials for a variety of applications, machining of difficult-to-machine materials, laser assisted materials processing, thermal modeling of manufacturing processes, development of novel cutting tools
Pourkargar, Davood	Optimization-based control of complex process networks, computational multiscale modeling of process systems in sustainable and smart manufacturing, cyber-physical systems and network communication analysis in large-scale processes, and system identification using process data analytics and machine learning with application to chemical and energy systems
Sharda, Ajay	Develop, analyze and experimental validation of control systems for agricultural machinery systems with emphasis on automation; sensor testing/development; mechatronic systems; develop automated test setups for hardware-in-the-loop simulations; high speed imaging; image analysis; unmanned vehicles, thermal infrared imaging
Singh, Gurpreet	Nanotechnology with a focus on processing-structure-property characterization of two-dimensional materials and molecular precursor derived ceramics for energy-based devices
Sobering, Tim	Director of the Electronics Design Laboratory provides advanced electronics, assists with integrating electronics technology into research programs, and aids in electronics technology transfer to users by providing ongoing technical support

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Sustainable Infrastructure

Name	Expertise
Wei, Mingjun	Computational science for simulation, modeling, control and optimization in fluid mechanics, high-performance computation for the simulation of incompressible and compressible flows involving the interaction with solid structures, developing model order reduction methods to apply on complex fluid-solid systems to achieve low order models for real-time computation and autonomous control, and developing adjoint-based approach for sensitivity study and optimization of fluid problems with large control space and moving/morphing solid boundaries
Zhang, Meng	Advanced manufacturing, renewable energy manufacturing, ultrasonic vibration-assisted processes and additive manufacturing for health, biomass preprocessing (pelleting and size reduction), relationships between cellulosic biomass structural features and enzymatic hydrolysis sugar yield, rotary ultrasonic machining of high performance materials, fiber reinforced additive manufacturing, and 3D bioprinting of living tissues for wound healing

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B. Terry Beck, Mechanical and Nuclear Engineering, Professor, tbeck@ksu.edu

Academic / Industrial Experience

B.S.	1971	Oakland University	Mechanical Engineering
M.S.	1974	Oakland University	Mechanical Engineering
Ph.D.	1978	Oakland University	Mechanical Engineering

- Sabbatical, URRP Appointment, AFOSR/Seiler Research Lab, USAF Academy, 1989-1991
- Director Non-Contact Precision Measurements Lab, Kansas State Univ., 1993-Present
- Asst., Assoc. & Full Professor, Kansas State Univ., 1983- present

Selected Industrial Applications

Railroad Tie Manufacturing Diagnostics

Tie Prestressing Wire Indent Profiling

Laboratory Capabilities

Field Equipment: Optical (LSI) Strain Measurement System, 6-Camera Strain Profiler

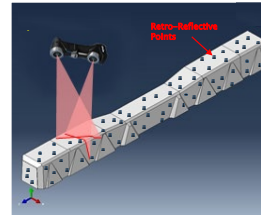**Lab Equipment:** PIV System (3D), LDV System (2D), 3D Optical Scanner, Prestressing Wire Indent Profiler
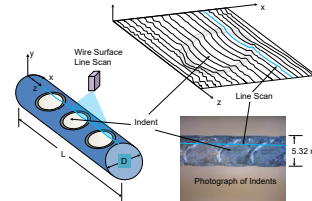
Research Interests

- Laser Velocimetry (PIV, LDV, PLIF)
- Optical Measurements
- Diagnostic Testing for Industrial Applications
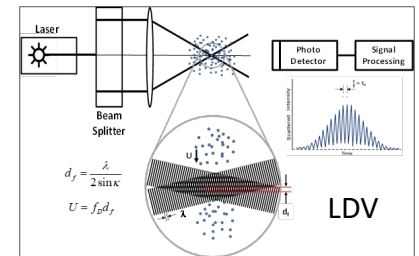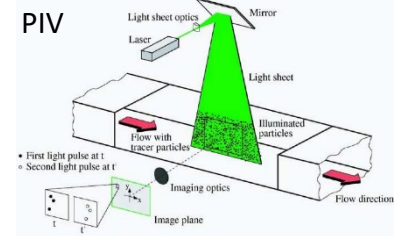- Two-Phase Flows and Heat Transfer

3D Optical Scanning

PIV

Indent Profiling

$$d_f = \frac{\lambda}{2\sin\kappa}$$

$$U = f_D d_f$$

LDV

Research Sponsors

Suprem R. Das, Industrial and Manufacturing Systems Engineering, Assistant Professor, srdas@ksu.edu

Academic / Industrial Experience

B.S.   1996   Utkal University, India   Physics (major & honors)
M.S.   1998   Utkal University, India   Physics (High Energy Physics)
M.S.   2006   University of Puerto Rico   Condensed Matter Physics
Ph.D. 2013   Purdue University   Condensed Matter Physics
        (with specialization in Nanoscience and Nanoelectronics)
Postdoc 2014   Purdue University   Electrical Engineering
Postdoc 2015-17   Iowa State University   Mechanical Engineering
- Ames DOE Lab, Div. of Materials Science and Engineering
- Assistant Professor, Kansas State University, 2017 – present

Academic / Industrial Activities
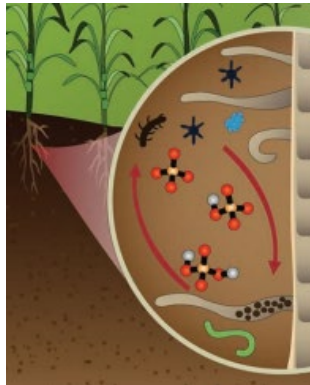
(Printed Graphene Soil Phosphate Sensors - Das, NSF Project)
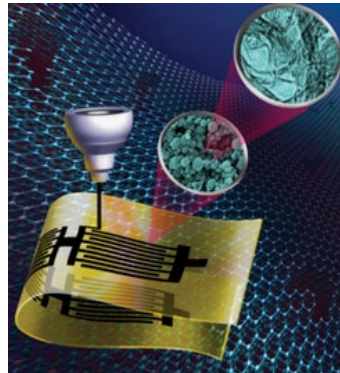
(Printed Graphene aerosol Gel Supercapacitors- Das, Industry Project)

Laboratory Capabilities

- Nanomaterials Synthesis and Characterization
- Additive Manufacturing (Inkjet Printing, 3D Printing)
- Electrical and Electrochemical Measurements

Research Interests

- Nano-dispersion for coating technology and additive manufacturing.
- Carbon-based nanomaterials and hybrid nanoscale materials for coating.
- Graphene inks and carbon nanotube inks manufacturing.
- Light-matter interactions for scalable manufacturing.
- We are interested in applications, including but not limited to, energy and sensing.

Research Sponsors

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DEFENSE MICROELECTRONICS ACTIVITY — UNITED STATES OF AMERICA

Sandia National Laboratories

HydroGraph CLEAN POWER INC.

KANSAS STATE UNIVERSITY

Shuting Lei, Industrial and Manufacturing Systems Engineering, Professor, lei@ksu.edu

Academic / Industrial Experience

B.S.	1987	Tsinghua University, China	Mechanical Engineering
M.S.	1989	Tsinghua University, China	Mechanical Engineering
Ph.D.	1999	Purdue University	Mechanical Engineering

- Asst., Assoc. & Full Professor, Industrial and Manufacturing Systems Engineering, Kansas State University, 1999 - present

Selected Industrial Applications
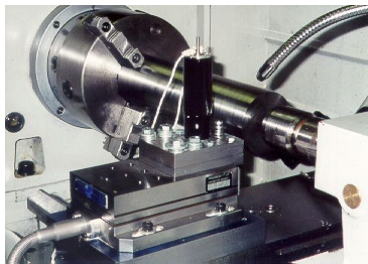
High speed machining of titanium alloy using driven rotary tool
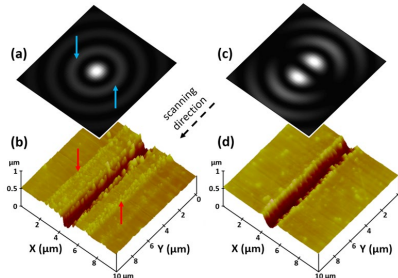
High precision laser micromachining using Bessel beam without ring damage

Laboratory Capabilities

Experimental: Femtosecond laser micromachining system, laser based additive manufacturing setup, CNC machine tools

Numerical: SolidWorks, MatLab, Comsol Multiphysics, HYADES (radiation hydrodynamics code), PFC2D (particle flow code)

Materials characterization: Optical microscope, 3d optical profiler, Kistler multicomponent dynamometer, materials testing equipment, high speed camera, data acquisition system

Research Interests

- Femtosecond laser micromachining
- Laser surface texturing
- Laser based additive manufacturing
- Laser assisted machining
- Laser ablation simulation using radiation hydrodynamics simulation code
- Machining of difficult-to-machine materials including ceramics, titanium alloys, superalloys, glass, composites, etc.
- Cutting tool design and machining tribology
- Machining simulation using finite element method and discrete element method

Laser surface texturing

Laser assisted machining

Laser micromachining

Cutting simulation

Research Sponsors

Davood Pourkargar, Chemical Engineering, Assistant Professor, dbpourkargar@ksu.edu
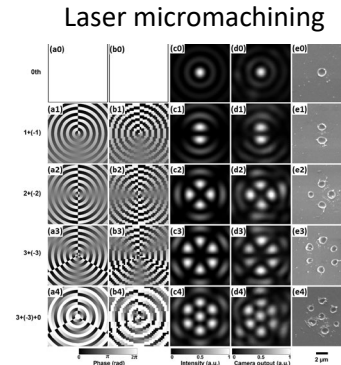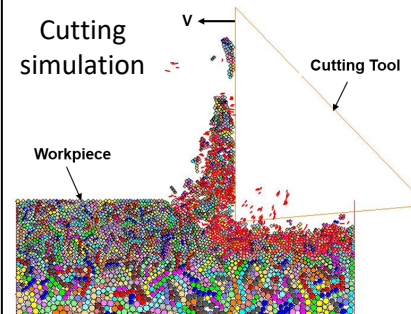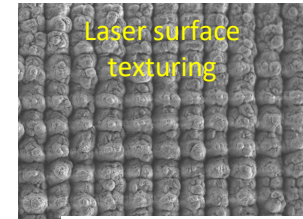
Academic / Industrial Experience

B.S.	2008	Sharif Univ. of Technology	Chemical Engineering
M.S.	2010	Sharif Univ. of Technology	Process Simulation & Control
Ph.D.	2015	Pennsylvania State University	Chemical Engineering

- Postdoctoral Researcher, University of Delaware, 2015-2016
- Postdoctoral Associate, University of Minnesota, 2016-2019
- Senior Engineer, ExxonMobil Research and Engineering, 2019-2020
- Assistant Professor, Kansas State University, 2020-present

Selected Industrial Applications

- Chemical process manufacturing
- Oil and gas processing
- Renewable energy production and management
- Energy storage
- Food processing industry
- Advanced materials processing
- Pharmaceutical industry

Laboratory Capabilities

- Develop computational multiscale modeling tools
- Simulate complex chemical process systems
- Optimal design of experiments
- Simulate integrated energy systems
- Design advanced control systems
- Optimization of large-scale chemical and energy systems
- Design sustainable and resilient process systems
- Develop machine learning-based tools for advanced manufacturing and decision-making

Research Interests

- Process Control
- Autonomous systems
- Computational modeling
- Multiscale simulation of chemical and energy systems
- Distributed control and optimization
- Cyber-physical systems
- Renewable energy productions and storage
- Sustainable and resilient process systems
- Advanced manufacturing
- Additive manufacturing and 3D printing
- Applied artificial intelligence
- Machine learning for engineering applications
- Food processing systems
- Continues pharmaceutical manufacturing
- Techno-economic analysis and life cycle assessment
- Energy, food, water, waste nexus
- Machine learning for biomedicine

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Ajay Sharda, Biological and Agricultural Engineering, Professor, asharda@ksu.edu

Academic / Industrial Experience

B.S.	1998	Punjab Agricultural University	Agricultural Engg
M.S.	2001	Punjab Agricultural University	Agricultural Engg
Ph.D.	2011	Auburn University	Biosystems Engg

- Post-Doc: CPAAS, Washington State University
- Graduate Research Assistant: Auburn University
- Assistant Professor: Punjab Agricultural University, India
- Asst/Assoc/Full Professor, Kansas State University, 2013-present

Selected Industrial Applications

- Sensing solution development and integration for agricultural machine systems
- Intelligent application systems for autonomous ag vehicles

Laboratory Capabilities

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- Computer vision system development and applications
- Sensing system development and validation
- Data analytics

Research Interests

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- Sensing and automation
- Data analytics for digital agriculture
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- Autonomous systems for intelligent sense and spray
- Remote sensing for crop health and machine performance metrics

Research Sponsors

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10-2022

Gurpreet Singh, Mechanical and Nuclear Engineering, Professor, gurpreet@ksu.edu

Academic / Industrial Experience

B.S.   2003 College of Engineering, Pune   Mechanical Engg.
M.S.   2006 Univ of Colorado, Boulder   Mechanical Engg.
Ph.D.   2007   Univ of Colorado, Boulder   Mechanical Engg.

- Student and Guest researcher, NIST, Boulder, 2006
- Postdoc, Virginia Tech, 2008-2009
- Professor, Kansas State University, 2009 - present
- Director: Multinational NSF PIRE Ceramics project, Kansas State University, current

Selected Industrial Applications

- Energy storage—batteries and supercapacitors
- Jet Engines, Nuclear Reactors–Ceramic Matrix Composites
- Additive Manufacturing of Ceramics and Ceramic protective coatings for ultrahigh temperature applications

Research Interests

- Nanotechnology (2D materials)
- Preceramic polymer rheology
- Glass and ceramics technologies
- Additive manufacturing technologies (processing, quality/qualification)
- Lithium-ion, Li-S, Na-ion batteries and supercapacitors
- Advanced and aerospace composites/hybrid technologies

Laboratory Capabilities

Processing: Several ultrahigh temperature furnaces, high precision glovebox, 3-D printer, fume hood for processing of preceramic polymers and ceramic matrix composites.

Characterization: Scanning electron microscope, mechanical testing, battery and supercapacitor testing.

Research Sponsors

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11-2022

Tim Sobering, [Electronics Design Laboratory](), Director, [edl@ksu.edu]()

Academic / Industrial Experience

B.S. 1982   Kansas State University Electrical Eng.

M.S. 1984   Kansas State University Electrical Eng.

- SMTS, Sandia National Laboratories, 1984-1996
- Director, EDL, K-State, 1996 - present
- Senior Professor of Practice, K-State, 2022-present

Laboratory Staff

Tim J. Sobering, MSEE, specializes in precision analog circuit design, modeling, system engineering, and technical management.

Russell Taylor, MSEE, PE, specializes in embedded control and data acquisition systems, FPGA, and software design.

David Huddleston, BSET, specializes in electronics manufacturing and assembly, PCB fabrication, and soldering and rework

Selected Projects

- DOMINO® MSND Radiation Detector (RDT)
- Mu2e FEB Production (FNAL)
- FPIX Phase II Electronics (CERN)
- Reconfigurable Wearable Det. Device (DTRA)
- Graphene Chamber Inst. (Hydrograph)
- Compact small angle scatting detector (SNL) (U of Memphis) (Washington University)
- NASA EPSCoR Microtransmitter Development

Laboratory Capabilities

- The Electronics Design Laboratory (EDL) is a multidisciplinary support facility supporting the research and educational programs at Kansas Regents Institutions and assisting technology start-ups in the State of Kansas.

- EDL's expertise in the development and manufacturing of high-end electronics and computer-based data acquisition systems enables researchers' to focus on their core expertise while also having easy access to advanced electronics to support the development of field-ready systems.

- EDL is structured to provide ongoing support as research programs grow and evolve, and also provides valuable hands-on experience for student interns who work directly with experienced engineers on customers' projects.

Research Sponsors

Sandia National Laboratories · NASA · Honeywell · USDA · U.S. DEPARTMENT OF ENERGY · RADIATION DETECTION TECHNOLOGIES, INC. · KANSAS STATE UNIVERSITY

Mingjun Wei, Mechanical and Nuclear Engineering, Associate Professor, mjwei@ksu.edu

Academic / Industrial Experience

B.S.   1996   University of Science and Technology of China
M.S.   2001   University of California, Los Angeles
Ph.D.   2004   University of Illinois at Urbana-Champaign

- Postdoctoral Research Associate, Princeton University, 2005-06
- Asst./Assoc. Professor, New Mexico State University, 2006-2016
- Associate Professor, Kansas State University, 2016 - present
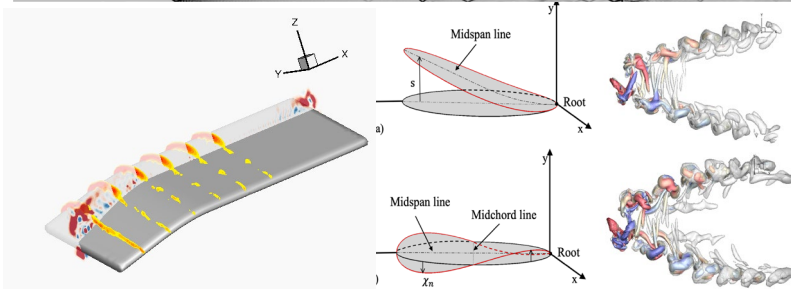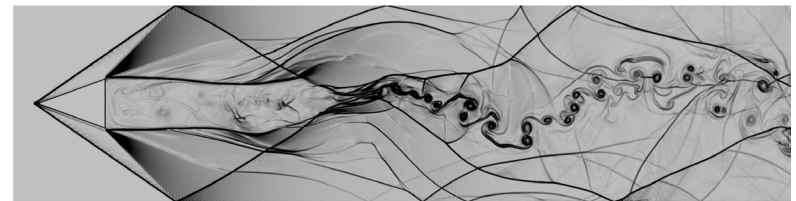
Selected Industrial Applications

- Computational Fluid Dynamics: Gas Flow (CFD)
- Data Science and Analysis
- Autonomous vehicle (i.e. UAVs and Drones) design, detection, and control
- Reduced order models for real-time flow controls
- Adjoint-based algorithms for optimal shape or motion design for industrial applications with complex flow systems

Laboratory Capabilities

- Dr. Wei's C-Sofa (Computational Science for Fluids and Acoustics) lab uses in-house code, open-source code, or commercial software for high-performance computation (HPC) of incompressible and compressible flows.
- The lab's computational capabilities also include data-driven modeling and machine learning, algorithms for flow control and optimization.
- The lab owns a few high-end computer servers and a wide range of software licenses.
- The C-Sofa lab currently has or has had accesses to various super-computer centers for more intensive computational needs.

Research Interests

- High-performance computation for the simulation of both incompressible and compressible flows including turbulent flows, fluid-structure interaction, shock-turbulence interaction, shock-structure interaction, aeroacoustics.
- Data-driven reduced-order models (ROM) of complex fluid flow systems for the purpose of real-time computation and autonomous control.
- Adjoint-based optimization for fixed-wing and flapping-wing aerodynamic performance

Research Sponsors

Meng Zhang, Industrial and Manufacturing Systems Engineering, Associate Professor, meng@ksu.edu
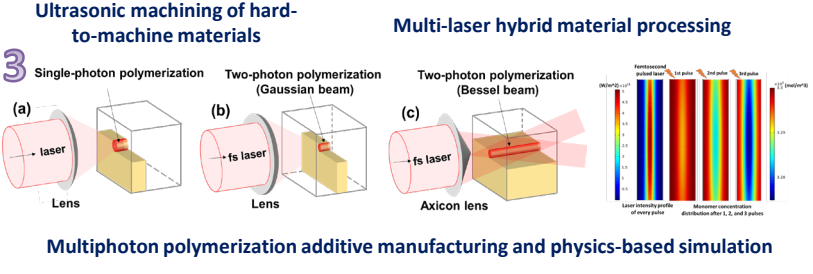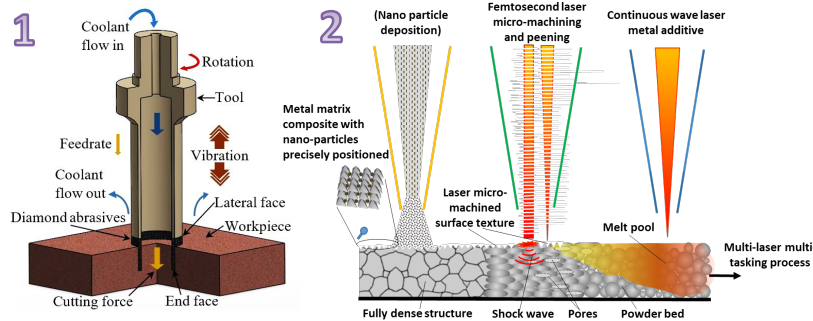
Academic / Industrial Experience

B.S.   2009   Dalian Univ of Technology   Mechanical Engineering
Ph.D.   2014   Kansas State University   Industrial Engineering
- Visiting Assistant Professor, Kansas State University, 2015-2016
- Asst. & Assoc. Professor, Kansas State University, 2016 - present

Selected Industrial Applications

**Field-assisted manufacturing (ultrasonic vibration and ultrafast laser)**

Ultrasonic machining of hard-to-machine materials

Multi-laser hybrid material processing

Multiphoton polymerization additive manufacturing and physics-based simulation

Laboratory Capabilities

Machines: Ultrasonic and rotary ultrasonic machines
Lasers: Continuous wave and ultrafast lasers (IMSE laser lab)
Reactors: Supercritical Carbon dioxide and Parr reactors
Measurements: Kistler dynamometer and capacitive displacement sensor
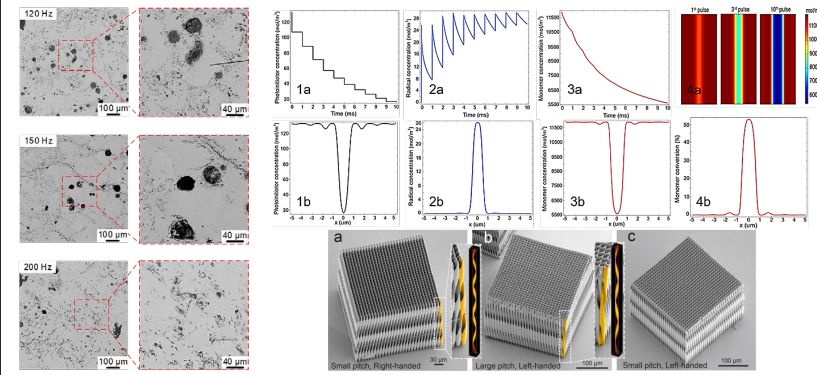*Computation*: COMSOL and ABAQUS FEA software

Research Interests

Ultrasonic-assisted processes: hole-making, pelleting, powder densification, pretreatment, *etc*.
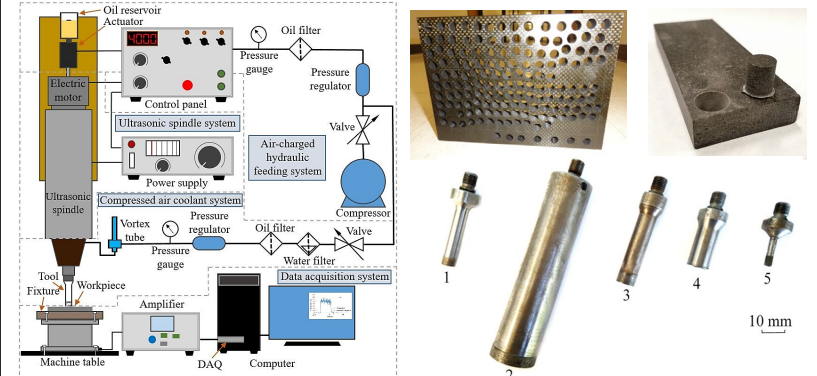
Making holes in ceramics, rocks, aerospace materials (CFRP, Ti, & SS)

Laser-assisted processes: powder-based additive manufacturing and multiphoton polymerization

Metal AM of 316L SS   **Multiphoton AM (with Drs. Yu and Kuebler, UCF)**

Research Sponsors

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