NC STATE Engineering

# 2022-23
# NEW FACULTY

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# FROM THE **DEAN OF ENGINEERING**

Dear Friends and Colleagues,

This year, the College of Engineering at NC State welcomes 38 new faculty members. We feel very fortunate to have recruited this distinguished and talented group. We are confident that their talents and accomplishments will take our College to even higher levels of achievement and provide our undergraduate and graduate students with exciting, new opportunities to strengthen the breadth and depth of their education. We are grateful to the departmental faculty recruiting committees and department heads for their exceptional work in attracting such outstanding candidates. Their insight and judgment were critical to the task, and the College has richly benefited from their efforts. We also want to acknowledge the significant commitments that have been made to the College by the university and the state that have facilitated this recruitment process. We are delighted with this important show of support and are excited about the prospects that our growing faculty will provide in the future, especially as we expand our College with funding from the state legislature's Engineering North Carolina's Future intiative.

We also extend a very warm and cordial welcome to our new faculty members and are delighted that you are now part of NC State's College of Engineering family. Please be assured that we are committed to providing you with an environment that will facilitate your success, allow you to achieve your full potential and ultimately turn your ideas and dreams into reality.

Sincerely,

Louis A. Martin-Vega, Ph.D.
*Professor and Dean*

**Assistant Professor**
Ph.D. (2022), Iowa State University

Research Interests: Agricultural robotics, 2D and 3D computer vision and machine learning.

# LIRONG XIANG

Xiang received her B.S. in biosystems engineering from Zhejiang University in Hangzhou, China. She received her Ph.D. in agricultural engineering from Iowa State University (ISU). She was a postdoctoral researcher in the Automation and Robotics Laboratory at ISU, led by Lie Tang, professor of agricultural and biosystems engineering.

Xiang's research is about high-fidelity biological sensing. During her Ph.D. program, she has been dedicating her efforts and time to developing robotic-assisted and automated facilities for plant phenotyping; S=stereo-vision-based image sensors for high-throughput, field-based plant phenotyping; and automated artificial intelligence (AI)-driven pipelines to analyze 2D and 3D images.

**Xiang, L.**, Tang, L., Gai. J., and Wang, L. (2021). Measuring stem diameter of sorghum plants in the field using a high-throughput stereo vision system. *Transactions of the ASABE, 64 (6).*

**Xiang, L.**, Nolan, T. M., Bao, Y., Elmore, M., Tuel, T., Gai, J., ... and Tang, L. (2021). Robotic Assay for Drought (RoAD): An Automated Phenotyping System for Brassinosteroid and Drought Response. *The Plant Journal, 107*(6)*, 1837-1853.*

**Xiang, L.**, Bao, Y., Tang, L., Ortiz, D., and Salas-Fernandez, M. G. (2019). Automated morphological traits extraction for sorghum plants via 3D point cloud data analysis. *Computers and Electronics in Agriculture, 162*, 951-961.





**Assistant Professor**
Ph.D. (2017), Lomonosov Moscow State University

Research Interests: Polymer physics, statistical physics of polyelectrolytes and polyampholytes, microphase separation in ionic polymer systems, role of monomer sequences, charge correlation effects, micellization of ionic polymers, polyelectrolyte gels and complex coacervates, polymer microgels.

# ARTEM RUMYANTSEV

Rumyantsev received his B.S. and M.S. in physics with honors from Lomonosov Moscow State University in 2013. He earned his Ph.D. in polymer physics from the same school in 2017. During his doctoral studies, he was simultaneously working in DWI–Leibniz Institute for Interactive Materials at RWTH Aachen University, Germany. He was a CNRS postdoctoral researcher in Pau, France. Prior to joining NC State University, he was a postdoctoral fellow at the Pritzker School of Molecular Engineering at the University of Chicago.

Rumyantsev's group combines scaling theory, field-theoretic methods and coarse-grained simulations to explore the relationship between the polymer structure and the physical properties of the resulting materials. Their research also deals with fundamental problems of polymer physics, including the biological context. Particular attention is paid to ionic polymers, such as polyelectrolytes and polyampholytes, in which the combination of long-range Coulomb interactions and connectivity of charges results in unique conformational and phase behaviors.

Rumyantsev, A. M.; de Pablo, J. J. Microphase separation in polyelectrolyte blends: Weak segregation theory and relation to nuclear "pasta." *Macromolecules* **2020**, 53, 1281-1292.

Rumyantsev, A. M.; Jackson, N. E.; Yu, B.; Ting, J.; Chen, W.; Tirrell, M. V.; de Pablo, J. J. Controlling complex coacervation via random polyelectrolyte sequences. *ACS Macro Lett.* **2019**, 8, 1296-1302.

Rumyantsev, A. M.; Zhulina, E. B.; Borisov, O. V. Scaling theory of complex coacervate core micelles. *ACS Macro Lett.* **2018**, 7, 811-816.

Rumyantsev, A. M.; Gumerov, R. A.; Potemkin. I. I. Polymer microgel at liquid-liquid interface: Theory vs computer simulations. *Soft Matter* **2016**, 12, 6799-6811.

Philippova, O. E.; Rumyantsev, A. M.; Kramarenko, E. Yu.; Khokhlov, A. R. New type of swelling behavior upon gel ionization: Theory vs experiment. *Macromolecules* **2013**, 46, 9359-9367.

**Assistant Professor**
Ph.D. (2020), University of Minnesota

Research Interests: Nonlinear control, data-driven control, derivative-free (black-box) optimization, distributed optimization, large-scale systems.

# WENTAO TANG

Tang was born in Hunan Province, China. He received his B.S. in chemical engineering and a secondary degree in mathematics and applied mathematics from Tsinghua University in 2015, and his Ph.D. in chemical engineering at University of Minnesota in 2020. He was a process control engineer at Shell Global Solutions (U.S.) Inc., where he undertook multiple research projects for the development of Shell's advanced process control software, prior to joining NC State University.

His current research focuses on developing data-driven control algorithms that integrate nonlinear control theory with machine learning techniques, which avoid detailed dynamic modeling procedures and can be more flexible for systems with complex dynamics. He is also interested in derivative-free algorithms for optimization problems without explicit algebraic models, especially in how the solution of large-scale problems can benefit from the identification of underlying network topology, decomposition of networks into constituent subsystems and adoption of acceleration schemes.


Tang, W., Allman, A., Pourkargar, D. B., & Daoutidis, P. (2018). Optimal decomposition for distributed optimization in nonlinear model predictive control through community detection. *Computers & Chemical Engineering*, 111, 43-54.

Tang, W., & Daoutidis, P. (2018). Distributed adaptive dynamic programming for data-driven optimal control. *Systems & Control Letters*, 120, 36-43.

Tang, W., & Daoutidis, P. (2021). Dissipativity learning control (DLC): Theoretical foundations of input–output data-driven model-free control. *Systems & Control Letters*, 147, 104831.

Tang, W., & Daoutidis, P. (2021). Coordinating distributed MPC efficiently on a plantwide scale: The Lyapunov envelope algorithm. *Computers & Chemical Engineering*, 155, 107532.

Tang, W., & Daoutidis, P. (2022). Fast and stable nonconvex constrained distributed optimization: The ELLADA algorithm. *Optimization and Engineering*, 23, 259-301.






**Associate Professor**
Ph.D. (2017), University of Wisconsin-Madison

Research Interests: Post-wildfire slope stability; laboratory characterization of mechanical, hydraulic and physicochemical behavior of soils; expansive clay behavior and geosynthetic clay liners; unsaturated soil mechanics; biogeotechnics.

# IDIL DENIZ AKIN

Akin earned her Ph.D. in 2017 and M.S. in 2014 from University of Wisconsin-Madison Civil and Environmental Engineering Department, and her B.S. in 2012 from Middle East Technical University, Turkey. Prior to joining NC State University, she was an assistant professor at Washington State University, where she developed an active teaching and research program in unsaturated soil mechanics and biogeotechnics.

Akin's current major research interest is in post-wildfire slope stability. She studies post-wildfire, wetting-induced landslides, runoff-dominated erosion, associated debris flows and hillslope stabilization. Her group uses a variety of techniques, from the atomic scale to the field scale, to understand the fundamental mechanisms that lead to unstable conditions. She also leads projects in bio-inspired and bio-mediated geotechnics. Her most recent project aims to understand how kangaroo rat burrows stay stable for extended periods under extreme environmental conditions.

Her research has been sponsored by multiple sources including the National Science Foundation (NSF), Department of Transportation and industry. She is a recipient of the 2021 NSF CAREER Award.


Akin, I.D., Potter, L.S., and Edil, T.B., 2021, "Implications of interparticle forces on resilient and shear modulus of unsaturated compacted kaolinite," *J. Geotech. Geoenviron. Eng.*, doi: 10.1061/(ASCE)GT.1943-5606.0002692.

Akin, I.D., and Akinleye, T.O., 2021, "Water vapor sorption behavior of wildfire-burnt soil," *J. Geotech. Geoenviron. Eng.*, doi: 10.1061/(ASCE)GT.1943-5606.0002648.

Akin, I.D., and Likos, W.J., 2020, "Suction stress of clay over a wide range of saturations," *Geotechnical and Geological Engineering*, doi: https://doi.org/10.1007/s10706-019-01016-7.

Akin, I.D., and Likos, W.J., 2017, "Implications of surface hydration and capillary condensation to strength and stiffness of compacted clay," *J. Eng. Mech.*, doi:10.1061/(ASCE)EM.1943-7889.0001265.

Akin, I.D., and Likos, W.J., 2014, "Specific surface area of clay using water vapor and EGME sorption methods," *Geotech. Test. J.*, Vol.37 (6): 1-12.

**Associate Professor**
Ph.D. (2009), University of Illinois, Urbana-Champaign

Research Interests: Computational mechanics, interface mechanics, coupled problems, composite materials, multiscale methods, damage mechanics, physics-informed machine learning.

# GHADIR HAIKAL

Haikal holds a bachelor's degree in civil engineering from Tishreen University, Syria, and M.S. and Ph.D degrees from the University of Illinois at Urbana-Champaign, also in civil engineering. She was an assistant professor in the Lyles School of Civil Engineering at Purdue University. Prior to joining the NC State University faculty, Haikal led the Computational Materials Integrity group in the Materials Engineering Department at Southwest Research Institute in San Antonio, Texas.

Haikal's research focuses on developing advanced computational models for assessing structural integrity and resilience in complex structures and materials governed by interactions on interfaces at different scales. Her work has introduced efficient and accurate numerical formulations of contact, bond, friction and damage on critical load transfer interfaces in civil, mechanical and aerospace applications, including bond and anchorage of reinforcement in structural concrete. Haikal's research targets the development of interface-driven multiscale models for novel composites and physics-informed machine learning methodologies for modeling structures and materials with limited data.


Seok, S., Haikal, G., Ramirez, J., Lowes, L. and Lim, J.-H. (2020) "Finite element simulation of bond-zone behavior of pullout test of reinforcement embedded in concrete using Concrete Damage-Plasticity Model 2 (CDPM2) for engineering structures." *Engineering Structures*, 221, 110984.

Amaireh, L. and G. Haikal, G. (2019) "Coupling non-matching finite element discretizations in small-deformation inelasticity: Numerical integration of interface variables" *Coupled System Mechanics*, 8(1), 71-93.

Seok, S., Haikal, G., Ramirez, J. and Lowes, L. (2018) "High-resolution finite element modeling for bond in high-strength concrete beams." *Engineering Structures*, 173: 918-922.

Montero, J. and Haikal, G. (2018) "Modeling beam-solid finite element interfaces: a stabilized formulation for contact and coupled systems." *International Journal of Applied Mechanics, Imperial College Press*, 10(9), 1850094.

Haikal, G. and Hjelmstad, K. D. (2007) "A finite element formulation of non-smooth contact based on oriented volumes for quadrilateral and hexahedral elements." *Computer Methods in Applied Mechanics and Engineering*, 196:4690–4711.






**Professor and Head**
Ph.D. (2007). Carnegie Mellon University

Research Interests: Interdisciplinary research on the quantification of risks due to environmental contamination and on the quantitative comparison policy options for controlling environmental risks.

# JACQUELINE MACDONALD GIBSON

MacDonald Gibson received her B.S. in mathematics from Bryn Mawr College, her M.S. in environmental science in civil engineering from the University of Illinois at Urbana-Champaign and a dual Ph.D. degree in civil and environmental engineering and engineering and public policy from Carnegie Mellon University.

Prior to her current position, MacDonald Gibson served for 12 years on the faculty of the Department of Environmental Sciences and Engineering in the Gillings School of Public Health at the University of North Carolina at Chapel Hill. She has also worked in senior engineer and research positions in the private and public sector. MacDonald Gibson is a topic editor of *Environmental Science & Technology* and serves on the Emerging Issues Committee for the Health Effects Science Institute and as chair of the Justice, Equity and Risk Specialty Group for the Society for Risk Analysis. She was an RTI University Scholar and received the IBM Junior Faculty Development Award and the Newton Underwood Award for Excellence in Teaching, Department of Environmental Sciences and Engineering, from UNC-Chapel Hill.


**MacDonald Gibson, J.**, J. M. MacDonald, M. Fisher, X. Chen, A. Pawlick, and P. J. Cook. 2022. Early-life lead exposure from private well water increases juvenile delinquency risk among U.S. teens. *Proceedings of the National Academy of Sciences of the United States of America* 119(6):e21110694119. doi.org/10.1073/pnas.2110694119

**MacDonald Gibson, J.**, M. Fisher, A. Clonch, John M. MacDonald, and P. Cook. 2020. Children drinking private well water have higher blood lead than those with city water. *Proceedings of the National Academy of Sciences of the United States of America* 117(29):16898-16907. DOI: 10.1073/pnas.2002729117

Mulhern, R., N. Bynum, C. Liyanapatirana, N. J. DeStepano, D. Knappe, and **J. MacDonald Gibson**. 2021. Longitudinal assessment of point-of-use carbon filters for removal of per- and polyfluoroalkyl substances from private well water. *AWWA Water Science* 3(6):e-1262.

Mulhern, R., J. Roostaei, S. Schwetschenau, T. Pruthi, C. Campbell, and **J. MacDonald Gibson**. 2022. A new approach to a legacy concern: predicting lead exposure risk in community water systems using machine-learned Bayesian networks. *Environmental Research* (204):112146. https://doi.org/10.1016/j.envres.2021.112146.

Lockhart, S., E. Wood, and **J. MacDonald Gibson**. 2020. Impacts of exclusion from municipal water service on water availability: A case study. *NEW SOLUTIONS: A Journal of Environmental and Occupational Health Policy* 30(2):127-137. DOI: 10.1177/1048291120932913

**Assistant Professor**
Ph.D. (2021), Stanford University

Research Interests: Advanced models for prediction of fracture in metals, finite element analysis, seismic engineering, uncertainty quantification, application of machine learning to civil engineering problems.

# ANDREW ZICCARELLI

Ziccarelli received his B.S. in civil engineering with a concentration in structures from the University of Notre Dame in 2011. He received his M.S. in civil and environmental engineering from Stanford University in 2014. After his M.S., he worked in industry as a practicing structural engineer at Tylk, Gustafson, Reckers, Wilson, Andrews (TGRWA), LLC in Chicago. In 2017, he returned to Stanford to pursue a Ph.D. He graduated with a Ph.D. in civil and environmental engineering in 2021, and joined the faculty at NC State University in January 2022.

Ziccarelli studies the behavior of civil structures under extreme limit states, with a particular emphasis on steel structures, and on the failure mode of fracture. As a doctoral student, he developed a novel technique for simulating ductile crack propagation in structural steel, and implemented this approach into an open-source finite element analysis program. His current work focuses on brittle cleavage fracture in steel and seismic engineering. His work involves both computational and experimental components.


Ziccarelli, A., Lao, X., Pericoli, V., Kanvinde, A., & Deierlein, G. (2022). "Finite-element simulation of ductile crack propagation in steel structures." *Proceedings of the Annual Stability Conference*, Structural Stability Research Council, American Institute of Steel Construction, Denver, CO.

Smith, C., Ziccarelli, A., Terashima, M., Kanvinde, A., Deierlein, G. (2021). "A stress-weighted ductile fracture model for steel subjected to ultra-low cycle fatigue." *Engineering Structures*, *245*, 112964.

Pericoli, V., Lao, X., Ziccarelli, A., Kanvinde, A. Deierlein, G. (2021). "Integration of an adaptive cohesive zone and continuum ductile fracture model to simulate crack propagation in steel structures." *Engineering Fracture Mechanics*, *258*, 108041.

Ziccarelli, A. (2021). *Simulating Earthquake-Induced Ductile Crack Propagation and Brittle Fracture in Steel Structures*. Stanford University [Doctoral Dissertation].

Pericoli V., Lao X., Terashima M., Ziccarelli A., Deierlein G., Kanvinde A. (2018). "Simulation of ductile fracture propagation in structural steel subjected to ultra-low cycle fatigue." *Proceedings of the 11th National Conference in Earthquake Engineering*, Earthquake Engineering Research Institute, Los Angeles, CA.






**Teaching Assistant Professor**
Ph.D. (2022), NC State University

Research Interests: Computer science and game design education, especially in project-based courses featuring design work, as well as procedural content generation.

# ALEXANDER CARD

Card received B.S. degrees in both mathematics and computer science and a M.S. in mathematics from the University of Central Missouri. After receiving his M.S., he taught mathematics courses at his alma mater before receiving his Ph.D. in computer science from NC State University.

Presently, Card studies the struggles novice game designers face in their coursework and investigates methods which can be used to facilitate learning and communication in the classroom.


A. Card and C. Martens, "The Ceptre Editor: A Structure Editor for Rule-Based System Simulation," 2019 IEEE Symposium on Visual Languages and Human-Centric Computing (VL/HCC), 2019, pp. 133-137, doi: 10.1109/VLHCC.2019.8818687.

A. Card, W. Wang, C. Martens and T. Price, "Scaffolding Game Design: Towards Tool Support for Planning Open-Ended Projects in an Introductory Game Design Class," in 2021 IEEE Symposium on Visual Languages and Human-Centric Computing (VL/HCC), St Louis, MO, USA, 2021 pp. 1-5. doi: 10.1109/VL/HCC51201.2021.9576209

**Associate Professor**
Ph.D. (2007), University of Illinois at Urbana-Champaign

Research Interests: Software testing and debugging, runtime verification, artificial intelligence (AI) for software engineering (SE), SE for AI, code repair.

# MARCELO D'AMORIM

d'Amorim received his Ph.D. from the University of Illinois at Urbana-Champaign in October 2007. Before joining NC State University, he was an associate professor at the Federal University of Pernambuco, Brazil.

His research interests are in software engineering, with a focus on improving software reliability through program analysis and systematic testing. Software bugs are expensive and inevitable as software is mostly written by humans or automatically synthesized via machine learning. His research focuses on improving various software quality assurance tasks, including bug prevention, bug finding, bug diagnosis and code repair. As part of his research, d'Amorim developed tools to automate software testing and debugging activities. The tools he developed revealed many bugs in code and were integrated into other software.


F. Molina, N. Aguirre, and M. d'Amorim. Fuzzing Class Specifications. In *International Conference on Software Engineering (ICSE)*. May 2022.

J. Henkel, D. Silva, L. Teixeira, M. d'Amorim, and T. Reps. Shipwright: A Human-in-the-Loop System for Dockerfile Repair. In *International Conference on Software Engineering (ICSE)*. May 2021.

B. Miranda, I. Lima, O. Legunsen, and M. d'Amorim. Prioritizing Runtime Verification Violations. In *IEEE International Conference on Software Testing, Verification and Validation (ICST)*. October 2020.

X. Li, S. Zhu, M. d'Amorim, and A. Orso. Enlightened Debugging. In *International Conference on Software Engineering (ICSE)*. May 2018.

M. Borges, A. Filieri, M. d'Amorim, C. S. P˘as˘areanu, and W. Visser. Compositional Solution Space Quantification for Probabilistic Software Analysis. In *ACM/SIGPLAN Programming Language Design and Implementation (PLDI)*. June 2014.






**Teaching Assistant Professor**
Ph.D. (2022), North Carolina State University

Research Interests: Activity sequences, educational data mining, novel exercise types, training regimens, student modeling, personalized student feedback, general student attitudes toward computer science.

# ADAM GAWEDA

Gaweda received two bachelor degrees from the University of North Carolina at Wilmington. He holds a B.S. in computer science and a B.A. in theatre with a focus on performance. He also holds an M.S in computer science and information systems from UNC Wilmington. Gaweda earned his Ph.D. in computer science from NC State University. Prior to joining NC State, he was the lead software development instructor for Cape Fear Community College and a systems analyst and research developer for Efficient Energy Technology, a smart-thermostat company out of Leland, NC.

During his M.S. at UNCW, Gaweda's research focused primarily on biometric identifiers for individuals including individual identification based on facial dynamics and artificial face aging. However, after finding a passion for teaching, his Ph.D. research focused on applying artificial intelligence toward computer science (CS) education. Currently, he studies lower-level practice exercise types commonly found in CS courses and determining how to provide students with deliberate practice to improve their skills.

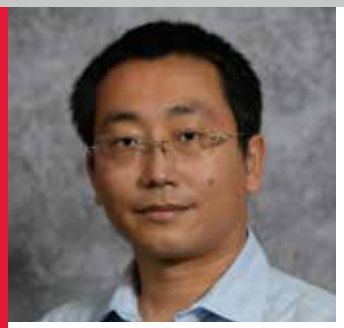

Gaweda, A. M., Lynch, C. F., Seamon, N., Silva de Oliveira, G., & Deliwa, A. (2020, February). Typing exercises as interactive worked examples for deliberate practice in cs courses. In Proceedings of the Twenty-Second Australasian Computing Education Conference (pp. 105-113).

Gaweda, A. M., & Lynch, C. F. (2021). Student Practice Sessions Modeled as ICAP Activity Silos. International Educational Data Mining Society.

Gaweda, A. M., & Lynch, C. F. (2022, March). Exploration of the Week-by-Week ICAP Transitions by Students. In Proceedings of the 53rd ACM Technical Symposium on Computer Science Education V. 2 (pp. 1088-1088).

Ma, Y., Martinez Ruiz, J., Brown, T. D., Diaz, K. A., Gaweda, A. M., Celepkolu, M., ... & Wiebe, E. (2022, February). It's Challenging but Doable: Lessons Learned from a Remote Collaborative Coding Camp for Elementary Students. In Proceedings of the 53rd ACM Technical Symposium on Computer Science Education V. 1 (pp. 342-348).

Gaweda, A., & Patterson, E. (2011, March). Individual identification based on facial dynamics during expressions using active-appearance-based Hidden Markov Models. In 2011 IEEE International Conference on Automatic Face & Gesture Recognition (FG) (pp. 797-802). IEEE.



**Associate Professor**
Ph.D. (2016), University of North Carolina at Chapel Hill

Research Interests: Real-time scheduling, machine learning (time series prediction and sparse discriminant learning), cyber-physical systems (autonomous driving and medical).

# ZHISHAN GUO

Guo received his B.Eng. (with honor) in computer science and technology from Tsinghua University, Beijing, China; his M.Phil. degree in mechanical and automation engineering from The Chinese University of Hong Kong, Hong Kong; and his Ph.D. degree in computer science from the University of North Carolina at Chapel Hill. Prior to joining the NC State University faculty, he was a tenure-track assistant professor and then a tenured associate professor in the Department of Electrical and Computer Engineering at the University of Central Florida (UCF).

His current research efforts are related to safety-critical autonomous systems, wearable medical sensor systems, intelligent medical education and diagnose systems, as well as smart city and smart transportation / tourism. During his years at UCF, his group published more than 25 papers on top-tier (CSRanking) conference venues and more than 20 Institute of Electrical and Electronics Engineers (IEEE) / Association for Computing Machinery (ACM) transaction papers in real-time cyber-physical systems, design automation and machine learning domains. His group has received several awards, including the Best Paper award of EMSOFT, and the Best Student Paper, Best Industry Solution and Outstanding Paper awards of Real-Time Systems Symposium (RTSS). His research is sponsored by the National Science Foundation (over $2 million) and several industry partners. He has also received departmental teaching and IEEE service awards.


Jiang Bian*, Abdullah Al Arafat*, Haoyi Xiong, Jing Li, Li Li, Hongyang Chen, Dejing Dou, Jun Wang, and Zhishan Guo. Machine Learning in Real-Time Internet of Things Systems, IEEE Internet of Things Journal (IoT-J), to appear, 2022.

Abdullah Al Arafat, Kurt Wilson, Sudharsan Vaidhun, Jinghao Sun, and Zhishan Guo. Response Time Analysis for Dynamic Priority Scheduling in ROS2. Proceedings of 59th Design Automation Conference (DAC), July 2022.

Jinghao Sun, Rongxiao Shi, Kexuan Wang, Nan Guan, and Zhishan Guo. Efficient Feasibility Analysis for Graph-based Real-Time Task Systems. International Conference on Embedded Software (EMSOFT), Sept. 2020. (Best Paper Award)

Ashikahmed Bhuiyan*, Kecheng Yang*, Samsil Arefin, Abusayeed Saifullah, Nan Guan, and Zhishan Guo. Mixed-Criticality Multicore Scheduling of Real-Time Gang Task Systems. Proceeding of 40th IEEE Real-Time Systems Symposium (RTSS), Hong Kong, China, Dec. 2019. (Outstanding Paper Award, Best Student Paper Award)

Haoyi Xiong*, Kafeng Wang*, Jiang Bian*, Zhanxing Zhu, Cheng-zhong Xu, Zhishan Guo, and Jun Huan. SpHMC: Spectral Hamiltonian Monte Carlo. Proceeding of the 33rd AAAI Conference on Artificial Intelligence (AAAI), Honolulu, USA, Feb. 2019.






**Assistant Professor**
Ph.D. (2017), University of Illinois at Urbana-Champaign

Research Interests: Resource- / time-dependent machine learning, AI / machine learning for cyber-physical and embedded systems, safety- / time-critical systems and real-time multicore systems.

# JUNG-EUN KIM

Kim received B.S. and M.S. degrees in computer science and engineering from Seoul National University, Korea. She received her Ph.D. in computer science from the University of Illinois at Urbana-Champaign. Kim was an associate research scientist in the Department of Computer Science at Yale University. Prior to joining NC State University, Kim was an assistant professor in the Department of Electrical Engineering and Computer Science at Syracuse University.

Kim is looking into AI/machine learning through the lens of systems. She studies "succinct" AI/machine learning solutions, from neural network architecture level to application level, which can be incorporated in resource-constrained environments such as embedded and edge platforms.

Kim is a co-principal investigator on a National Science Foundation Secure and Trustworthy Cyberspace (SaTC) CORE from 2020-23. Kim was awarded a GPU Grant from NVIDIA Corporation, selected for the Massachusetts Institute of Technology Electrical Engineering and Computer Science Rising Stars and is a recipient of the Richard T. Cheng Endowed Fellowship.


Cuong Tran, Ferdinando Fioretto, **Jung-Eun Kim**, and Rakshit Naidu, "*Pruning has a disparate impact on model accuracy,*" *CoRR abs/2205.13574 [cs.LG]*, 2022.

**Jung-Eun Kim**, Richard Bradford, Max Del Giudice, and Zhong Shao, "*Adaptive Generative Modeling in Resource-Constrained Environments,*" in Proceedings of the 24th ACM/IEEE Design, Automation, and Test in Europe (DATE), Feb. 2021.

**Jung-Eun Kim**, Richard Bradford, Max Del Giudice, and Zhong Shao, "*Paired Training Framework for Time-Constrained Learning,*" in Proceedings of the 24th ACM/IEEE Design, Automation, and Test in Europe (DATE), Feb. 2021.

**Jung-Eun Kim**, Richard Bradford, and Zhong Shao, "*AnytimeNet: Controlling Time-Quality Tradeoffs in Deep Neural Network Architectures,*" in Proceedings of the 23rd ACM/IEEE Design, Automation, and Test in Europe (DATE), Mar. 2020.

**Jung-Eun Kim**, Richard Bradford, Man-Ki Yoon, and Zhong Shao, "*ABC: Abstract prediction Before Concreteness,*" in Proceedings of the 23rd ACM/IEEE Design, Automation, and Test in Europe (DATE), Mar. 2020.

**Associate Professor**
Ph.D. (2014), University of Nebraska-Lincoln

Research Interests: Combination of human-computer interaction, software engineering and artificial intelligence, with a focus on the human aspects of software engineering by studying and modeling programmer behavior and then designing and developing mixed-initiative programmer-computer systems.

# SANDEEP KAUR KUTTAL

Kuttal received her Ph.D. in computer science from the University of Nebraska-Lincoln. She received her B.Tech and M.Tech (with distinction) in computer science and engineering from the Punjab Technical University, India. She was a postdoctoral researcher in the School of Electrical Engineering and Computer Science at Oregon State University. Prior to joining the NC State University faculty, she was an assistant professor at the University of Tulsa, Oklahoma, directing the Human-Centric Software Engineering Lab.

She is interested in inventing technologies by studying and modeling both human factors and software engineering factors, in the context of programming tasks. The primary goal of her research is to empower programmers by integrating software engineering activities into their existing workflow without changing the nature of their work or priorities by using or inventing human-computer interaction methods. Kuttal has developed new strategies, theories, visualizations and prototypes for programmers. She is a recipient of the National Science Foundation CAREER Award and U.S. Air Force Young Investigator Program (YIP) Award.


S. Kuttal, B. Ong, K. Kwasny and P. Robe, Trade-offs for substituting a human with an agent in a pair programming context: The good, the bad and the ugly, *Proceedings of the International Conference on Human Factors in Computing Systems*, 2021.

P. Robe and S. Kuttal, Designing PairBuddy – A conversational agent for pair programming, *ACM Transactions on Computer-Human Interaction*, vol. 29(4), 2021.

S. Kuttal, M. Burnett, A. Sarma, G. Rothermel, I. Koeppe and B. Shepherd, How end-user programmers debug visual web-based programs: An information foraging theory perspective, *Journal of Visual Languages and Computing*, vol. 53, pp. 22-37, 2019.

S. S. Ragavan, S. Kuttal, C. Hill, A. Sarma, D. J. Piorkowski, M. M. Burnett, "Foraging among an Overabundance of Similar Variants," in Proceedings of Computer and Human Interactions - CHI, San Jose, USA, pages 3509-3521, May 2016.

C. Lott, A. McAuliffe, S. Kuttal, "Remote Pair Collaborations of CS Students: Leaving Women Behind?" in Proceedings of Visual Languages and Human-Centric Computing (VL/HCC), 2021.






**Assistant Professor**
Ph.D. (2018), Georgia Institute of Technology

Research Interests: High performance computing, tensor algorithms, auto-tuning.

# JIAJIA LI

Li's research emphasizes high performance computing with a focus on the interaction among applications, numerical methods, data structures, algorithms, automatic performance tuning and computer architectures. She is eager to pursue high performance sparse (multi-) linear algebra, solvers and tensor decompositions for large-scale data analytics and domain applications on diverse computer architectures.

Li was an assistant professor in the Department of Computer Science at the College of William & Mary and a research scientist at the High Performance Computing group of Pacific Northwest National Laboratory (PNNL) from 2018-22. She received her Ph.D. in August 2018 in computational science and engineering from the Georgia Institute of Technology, advised by Professor Richard Vuduc. She received Rising Stars in Computational and Data Sciences, Best Student Paper Award and an IBM Ph.D. Fellowship. Before, she was a research intern of IBM Thomas J. Watson Research Center and Intel Parallel Computing Lab in the summers of 2015 and 2016, respectively. In July 2013, she received a Ph.D. from the Institute of Computing Technology at the Chinese Academy of Sciences. She received her B.S. in July 2008 in computational mathematics from Dalian University of Technology in the Accelerated Student Program, graduating second of 180 in her class.

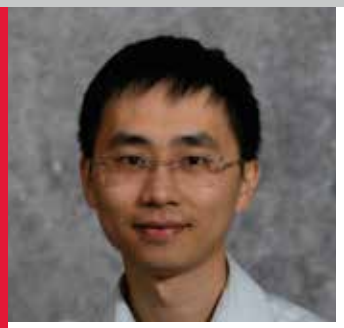

Liu, Jiawen, Jie Ren, Roberto Gioiosa, Dong Li, and Jiajia Li. "Sparta: High-performance, element-wise sparse tensor contraction on heterogeneous memory." In *Proceedings of the 26th ACM SIGPLAN Symposium on Principles and Practice of Parallel Programming*, pp. 318-333. 2021.

Meng, Ke, Jiajia Li, Guangming Tan, and Ninghui Sun. "A pattern based algorithmic autotuner for graph processing on GPUs." In *Proceedings of the 24th Symposium on Principles and Practice of Parallel Programming*, pp. 201-213. 2019.

Li, Jiajia, Jimeng Sun, and Richard Vuduc. "HiCOO: Hierarchical storage of sparse tensors." In *SC18: International Conference for High Performance Computing, Networking, Storage and Analysis*, pp. 238-252. IEEE, 2018.

Li, Jiajia, Casey Battaglino, Ioakeim Perros, Jimeng Sun, and Richard Vuduc. "An input-adaptive and in-place approach to dense tensor-times-matrix multiply." In *SC'15: Proceedings of the International Conference for High Performance Computing, Networking, Storage and Analysis*, pp. 1-12. IEEE, 2015.

Li, Jiajia, Guangming Tan, Mingyu Chen, and Ninghui Sun. "SMAT: An input adaptive auto-tuner for sparse matrix-vector multiplication." In *Proceedings of the 34th ACM SIGPLAN conference on Programming language design and implementation*, pp. 117-126. 2013.



**Assistant Professor**
Ph.D. (2018), University of Florida

Research Interests: Computer communications and networking with emphasis on MAC- and network-layer design and evaluation; network security, data privacy; low-power Internet-of-Things; and quantum networks.

# JIANQING LIU

Liu received his B.S. degree in electrical engineering from the University of Electronic Science and Technology of China (UESTC) in 2013 and Ph.D. in computer engineering from the University of Florida in 2018. Prior to joining NC State University, he was an assistant professor in the Department of Electrical and Computer Engineering at the University of Alabama in Huntsville from 2018 to 2022.

In broad terms, Liu's research interests lie in computer communications, systems and networking and security. He applies both theoretical (e.g., optimization, control and statistics) and experimental (e.g., system implementation and hardware-software co-design) approaches to solve complex research problems in the future communication technologies such as Internet-of-Things, 5G-and-Beyond systems and quantum networks.


Liu, Jianqing, et al., "Privacy Preservation in Multi-Cloud Secure Data Fusion for Infectious-Disease Analysis." *IEEE Transactions on Mobile Computing (2022), DOI: 10.1109/TMC.2022.3145745.*

Liu, Jianqing, et al., "Optimizing IoT Energy Efficiency on Edge (EEE): a Cross-layer Design in a Cognitive Mesh Network." *IEEE Transactions on Wireless Communications (2021), Vol.20, no.4, pp.2472-2486.*

Liu, Jianqing, et al., "DPavatar: A Real-Time Location Protection Framework for Incumbent Users in Cognitive Radio Networks." *IEEE Transactions on Mobile Computing (2020), Vol.19, no.3, pp.552-565.*

Liu, Jianqing, et al., "EPIC: A Differential Privacy Framework to Defend Smart Homes Against Internet Traffic Analysis." *IEEE Internet of Things Journal (2018), Vol.5, no.2, pp.1206-1217.*

Liu, Jianqing, et al., "An Energy-Efficient Strategy for Secondary Users in Cooperative Cognitive Radio Networks for Green Communications." *IEEE Journal on Selected Areas in Communications (2016), Vol.34, no.12, pp.3195-3207 (IEEE TCGCC Best Journal Paper Award).*






**Assistant Professor**
Ph.D. (2022), Michigan State University

Research Interests: Large-scale machine learning, distributed optimization; trustworthy artificial intelligence, security and fairness in AI; deep learning on graphs, graph neural networks.

# XIAORUI LIU

Liu received his Ph.D. in computer science from Michigan State University in 2022 under Jiliang Tang, University Foundation Professor in the Department of Computer Science and Engineering. Before that, he received his master's degree in electrical engineering and bachelor's degree in automation from South China University of Technology. He was awarded the Best Paper Honorable Mention Award at the International Conference on Healthcare Informatics (ICHI) 2019, the MSU Engineering Distinguished Fellowship in 2017 and the Cloud Computing Fellowship in 2021.

He has published innovative works in top-tier conferences such as the Conference and Workshop on Neural Information Processing Systems (NeurIPS), International Conference on Machine Learning (ICML), International Conference on Learning Representations (ICLR), Special Interest Group on Knowledge Discovery and Data Mining (KDD) and International Conference on Artificial Intelligence and Statistics (AISTATS). He also organized and co-presented five tutorials related to these research topics in KDD 2021, International Joint Conference on Artificial Intelligence (IJCAI) 2021, International Conference on Automated Planning and Scheduling (ICAPS) 2021 and World Wide Web Conference (WWW) 2022. He regularly serves as organizer, (senior) PC member and reviewer for multiple international conferences and journals in machine learning and data science such as the ICML, NeurIPS, ICLR, KDD, Association for the Advancement of Artificial Intelligence, IJCAI, WWW, Web Search and Data Mining, Learning on Graphics, Conference on Machine Learning and Systems, Transactions on Machine Learning Research, Transactions on Neural Networks and Learning Systems and Transactions on Pattern Analysis and Machine Intelligence.


A Double Residual Compression Algorithm for Efficient Distributed Learning, AISTATS 2020

Linear Convergent Decentralized Optimization with Compression, ICLR 2021

Graph Neural Networks with Adaptive Residual, NeurIPS 2021

Elastic Graph Neural Networks, ICML 2021

To be Robust or to be Fair: Towards Fairness in Adversarial Training, ICML 2021

**Assistant Professor**
Ph.D. (2022), Georgia Institute of Technology

Research Interests: Networking and wireless systems; mobile computing; machine learning for networking and sensing; new communication paradigms; optimization and resilience; software and simulator development for computer networks.

# YUCHEN LIU

Liu received his Ph.D. in electrical and computer engineering from the Georgia Institute of Technology. Before that, he received his B.S. in electrical engineering from Shanghai University, China, and an M.S. in electrical and computer engineering from Shanghai Jiao Tong University, China.

His research covers broad areas of networking, computing and communication, which aims to increase the intelligence, capacity and robustness of next-generation (nextG) network systems that support emerging applications on mobile edges, and enable the freedom of experience via untethered and smart connectivity for work, entertainment, social connections, health, etc. Liu also seeks to develop novel software and testbeds for the evaluations of computer networks with enhanced efficiency and run-time scalability. All research topics are investigated using theory, algorithms, simulation and experimental techniques.


Liu, Y., Jian, Y., Sivakumar, R., and Blough, D. M. (2022). Maximizing Line-of-Sight Coverage for mmWave Wireless LANs With Multiple Access Points. *IEEE/ACM Transactions on Networking*, 30(2), 698-716.

Liu, Y. and Blough, D. M. (2021). Blockage tolerance in roadside millimeter-wave backhaul networks. *Computer Networks*, 198, 108377.

Liu, Y., Hu, Q., and Blough, D. M. (2020). Joint link-level and network-level reconfiguration for urban mmWave wireless backhaul networks. *Computer Communications*, 164, 215-228.

Liu, Y., and Blough, D. M. (2020). Blockage robustness in access point association for mmWave wireless LANs with mobility. *IEEE 45th Conference on Local Computer Networks* (LCN), pp. 1-12.

Liu, Y., Zhang, A., Li, S., Tang, J., and Li, J. (2017). A lightweight authentication scheme based on self-updating strategy for space information network. *International Journal of Satellite Communications and Networking*, 35(3), 231-248.






**Teaching Assistant Professor**
Ph.D. (2019), University of North Carolina at Charlotte

Research Interests: Robot motion planning, software testing for robotics, computer science education.

# STERLING MCLEOD

McLeod received his B.S. and M.S. in computer science from the University of North Carolina at Charlotte. His Ph.D. was also from UNCC studying real-time robot motion planning for mobile robots in unknown environments. Prior to joining NC State University, he was a lecturer at UNCC in the Department of Computer Science. His research in robotics focuses on enabling robots to navigate real-world environments, which are often unknown and/or unpredictable. This requires robust and adaptable motion planning systems whose performance can be measured and verified. At UNCC, he introduced two new robotics courses that became regularly scheduled and led several curriculum development initiatives. McLeod is also interested in indie video game development. He worked on the 2017 and 2018 Axis Football game releases and an upcoming VR language learning game NounTown set to release in late 2022 or early 2023.


**Sterling McLeod** and Jing Xiao. Navigating Dynamically Unknown Environments Leveraging Past Experience. In IEEE International Conference on Robotics and Automation (ICRA), 2019.

Mahmoud Abdelgawad, **Sterling McLeod**, Anneliese Andrews, and Jing Xiao. Model-based testing of a real-time adaptive motion planning system. Advanced Robotics, 31(22):1159–1176, 2017.

**Sterling McLeod** and Jing Xiao. Real-time adaptive non-holonomic motion planning in unforeseen dynamic environments. In IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), 2016.

**Associate Professor**
Ph.D. (2014), Louisiana State University

Research Interests: String algorithms, compressed data structures, bioinformatics.

# SHARMA THANKACHAN

Thankachan received his bachelor's degree in electrical and electronics engineering from the National Institute of Technology in Calicut, India, in 2006. He received his Ph.D. in computer science from Louisiana State University in 2014. After that, he worked at the University of Waterloo and the Georgia Institute of Technology as a postdoctoral researcher and research scientist. Before joining NC State University, he was an assistant professor of computer science at the University of Central Florida.

He is interested in theoretical computer science, specifically designing and analyzing algorithms and data structures for processing massive text data (also known as strings or sequences). Such problems are primarily motivated by applications in computational biology. His recent research has focused on advanced techniques for indexing / querying compressed string data, which is highly repetitive (a feature prevalent in many modern data sets) and complex graphs (derived from biological sequences, e.g., pan-genome graphs). His research is supported mainly by the National Science Foundation.


Arnab Ganguly, Rahul Shah , and Sharma V. Thankachan: Fully Functional Parameterized Suffix Trees in Compact Space. The 49th International Colloquium on Automata, Languages, and Programming (**ICALP**), 2022.

Daniel Gibney, Sharma V. Thankachan and Srinivas Aluru: The Complexity of Approximate Pattern Matching on De Bruijn Graphs. The 26th International Conference on Research in Computational Molecular Biology (**RECOMB**), 2022.

Chirag Jain, Daniel Gibney and Sharma V. Thankachan: Co-linear chaining with overlaps and gap costs. The 26th International Conference on Research in Computational Molecular Biology (**RECOMB**), 2022.

Arnab Ganguly, Dhrumil Patel , Rahul Shah , and Sharma V. Thankachan: LF Successor: Compact Space Indexing for Order-Isomorphic Pattern Matching. The 48th International Colloquium on Automata, Languages, and Programming (**ICALP**), 2021.

Arnab Ganguly, Rahul Shah and Sharma V. Thankachan: pBWT: Achieving Succinct Data Structures for Parameterized Pattern Matching, and Related Problems. 28th ACM-SIAM Symposium on Discrete Algorithms (**SODA**), 2017.






**Assistant Professor**
Ph.D. (2022), Pennsylvania State University

Research Interests: Parameter efficiency (network pruning, knowledge distillation); data efficiency (few-shot learning, self-supervised learning); computation efficiency (weight-sharing learning, reduced-cost training); domains (natural language understanding, computer vision, neuroinformatics); applications (model compression for memory-limited devices, privacy-preserving deep learning, energy-efficient AI systems).

# DONGKUAN (DK) XU

Xu earned his Ph.D. at Pennsylvania State University in 2022. His research interest is in resource-efficient deep learning for AI at scale, focusing on how to improve the efficiency of deep learning systems to achieve Pareto optimality between resources (e.g., parameters, data, computation) and performance (e.g., inference, training). Xu has published more than 26 papers in top conferences and journals, including Conference and Workshop on Neural Information Processing Systems (NeurIPS), Association for the Advancement of Artificial Intelligence (AAAI), Association for Computational Linguistics (ACL), North American Chapter of the Association for Computational Linguistics (NAACL) and the International Joint Conference on Artificial Intelligence (IJCAI), with more than 1,600 citations. He has served as a (senior) PC member or regular reviewer for over 28 major conferences and 15 journals, and has worked as an instructor or teaching assistant for eight courses. Xu also has extensive research experience in industry. He has interned at Microsoft Research Redmond, Moffett AI and NEC Labs America, and holds eight U.S. patents / applications. Xu's long-term research goal is to democratize AI to serve a broader range of populations and domains.


Xu, D., Mukherjee, S., Liu, X., Dey, D., Wang, W., Zhang, X., ... & Gao, J. (2022). AutoDistil: Few-shot Task-agnostic Neural Architecture Search for Distilling Large Language Models. arXiv preprint arXiv:2201.12507.

En-Hsu Yen, I., Xiao, Z., & Xu, D. (2022). S4: a High-sparsity, High-performance AI Accelerator. arXiv e-prints, arXiv-2207.

Xu, D., Yen, I. E., Zhao, J., & Xiao, Z. (2021). Rethinking Network Pruning--under the Pre-train and Fine-tune Paradigm. arXiv preprint arXiv:2104.08682.

Xu, D., Cheng, W., Luo, D., Chen, H., & Zhang, X. (2021). Infogcl: Information-aware graph contrastive learning. Advances in Neural Information Processing Systems, 34, 30414-30425.

Huang, S., Xu, D., Yen, I. E., Chang, S. E., Li, B., Chen, S., ... & Ding, C. (2021). Sparse progressive distillation: Resolving overfitting under pretrain-and-finetune paradigm. arXiv preprint arXiv:2110.08190.

**Assistant Professor**
Ph.D. (2017), University of Illinois at Urbana-Champaign

Research Interests: Security of safety-critical cyber-physical systems, real-time embedded computing, accountable computing for autonomous systems.

# MAN-KI YOON

Yoon received his B.S. in computer science and engineering from Seoul National University. He received his M.S. and Ph.D. in computer science from the University of Illinois at Urbana-Champaign. Prior to joining the NC State University faculty, he was a research scientist in computer science at Yale University.

He has been tackling security challenges of cyber-physical systems such as autonomous vehicles and unmanned aerial systems. He studies how a complex integration of seemingly trustworthy software components for a cyber-physical system can create unforeseen vulnerabilities such as illegitimate information flow and denial-of-service attacks. The current focus of his research is on developing computer systems technologies that make the non-deterministic decision-making process of autonomous systems transparent and accountable to enable machine intelligence for safety-critical tasks in a dependable and trustworthy manner.


Man-Ki Yoon, Jung-Eun Kim, Richard Bradford, and Zhong Shao, "TimeDice: Schedulability-Preserving Priority Inversion for Mitigating Covert Timing Channels Between Real-time Partitions." *Proceedings of the 52nd IEEE/IFIP International Conference on Dependable Systems and Networks, Jun. 2022*

Man-Ki Yoon, Mengqi Liu, Hao Chen, Jung-Eun Kim, and Zhong Shao, "Blinder: Partition-Oblivious Hierarchical Scheduling." *Proceedings of the 30th USENIX Security Symposium, Aug. 2021*

Valerie Chen, Man-Ki Yoon, and Zhong Shao, "Task-Aware Novelty Detection for Visual-based Deep Learning in Autonomous Systems." *Proceedings of the 37th IEEE International Conference on Robotics and Automation, May 2020*

Mengqi Liu, Lionel Rieg, Zhong Shao, Ronghui Gu, David Costanzo, Jung-Eun Kim, and Man-Ki Yoon, "Virtual Timeline: A Formal Abstraction for Verifying Preemptive Schedulers with Temporal Isolation." *Proceedings of the 47th ACM SIGPLAN Symposium on Principles of Programming Languages, Jan. 2020*

Man-Ki Yoon and Zhong Shao, "ADLP: Accountable Data Logging Protocol for Publish-Subscribe Communication Systems." *Proceedings of the 39th IEEE International Conference on Distributed Computing Systems, Jul. 2019*






**Assistant Professor**
Ph.D. (2019), Texas A&M University

Research Interests: Pre-silicon security verification of advanced microarchitectural designs, considering the security of application of machine learning in hardware, identifying microarchitectural side channel and adversarial machine learning attacks, and developing defenses for them.

# SAMIRA MIRBAGHER AJORPAZ

Ajorpaz received her B.S. in computer engineering from University of Isfahan in 2014 and her Ph.D. in computer science from Texas A&M University in 2019. She is a 2020 University of California postdoctoral fellow in the Department of Computer Science and Engineering at the University of California, San Diego. She is also a 2021 Massachusetts Institute of Technology Department of Electrical and Computer Engineering (MIT ECE) Rising Star.

Her research is centered at the intersection of computer architecture, computer systems security and machine learning with a focus on designing fast, energy efficient and secure microarchitectural units with nano-second scale timing margins. Her recent studies use generative modeling to enable hardware to dynamically adapt itself for security, performance and power efficiency. She has taught graduate machine learning courses at Texas A&M University in 2020, Advanced Microarchitecture at UC San Diego in 2021 and 2022 and will be teaching ECE 792-059: Performance and Security Analysis of Advanced Microarchitecture at NC State University.


**MICRO 2022**, S. Mirbagher-Ajorpaz, D. Moghimi, Jeff Collins, G. Pokam, N. Abu-Ghazaleh, and D. Tullsen, *"EVAX: Towards a Practical, Pro-active and Adaptive Architecture for High Performance & Security."* Will appear in the proceedings of the 55th IEEE/ACM International Symposium on Microarchitecture.

**MICRO 2020**, S. Mirbagher-Ajorpaz, G. Pokam, E. Garza, E. M. Koruyeh, N. Abu-Ghazaleh, and D. A. Jiménez, *"PerSpectron: Detecting Microarchitectural Footprints of Side Channel Attacks with Perceptron Learning."* In proceedings of the 53rd IEEE/ACM International Symposium on Microarchitecture.

**MICRO 2020**, S. Mirbagher-Ajorpaz, E. Garza, G. Pokam, and D. A. Jiménez, *"CHiRP: Control-flow History Reuse Prediction."* In proceedings of 53rd IEEE/ACM International Symposium on Microarchitecture.

**ISCA 2019**, E. Garza, S. Mirbagher-Ajorpaz, T. A. Khan, and D. A. Jiménez, *"Bit-level Perceptron Prediction for Indirect Branches."* In proceedings of 46th International Symposium on Computer Architecture.

**ISCA 2018**, S. Mirbagher-Ajorpaz, E. Garza, S. Jindal, and D. A. Jiménez, *"Exploring Predictive Replacement Policies for Instruction Cache and Branch Target Buffer."* In proceedings of 45th ACM/IEEE Annual International Symposium on Computer Architecture.

**Assistant Professor**
Ph.D. (2020), Purdue University

Research Interests: Reinforcement learning and bandits; optimization and statistical inference; federated learning; control and estimation over networks; resilience and security.

# ARITRA MITRA

Mitra received his Ph.D. from the School of Electrical and Computer Engineering, Purdue University, in 2020. He received his M. Tech degree from the Indian Institute of Technology, Kanpur, in 2015, and his B.E. degree from Jadavpur University, Kolkata, in 2013, both in electrical engineering. Before joining NC State University, he was a postdoctoral researcher in the Department of Electrical and Systems Engineering at the University of Pennsylvania, from 2020 to 2022.

The broad goal of Mitra's research is to enable reliable and efficient learning and decision-making in large-scale distributed systems, while contending with modern challenges related to computation, communication and adversarial robustness. To meet this goal, his research draws on ideas and tools from control and optimization theory, statistical signal processing, machine learning and network science. The theory he develops is motivated by a variety of applications spanning multi-robot systems, wireless sensor networks, federated learning and edge computing.


Mitra, Adibi, Pappas, and Hassani, *"Collaborative Linear Bandits with Adversarial Agents: Near-Optimal Regret Bounds,"* 2022.

Mitra, Jaafar, Pappas, and Hassani, *"Linear Convergence in Federated Learning: Tackling Client Heterogeneity and Sparse Gradients,"* Neural Information Processing Systems (**NeurIPS**), 2021.

Mitra, Richards, and Sundaram, *"A New Approach to Distributed Hypothesis Testing and Non-Bayesian Learning: Improved Learning Rate and Byzantine-Resilience,"* IEEE Transactions on Automatic Control, (**TAC**), 2020.

Mitra and Sundaram, *"Byzantine-Resilient Distributed Observers for LTI Systems,"* **Automatica**, 2019.

Mitra and Sundaram, *"Distributed Observers for LTI Systems,"* IEEE Transactions on Automatic Control, (**TAC**), 2018.






**Assistant Professor**
Ph.D. (2018), University of Central Florida

Research Interests: Nanophotonics, plasmonics, nanotechnology, micro/nano fabrication and packaging of photonic devices, biosensing, wearable devices, implantable devices, wireless multimodal biosensors, closed-loop control in biological systems, bio-integrated optoelectronics and nanophotonics.

# ABRAHAM VÁZQUEZ-GUARDADO

Vázquez-Guardado received his B.Eng. in electrical engineering from the Autonomous University of Nayarit in 2008, his M.S. in optics from the National Institute for Astrophysics Optics and Electronics in 2012 and his Ph.D. in optics and photonics from the College of Optics and Photonics (CREOL) at the University of Central Florida in 2018. Vázquez-Guardado was a postdoctoral researcher in the Querrey Simpson Institute for Bioelectronics at Northwestern University. Vázquez-Guardado will join the Department of Electrical and Computer Engineering at NC State as an assistant professor in January 2023. In his postdoctoral training at Northwestern University, he worked in the design and development of bioengineered implantable NFC and bluetooth wireless devices, some of them in battery-free configuration. Examples include implantable oximeters, optogenetic stimulators and optical sensors for behavioral neuroscience research, and implantable multimodal medical devices for closed-loop control in biological systems. In his future research at NC State, Vázquez-Guardado will develop the next generation of optics and photonics enabled wearable and implantable devices for applications in clinical diagnostics, medicine and neuroscience. The main focus is the fundamental research, fabrication and packaging of novel nanoscale optical and photonics sensing devices for continuous multimodal biosensing of physiological parameters.


Y. H. Jung†, J.-Y. Yoo†, A. Vázquez-Guardado†, J.-H. Kim†, J.-T. Kim†, H. Luan, M. Park, J. Lim, H.-S. Shin, C.-J. Su, R. Schloen, J. Trueb, R. Avila, J.-K. Chang, D. S. Yang, Y. Park, H. Ryu, H.-J. Yoon, G. Lee, H. Jeong, J. U. Kim, T. Kim, Y. Huang, and J. A. Rogers. "An advanced wireless haptic interface for high resolution, programmable patterns of touch across large areas of the skin." *Nature Electronics*, 5:374–385, 2022. (†*equal contribution*).

Y. Yang†, M. Wu†, A. Vázquez-Guardado†, A. J. Wegner, J. G. Grajales-Reyes, Y. Deng, T. Wang, R. Avila, J. A. Moreno, S. Minkowicz, , J. Lee, S. Zhang, A. Legaria, Y. Ma, S. Mehta, D. Franklin, L. Hartman, W. Bai, M. Han, H. Zhao, W. Lu, Y. Yu, X. Sheng, A. Banks, X. Yu, R. W. Gereau IV, C. H. Good, Z. Xie, Y. Huang, Y. Kozorovitskiy, J. A. Rogers. "Real-time control in wireless multilateral optogenetics for broad neuroscience applications." *Nature Neuroscience*, 24: 1035-1045, 2021. (†*equal contribution*).

A. Vázquez-Guardado†, Y. Yang†, A. J. Bandodkar†, J. A. Rogers. "Recent advances in neurotechnologies with broad potential for neuroscience research." *Nature Neuroscience*, 23: 1522-1536, 2020. (†*equal contribution*).

A. Vázquez-Guardado, S. Barkam, M. Peppler, A. Biswas, D. Wessley, S. Das, S. Seal, and D. Chanda, "Enzyme-Free Plasmonic Biosensor for Direct Detection of Neurotransmitter Dopamine from Whole Blood." *Nano Letters*, 19(1):449-454, 2019.

A. Vázquez-Guardado and D. Chanda. "Superchiral light generation on degenerate achiral surfaces." *Physical Review Letters*. 120(13): 137601, 2018.

**Assistant Professor**
Ph.D. (2017), University of Utah

Research Interests: Topics in electromagnetic-circuit co-design approaches include metamaterials / metasurfaces / active reflector arrays (GHz - THz), phased arrays, computational imaging, integrated circuits, 5G communication, physical layer security, antenna / waveguide theory and design, transformation optics design, remote sensing, RF characterization / instrumentation, advanced EM simulations.

# SURESH VENKATESH

Venkatesh received his B.Eng. in electronics and communications from Ramaiah Institute of Technology, Bangalore, India. He received his M.S. in electrical and computer engineering from NC State University, and his Ph.D. from University of Utah, under the guidance of David Schurig, associate professor of electrical and computer engineering. Prior to joining the NC State University faculty, he was a research associate scholar at Princeton University in the Department of Electrical Engineering. He was the recipient of the best dissertation award in 2016 and Mistletoe Research Fellowship from Momental Foundation in 2021-22. He serves as an affiliate member on two technical committees in the Institute of Electrical and Electronics Engineers (IEEE) Microwave Theory and Technology Society. He is also a lead antenna technology consultant at E-Space, a startup company based in Massachusetts, pursuing massively deployable and sustainable satellite technology solutions.

Presently, his research area is in developing electromagnetic-circuit co-design approaches for applications such as high-speed secure communications, imaging and sensing across the electromagnetic spectrum from Microwave to Terahertz regime.

**Suresh Venkatesh**, Xuyang Lu, Hooman Saeidi, and Kaushik Sengupta. "A high-speed programmable and scalable terahertz holographic metasurface based on tiled CMOS chips." *Nature Electronics* 3, no. 12 (2020): 785-793.

**Suresh Venkatesh**, Xuyang Lu, Bingjun Tang, and Kaushik Sengupta. "Secure space–time-modulated millimetre-wave wireless links that are resilient to distributed eavesdropper attacks." *Nature Electronics* 4, no. 11 (2021): 827-836.

**Suresh Venkatesh**, Daniel Sturm, Xuyang Lu, Robert J. Lang, and Kaushik Sengupta. "Origami Microwave Imaging Array: Metasurface Tiles on a Shape-Morphing Surface for Reconfigurable Computational Imaging." *Advanced Science* (2022): 2105016.

Hooman Saeidi, **Suresh Venkatesh**, Xuyang Lu, and Kaushik Sengupta. "THz Prism: One-shot simultaneous localization of multiple wireless nodes with leaky-wave THz antennas and transceivers in CMOS" *IEEE Journal of Solid-State Circuits* 56, no. 12 (2021): 3840-3854.

**Suresh Venkatesh**, Naren Viswanathan, and David Schurig. "W-band sparse synthetic aperture for computational imaging." *Optics Express* 24, no. 8 (2016): 8317-8331.





**Assistant Professor**
Ph.D. (2020), Purdue University

Research Interests: Engineering and climate justice, data science, risk analysis, simulation, operations research.

# BENJAMIN (BEN) RACHUNOK

Rachunok received his B.S. in industrial and systems engineering from NC State University, and holds a Ph.D. in industrial engineering from Purdue University. Prior to joining the NC State faculty, he was a postdoctoral scholar in the Department of Civil and Environmental Engineering at Stanford University, and a fellow of the 2021 cohort of the Rising Environmental Leaders Program at the Stanford Woods Institute for the Environment.

Rachunok uses data science and risk analysis to study sustainability. Specifically, he studies how low-income communities can be made more sustainable and resilient to natural hazards and climate change. He blends operations research, data science and simulation methods to develop tools which quantify the disproportionate impact of natural hazards on historically marginalized communities. His work investigates how the policies, designs and decision-making related to how we build our communities contribute to inequity in disaster impacts.

Rachunok B, Nateghi R. Overemphasis on Recovery Inhibits Community Transformation and Creates Resilience Traps. *Nature Communications*. 2022.

Choi M, Rachunok B, Nateghi R. Short-term Solar Irradiance Forecasting Using Convolutional Neural Networks and Cloud Imagery. *Environmental Research Letters*. 2020.

Rachunok B, Staid A, Watson D, Woodruff D. Evaluation of Parametric Wind Power Scenarios. *Applied Energy*. 2020.

Rachunok B, Nateghi R. The Sensitivity of Electric Power Infrastructure Resilience to the Spatial Distribution of Disaster Impacts. *Reliability Engineering and System Safety*. 2020.

Rachunok B, Bennett J, Nateghi R. Twitter and Disasters: A Social Resilience Fingerprint. *IEEE Access*. 2019.

**Teaching Professor**
Ph.D. (1991), NC State University

Research Interests: Advanced manufacturing, continuous process improvement, robotics, machine learning, communication and imitation in autonomous intelligent agents and electronics and interactive vision.

# MICHAEL R. SPANO

Spano holds a Ph.D. in industrial engineering, with a minor in artificial intelligence, and an M.S. in integrated manufacturing systems from NC State University. He has been teaching at NC State and Duke University for over 25 years in the areas of manufacturing, database and applications, application development, mechatronics, robotics, instinctual intelligence and electronics in interactive art.

Spano was formerly the chief technology officer (CTO) for the NC Department of Public Instruction and several other top companies. He is a forward-thinking technology executive with over 40 years of broad expertise collaborating with global, cross-functional internal and external stakeholders to drive innovative solutions for seamless operations in diverse and rapidly changing business environments. Spano is a situational-style team leader and dedicated team player with proven success managing complex billion-dollar projects, programs and portfolios, and an analytical problem-solver with exceptional interpersonal and C-level communication skills.

"MRPIII: An Integrated Command and Control for Quick Response Manufacturing of Custom Designs," with Cyrus Hadavi, *Proceedings of AUTOFACT 94*, Detroit, Michigan, November 13-17, 1994.

"A Hierarchical Labeled Object Classification System", with Sameer M. Prabhu and Devendra P. Garg, *Proceedings of the 12th International Conference on Pattern Recognition*, Jerusalem, Israel, Oct. 9-13, 1994.

"The Design of Flexible Manufacturing Systems," with Peter J. O'Grady and Robert E. Young, *Computers in Industry*, v 21 n 2, February 1993, pp 185-198.

Thinktank session Chairman on Advanced Security for more Dependable Networks, eBusiness Summit Think Tank, May 14-16, 2001.

Book review of "Manufacturing Systems: Foundations of World-Class Practice," by Joseph A. Heim and W. Dale Compton, *American Scientist*, Vol. 81, November-December 1993.





**Assistant Professor**
Ph.D. (2017), University of North Texas

Research Interests: High-temperature applications; material vulnerabilities: deformation mechanisms and corrosion dynamics; laser-based additive manufacturing; nano-mechanical testing.

# BHARAT GWALANI

Gwalani received his Bachelor of Technology (B.Tech) degree from the National Institute of Technology, Jaipur, India, in 2010, and his Ph.D. from the University of North Texas in 2017, both in materials science and engineering. After receiving his B. Tech. degree, he worked in the steel industry for three years. In 2019, Gwalani joined the Department of Energy Office of Science's Pacific Northwest National Laboratory and served as a senior materials scientist. His research focuses on mechanistic understanding of materials vulnerabilities under extreme environments, deformation-assisted modification of phase transformation pathways, development and characterization of advanced materials.

Bharat Gwalani, Jia Liu, Sten Lambeets, Matthew Olszta, Jonathan Poplawsky, Amit Shyam & Arun Devaraj (2022) Rapid assessment of interfacial stabilization mechanisms of metastable precipitates to accelerate high-temperature Al-alloy development, *Materials Research Letters*, 10:12, 771-779

Gwalani, Bharat, et al. "Modifying transformation pathways in high entropy alloys or complex concentrated alloys via thermo-mechanical processing." *Acta Materialia* 153 (2018): 169-185.

Gwalani, Bharat, Matthew Olszta, Soumya Varma, Lei Li, Ayoub Soulami, Elizabeth Kautz, Siddhartha Pathak et al. "Extreme shear-deformation-induced modification of defect structures and hierarchical microstructure in an Al–Si alloy." *Communications Materials* 1, no. 1 (2020): 1-7.

Gwalani, Bharat, Sindhura Gangireddy, Shivakant Shukla, Christopher J. Yannetta, Sheena Grace Valentin, Rajiv S. Mishra, and Rajarshi Banerjee. "Compositionally graded high entropy alloy with a strong front and ductile back." *Materials Today Communications* 20 (2019): 100602.

Gwalani, Bharat, Sriswaroop Dasari, Abhishek Sharma, Vishal Soni, Shivakant Shukla, Abhinav Jagetia, Priyanshi Agrawal, Rajiv S. Mishra, and Rajarshi Banerjee. "High density of strong yet deformable intermetallic nanorods leads to an excellent room temperature strength-ductility combination in a high entropy alloy." *Acta Materialia* 219 (2021): 117234.

**Assistant Professor**
Ph.D. (2019), University of California, Berkeley

Research Interests: Low-dimensional optoelectronic materials and electron microscopy.

# YIN LIU

Liu received his B.S. and M.S. both in materials science and engineering from Zhejiang University in China. He received a Ph.D. in materials science and engineering from University of California, Berkeley. He was a postdoctoral researcher in the Department of Materials Science and Engineering at Stanford University.

Presently, Liu's research group focuses on synthesis, optical and electric measurements of two-dimensional materials and heterostructures. The group uses analytical scanning transmission electron microscopy, electron energy-loss spectroscopy and cathodoluminescence spectroscopy in combination with optical spectroscopies to investigate the fundamental structure-property relationships on the nanoscale for novel electronic, photonic and polaritonic properties.


Y. Liu et al., Helical van der Waals crystals with discretized Eshelby twist, Nature, 570, 358-362 (2019).

Z. Fang, Y. Liu et al., Chemically modulating the twist rate of helical van der Waals crystals, Chemistry of Materials, 32, 299-307 (2020).

S. Lou, Y. Liu et al., Three-dimensional Architecture Enabled by Strained Two-dimensional Material Heterojunction, Nano letters, 18, 1819-1825 (2018).

K. W. Noh, Y. Liu et al., Challenges associated with in-situ TEM in environmental systems: The case of silver in aqueous solutions, Ultramicroscopy, 116, 34 (2012).

Y. Liu et al., Growth kinetics and morphological evolution of ZnO precipitated from solution, Chemistry of Materials, 25, 2927-2933 (2013).






**Professor**
Ph.D. (2008), University of Iowa

Research Interests: Soft materials, metastable materials, surface and interface thermodynamics, nanostructures, frugal innovation.

# MARTIN THUO

Thuo obtained his bachelor's and M.S. degrees from Kenyatta University, Nairobi, Kenya. After a brief stay at Simon Fraser University, he transferred to the University of Iowa where he obtained his Ph.D. Thuo pursued postdoctoral work at Harvard University, first as a Mary-Fieser Fellow. A second fellowship from the Nanoscale Science and Engineering Center capped his stay at Harvard. He joined Iowa State University as an assistant professor in 2014 and was promoted to associate professor in 2020. He held a Black & Veatch Junior Faculty Fellowship followed by the Schafer 2050 Challenge Professor upon promotion to associate professor.

Thuo is interested in surface and thermodynamics driven frugal innovation. His research cuts across applied and fundamental areas of all material classes. His specific interests are in soft matter (molecular electronics, polymers, and low-melting alloys), metastable materials and applied interface engineering.


C. Du, S. Norris, A. Thakur, J. Chen, B. VanVeller, M. Thuo 'Molecular Conformation in Charge Tunneling across Large-Area Junctions' *J. Amer. Chem. Soc.* **2021** 143, 34, 13878-13886 doi.org/10.1021/jacs.1c06622

J.J. Chang, C. Du, A. Pauls, M. Thuo "Tunable Hydrophobicity via Dimensionally Confined Polymerization of Organometallic Adducts" *Angew. Chem.* **2021** 60,13929-13936 DOI: 10.1002/anie.202101795

A. Martin, B. Chang, J. Cutinho, L. Shen, T. Ward, E. Cochran, M. Thuo "Passivation-Driven Speciation, Dealloying and Purification" *Mat. Hor.* **2021**, 8, 925-931 DOI: 10.1039/D0MH01832E (cover article)

A. Martin, B.S. Chang, Z. Martin, D. Paramanik, C. Frankiewicz, S. Kundu, I. Tevis, M. Thuo "Heat-Free Fabrication of Metallic Interconnects for Flexible/Wearable Devices" Advanced Functional Materials 2019, 1903687 DOI:10.1002/adfm.201903687 (cover article)

B. Chang, R. Tutika, J. Cutinho, S. Oyola-Reynoso, J. Chen, M. D. Bartlett, M. M. Thuo "Mechanically triggered composite Stiffness Tuning Through Thermodynamic Relaxation (ST3R)" 2018 Mater. Horizons. 5, 416-422 DOI: 10.1039/C8MH00032H.

**Assistant Professor**
Ph.D. (2018), University of California, Berkeley

Research Interests: Synthesis of oxide thin film heterostructures and freestanding membranes, understanding structure-property relationship in oxide materials, and in situ control of material properties via strain, temperature and electric field.

# RUIJUAN XU

Xu received her M.S. in materials science and engineering from the University of Illinois at Urbana-Champaign and a Ph.D. in materials science and engineering from the University of California, Berkeley. She was a Geballe Laboratory for Advanced Materials (GLAM) postdoctoral fellow at Stanford University.

Presently, she is focused on developing novel oxide thin-film materials for next-generation nanomechanical, electromechanical and magnetoelectric applications. She studies complex oxide materials exhibiting dielectric, ferroelectric, piezoelectric, pyroelectric and multiferroic properties using thin-film synthesis, multi-scale characterization and nanofabrication techniques. She is particularly interested in understanding the mesoscopic physics of complex oxides as well as manipulating the structure and property of these materials using various external stimuli such as strain, temperature and electric field, etc.


Xu, R. 2020, "Strain-induced room-temperature ferroelectricity in SrTiO3 membranes," *Nature Communications* 11, 3141.

Xu, R. 2019, "Kinetic control of tunable, multi-state switching in ferroelectric thin films," *Nature Communications* 10, 1282.

Xu, R. 2018, "Reducing coercive-field scaling in ferroelectric thin films via orientation control," *ACS Nano* 12, 4736-4743.

Xu, R. 2015, "Ferroelectric polarization reversal via successive ferroelastic transitions," *Nature Materials* 14, 79-86.

Xu, R. 2014, "Stationary domain wall contribution to enhanced ferroelectric susceptibility," *Nature Communications* 5, 3120.






**Associate Professor**
Ph.D. (2009), Chinese Academy of Sciences

Research Interests: Additive manufacturing, advanced microstructural characterization, radiation effects, mechanical / thermal properties, oxidation / corrosion behavior of advanced ceramics and nuclear materials.

# LINGFENG HE

He received his B.E. in metallurgical engineering from the Central South University and a Ph.D. in materials science from the Chinese Academy of Sciences. He was a postdoctoral researcher and assistant scientist at Nagaoka University of Technology, Japan, and at the University of Wisconsin-Madison before joining Idaho National Laboratory as a staff scientist in 2014. He was a distinguished staff scientist and High-Resolution Materials Characterization group lead prior to joining NC State University.

He studies materials behavior in extreme environments, with a focus on environmental degradation of materials in nuclear power systems. He aims to understand how the processing and radiation/corrosion environments affect the microstructure, mechanical / thermal properties and structural integrity / durability of materials and components. He has published 123 peer-reviewed journal articles, with an H-index of 30 (according to Web of Science). He is the recipient of the Laboratory Director's 2020 Exceptional Scientific Achievement Award at Idaho National Laboratory.


Y. Wang, X. Liu, D.J. Murray, F. Teng, W. Jiang, M. Bachhav, L. Hawkins, E. Perez, C. Sun, J. Lian, C. Judge, J. H. Jackson, R. G. Carter, L. He, "Measurement of grain boundary strength of Inconel X-750 superalloy using in-situ micro-tensile testing techniques in FIB/SEM system." *Mater. Sci. Eng. A*, 849 (2022) 143475.

L. He, T. Yao, K. Bawane, M. Jin, C. Jiang, X. Liu, W.-Y. Chen, J.M. Mann, D. Hurley, J. Gan, M. Khafizov, "Dislocation loop evolution in Kr-irradiated ThO2." *J. Am. Ceram. Soc.*, 105 (2022) 5419-5435.

K. Bawane, X. Liu, R. Gakhar, M. Woods, M. Ge, X. Xiao, W.-K. Lee, P. Halstenberg, S. Dai, S. Mahurin, S.M. Pimblott, J.F. Wishart, Y.K. Chen-Wiegart, L. He, "Visualizing time-dependent microstructural and chemical evolution during molten salt corrosion of Ni-20Cr model alloy using correlative quasi in situ TEM and in situ synchrotron X-ray nano-tomography." *Corro. Sci.* 195 (2022) 109962.

L. He, M. Khafizov, C. Jiang, B. Tyburska-Püschel, B. Jaques, P. Xiu, P. Xu, M. Meyer, K. Sridharan, D. Butt, and J. Gan. "Phase and defect evolution in uranium-nitrogen-oxygen system under irradiation." *Acta Mater.* 208 (2021) 116778.

K. Bawane, P. Manganaris, Y. Wang, J. Sure, A. Ronne, P. Halstenberg, S. Dai, S. K. Gill, K. Sasaki, Y. K. Chen-Wiegart, R. Gakhar, S. Mahurin, S. M. Pimblott, J. F. Wishart, L. He, "Determining oxidation states of transition metals in molten salt corrosion using electron energy loss spectroscopy." *Scripta Mater.*, 197 (2021) 113790.

**Assistant Professor**
Ph.D. 2018, Rensselaer Polytechnic Institute

Research Interests: Characterization of laser produced plasmas using optical diagnostics, oxidation in gas and solid phases, nanoparticle formation in laser ablation plumes, laser-material interaction.

# ELIZABETH J. KAUTZ

Kautz received her B.S. in materials engineering in 2010 from Rensselaer Polytechnic Institute (RPI) in Troy, NY. From 2010-14 she worked at Knolls Atomic Power Laboratory (KAPL, Schenectady, NY) as a materials engineer. She received her M.S. and Ph.D. in materials engineering from RPI in 2014 and 2018, respectively. She was a postdoctoral researcher at Pacific Northwest National Laboratory (PNNL) in Richland, Washington, from 2018-20, and a staff scientist at PNNL from 2020-22 prior to joining the NC State University faculty.

Her research is focused on materials detection, monitoring and degradation phenomena relevant to nuclear energy, defense, forensics and non-proliferation applications. Specific topics of interest include understanding the hydrodynamics, chemistry evolution and nanoparticle formation in laser produced plasmas generated from reactive materials, such as actinides. She also studies oxidation phenomena in the gas and solid phases. She uses a variety of tools and techniques in her research including optical diagnostics for studying laser produced plasmas, and materials characterization techniques, such as electron microscopy and atom probe tomography. Another topic of interest is the application of machine learning methods for improving analytical capabilities of materials detection and characterization techniques.


Kautz, Elizabeth J., et al. "Optical spectroscopy and modeling of uranium gas-phase oxidation: Progress and perspectives." *Spectrochimica Acta Part B: Atomic Spectroscopy* 185 (2021): 106283.

Kautz, Elizabeth J., Mark C. Phillips, and Sivanandan S. Harilal. "Unraveling spatio-temporal chemistry evolution in laser ablation plumes and its relation to initial plasma conditions." *Analytical Chemistry* 92.20 (2020): 13839-13846.

Kautz, Elizabeth J., David J. Senor, and Sivanandan S. Harilal. "The interplay between laser focusing conditions, expansion dynamics, ablation mechanisms, and emission intensity in ultrafast laser-produced plasmas." *Journal of Applied Physics* 130.20 (2021): 204901.

Kautz, Elizabeth J., et al. "Rapid assessment of structural and compositional changes during early stages of zirconium alloy oxidation." *npj Materials Degradation* 4.1 (2020): 1-9.

Kautz, Elizabeth J., et al. "Evaluating the microstructure and origin of nonmetallic inclusions in as-cast U-10Mo fuel." *Journal of Nuclear Materials* 554 (2021): 152949.






**Assistant Professor**
Ph.D. (2017), Vienna University of Technology

Research Interests: Experimental fusion energy research with focus on the edge boundary layer of magnetically confined, high temperature plasmas, studying plasma-neutral interaction, associated diagnostic techniques, edge pressure stability and edge localized modes as well as solid impurity powder injection for wall conditioning and power exhaust.

# FLORIAN M. LAGGNER

Laggner is an experimental plasma physicist, who received his B.Sc. from TU Wien, Austria. He also received his M.Sc. and Ph.D. from TU Wien, performing research in a collaboration with the Max Planck Institute for Plasma Physics in Garching, Germany. In 2017, Laggner joined the plasma control group at the Department of Mechanical and Aerospace Engineering at Princeton University as a postdoctoral researcher. Prior to joining NC State University, he worked as a research scientist for Princeton Plasma Physics Laboratory, a U.S. Department of Energy national laboratory, with permanent research assignment at the DIII-D National Fusion Facility in San Diego.

Laggner studies the ionization source form neutral deuterium in high temperature plasmas. In collaboration with the MIT Plasma Science and Fusion Center, he installed a prototype Lyman-α diagnostic called LLAMA at DIII-D, which enables the measurement of edge-neutral density profiles. Furthermore, he performs research toward establishing low Z impurity powder injections as a real time actuator for plasma control in international collaborations with the fusion facilities KSTAR (Korea) and ASDEX Upgrade (Germany).


Laggner, F. M. et al. 2021 "Absolute calibration of the Lyman-α measurement apparatus at DIII-D" Rev. Sci. Instrum. 92 033522

Diallo A. and Laggner, F. M. 2021 "Turbulence dynamics during the pedestal evolution between edge localized modes in magnetic fusion devices" Plasma Phys. Control. Fusion 63 013001

Nelson A. O., Laggner F. M. et al. 2021 "Time-dependent experimental identification of inter-ELM microtearing modes in the tokamak edge on DIII-D" Nucl. Fusion 61 116038

Laggner, F. M. et al. 2020 "Real-time pedestal optimization and ELM control with 3D fields and gas flows on DIII-D" Nucl. Fusion 60 076004

Laggner, F. M. et al. 2019 "Inter-ELM pedestal localized fluctuations in tokamaks: Summary of multi-machine observations" Nucl. Mater. Energy 19, 479-486

**Assistant Professor**
Ph.D. (2019), University of Michigan

Research Interests: Low temperature plasmas, computational modeling of plasmas, plasma chemistry, plasma medicine, plasma etching, plasma catalysis, high performance computing.

# AMANDA M. LIETZ

Lietz received her Ph.D. in nuclear engineering and radiological sciences at the University of Michigan in 2019 and a B.S. in nuclear, plasma and radiological engineering from the University of Illinois at Urbana-Champaign. She was the recipient of the National Science Foundation Graduate Research Fellowship and the Towner Prize for Outstanding Ph.D. Research. Before joining NC State University, she was a postdoctoral researcher at Sandia National Laboratories in the Applied Optical and Plasma Sciences Department.

Her research is focused on computational modeling of low temperature plasmas for a variety of practical industrial applications. These applications include the manufacturing of computer chips, treatment of cancer and chronic wounds, and electrification of the chemical industry. Through computational modeling, it is possible to investigate the role of radiation transport, gas flow and different chemical pathways in low temperature plasma sources.


A. M. Lietz, E. V. Barnat, G. R. Nail, N. A. Roberds, A. S. Fierro, B. T. Yee, C. H. Moore, P. G. Clem, and M. M. Hopkins. "High-fidelity modeling of breakdown in helium: initiation processes and secondary electron emission" Journal of Physics D: Applied Physics, 54, 334005 (2020).

A. M. Lietz, E. V. Barnat, J. E. Foster, and M. J. Kushner. "Ionization wave propagation in a He plasma jet in a controlled gas environment" Journal of Applied Physics, 128, 083301 (2020).

A. M. Lietz and M. J. Kushner. "Electrode Configurations in Atmospheric Pressure Plasma Jets: Production of Reactive Species." Plasma Sources Science and Technology, 27, 105020 (2018).

A. M. Lietz, E. Johnsen, and M. J. Kushner. "Plasma-induced flow instabilities in atmospheric pressure plasma jets." Applied Physics Letters 111, 114101 (2017).

A. M. Lietz and M. J. Kushner. "Air plasma treatment of liquid covered tissue: long timescale chemistry." Journal of Physics D: Applied Physics 49, 425204 (2016).






**Assistant Professor**
Ph.D. (2017), University of Michigan

Research Interests: Polymer-crystal interactions, biomineralization, phase change materials, stimuli-responsive polymers and gels, ionic circuitry, wearable devices, energy and sustainability, bioinspiration.

# THOMAS SCHROEDER

Schroeder received a B.A. in chemistry from Northwestern University and an M.S.E. and Ph.D. in chemical engineering from the University of Michigan. During his Ph.D., his research group moved to the Adolphe Merkle Institute in Switzerland, where he worked for three years. Most recently, he has worked as a postdoc in materials science at Harvard University. Lately, Schroeder has focused on studying and engineering diverse transport processes in gels, including electrical power generation from salt gradients, light-responsive behaviors mediated by photoswitches and crystal growth (and concomitant latent heat release and mechanical transitions).

The Schroeder Research Group will engineer polymeric additives to control crystallization processes relevant to material fabrication and energy storage. A related focus will be the development of new mineralization-based processing techniques to sustainably produce plastic-like materials from biopolymers. Another area will be the development of ionic circuitry in textiles and gels towards autonomous functionality. Schroeder is excited to leverage the resources of the College of Textiles to scale up materials developed at the bench, as well as to collaborate with colleagues across NC State University.


Schroeder, T.B.H. and Aizenberg, J. 2022, "Patterned crystal growth and heat wave generation in hydrogels." *Nat. Commun.* 13, 259.

Meeks, A.M., Lerch, M.M., Schroeder, T.B.H., Shastri, A., Aizenberg, J. 2021, "Spiropyran photoisomerization dynamics in multi-responsive hydrogels." *J. Am. Chem. Soc.* 144, 219-227.

Schroeder, T.B.H.,† Houghtaling, J.,† Wilts, B.D., Mayer, M. 2018, "It's not a bug, it's a feature: Functional materials in insects." *Adv. Mater.* 30, 1705322. (†*equal contribution*).

Schroeder, T.B.H.,† Guha, A.,† Lamoureux, A., VanRenterghem, G., Sept, D., Shtein, M., Yang, J., Mayer, M. 2017, "An electric eel-inspired artificial soft power source from stacked hydrogels." *Nature* 552, 214-218. (†*equal contribution*).

Schroeder, T.B.H., Leriche, G., Koyanagi, T., Johnson, M.A., Haengel, K.N., Eggenberger, O.M., Wang, C.L., Kim, Y.H., Diraviyam, K., Sept, D., Yang, J., Mayer, M. 2016, "Effects of lipid tethering in extremophile-inspired membranes on H+/OH- flux at room temperature." *Biophys. J.* 110, 2430-2440.

**Research Assistant Professor**
Ph.D. (2018), NC State University

Research Interests: Biocolorants; biosynthesis / bioproduction of dyes; dye-substrate interactions; environmental / toxicological analysis of dyes; experimental and computer-aided molecular dye design, green / sustainable chemistry; hair dye design and application; organic (dye) synthesis; structure-property relationships (dyes, substrates); supercritical CO2 dyeing; textile dyeing and finishing.

# TOVA N. WILLIAMS

Williams is a double alumna of NC State University, earning her Ph.D. in fiber and polymer science (chemistry minor) in 2018 and her B.S. in polymer and color chemistry in 2014. Her dissertation work focused on experimental and computational approaches to the design of sustainable permanent hair dyes. In 2019, she held a postdoctoral research scholar appointment in the Textile Protection and Comfort Center at NC State and investigated, for example, quantitative and qualitative analytical techniques to detect contaminants found on firefighter gear. Complementary to her academic experience, she has held various positions in research, manufacturing and sales. Currently, she leads The Sustainable Dye Chemistry Laboratory. Her research focuses on the design and development of environmentally benign dyes and dyeing processes for textiles, human hair and other materials using a variety of approaches (e.g., application of green design tools such as cheminformatics / computer modeling and exploitation of microorganisms for their potential to produce colorants). In addition, she investigates dye and substrate structure-property relationships (e.g., toxicity, porosity) and dye-substrate interactions (e.g., uptake of dye) key in designing and developing the dyes.


Williams, T.N. et al. 2022, "Evaluation of the Toxicological and Color Properties of Anionic Hydrophobic Monoazo Dyes for Sustainable Human Hair Coloration." *ACS Sustainable Chem. Eng.* 10 (8), 2593-2601.

Williams, T.N., Szymczyk, M., and Freeman, H.S. 2021, "In situ Chelation of Monoazo Dyes in Human Hair Keratin Fibers Using Environmentally Benign Metal Ions." *ACS Appl. Bio Mater.* 4 (8), 6195-6202.

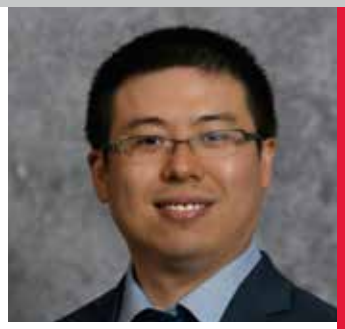
Williams, T.N. and Freeman, H.S. 2019, "Analysis of keratin films as screening tools for predicting the efficacy of potential hair dyes." *Color. Technol.* 135 (4), 253-266.

Williams, T.N. et al. 2018, "Toward the Rational Design of Sustainable Hair Dyes Using Cheminformatics Approaches: Step 2. Identification of Hair Dye Substance Database Analogs Based on the Max Weaver Dye Library." *ACS Sustainable Chem. Eng.* 6 (11), 14248-14256.

Williams, T.N. et al. 2018, "Toward the Rational Design of Sustainable Hair Dyes Using Cheminformatics Approaches: Step 1. Database Development and Analysis." *ACS Sustainable Chem. Eng.* 6 (2), 2344-2352.





**Assistant Professor**
Ph.D. (2017), University of Miami

Research Interests: Design and synthesis of dyes, fluorophores and photoresponsive materials; single-molecule super-resolution optical imaging and functional nanoscopy; analytical chemistry; machine learning; vision science.

# YANG ZHANG

Zhang received his B.S. in chemistry in 2012 from the Qilu University of Technology in Jinan, China. He received his Ph.D. in chemistry in 2017 from the University of Miami in Coral Gables, Florida. He was a postdoctoral fellow in the Department of Biomedical Engineering at Northwestern University from 2017-19. Prior to joining the NC State University faculty, he was a research assistant professor of biomedical engineering at Northwestern University.

Zhang focuses on the synergistic developments of (1) new dyes and photoactive materials, and (2) nanoscopic and single-molecule imaging technologies towards the understanding of new structure-function relationships in the textile complex and functional materials at the nanoscale. Zhang also seeks the application of integrated chemical and imaging tools for understanding the complex molecular basis of life processes related to color perception and human vision.

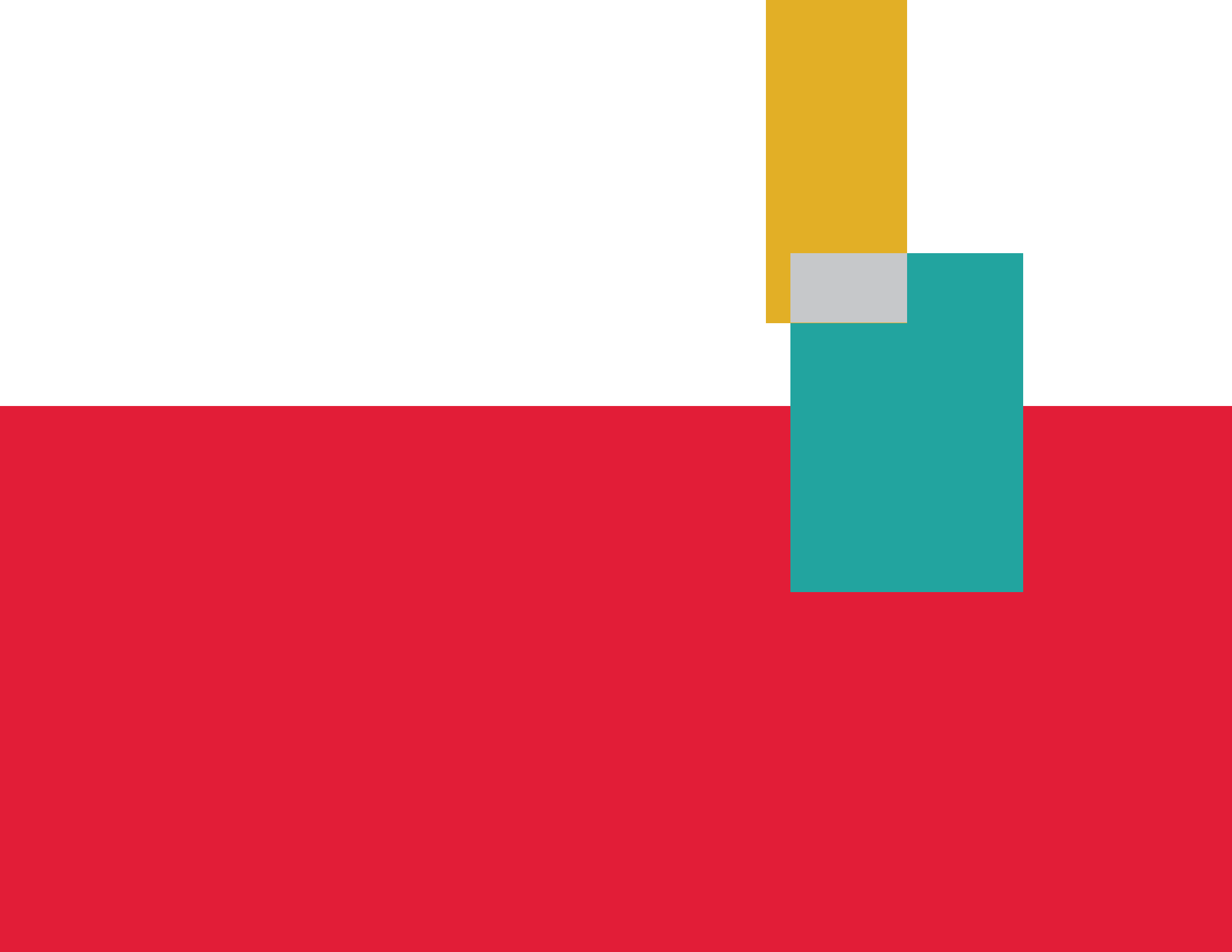

Y. Zhang, S. Swaminathan, S. Tang, J. Garcia-Amorós, M. Boulina, B. Captain, J.D. Baker, and F. M. Raymo, Photoactivatable BODIPYs Designed to Monitor the Dynamics of Supramolecular Nanocarrier. J. Am. Chem. Soc., 2015, 137, 4709–4719

Y. Zhang, K. Song, S. Tang, L. Ravelo, J. Cusido, C. Sun, H. F. Zhang, F. M. Raymo, Far-Red Photoactivatable BODIPYs for the Super-Resolution Imaging of Live Cells. J. Am. Chem. Soc., 2018, 140, 12741-12745.

Y. Zhang, B. Captain and F. M. Raymo. A pH-Gated Photocage. Adv. Optical. Mater., 2016, 4, 1363-1366.

K. Song[#1], Y. Zhang[#1], B. Brenner, C. Sun, H. F. Zhang. Symmetrically-dispersed spectroscopic single-molecule localization microscopy. Light Sci. Appl. (by Nature Publishing Group), 2020, 9, 92: 1-10. ([#1] Co-First Author)

Y. Zhang, Yu Zhang, K. Song, W. Lin, C. Sun, G. C. Schatz, H. F. Zhang, Investigating Single-Molecule Fluorescence Spectral Heterogeneity of Rhodamines Using High-Throughput Single-Molecule Spectroscopy. 2021, J. Phys. Chem. Lett., 2021, 3914-3921.



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