Department of Electrical and Computer Engineering

TEXAS TECH UNIVERSITY
Edward E. Whitacre Jr.
College *of* Engineering

Spring 2024 Seminar Series

Seminar Title: ***Nanotechnology Meets Nature: Leveraging Bioinspired Nanosensors for Disease Diagnostics***

Time: 2:00-2:50 PM, Friday, Jan 19, 2024
Location: Holden Hall 150

Speaker:
Indrajit Srivastava
TTU Department of Mechanical Engineering

Abstract:
With the emergence of nanotechnology, the field of biomedicine has been ushered into a new dawn for early diagnosis and treatment regimens for a multitude of human diseases. However, the design and development of functional nanoconstructs are often hindered by biological barriers and constraints of material characteristics that can negatively impact their efficacy when introduced into a physiologically relevant system. In this seminar, I will discuss how combining nanoengineering design principles and natural materials helps us overcome these challenges and leads to the development of biomimetic nanosensors for image-guided surgical and therapeutic interventions for cancer. First, I will discuss how designing biomimetic nanoparticles mimicking the chemical attributes of red-blood-cell can be used to accurately delineate tumors from healthy regions and simultaneously provide a qualitative indicator of metastases cancer progression, thereby assisting fluorescence-guided cancer surgeries. Second, I will discuss a new class of biomimetic surface-enhanced Raman scattering (SERS)-plasmonic nanosensors with improved dispersibility characteristics and enhanced SERS signal brightness can be used for spectroscopy-guided tumor cell identification and multi-modal cancer surgery. I will conclude by briefly talking about my lab's current research on creating methodologies that develop nanoparticles with tunable biomimetic features and easily impartible activable molecular imaging signals. Such biomimetic nanoparticles combined with data-driven approaches can lead us to breakthroughs in understanding fundamental questions (organ-specific targeting, endosomal escape, toxin neutralization) and aid in development of next-generation of nanotherapeutics, nanovaccines and disease diagnostic tools.

Speaker Bio:
Dr. Indrajit Srivastava joined Texas Tech University as a tenure-track assistant professor in the Mechanical Engineering department in fall 2023. Prior to this, Dr. Srivastava was a Postdoctoral Research Associate (2020-2023) in the labs of Profs. Shuming Nie and Prof. Viktor Gruev at the Departments of Bioengineering and Electrical & Computer Engineering, respectively at the University of Illinois at Urbana-Champaign (UIUC). His postdoctoral work focuses on designing biomimetic nanoparticles for fluorescence and spectroscopy-guided cancer surgeries. He received his M.S. and Ph.D. degrees from UIUC in 2017 and 2020, respectively. As a graduate student in the lab of Prof. Dipanjan Pan at UIUC, his thesis focused on developing intrinsically fluorescent nanoparticles called carbon dots and expanding their applications as therapeutics, in vivo bioimaging of diseases, and array-based biosensing of analytes. Previously, he received his B.E. in Metallurgical Engineering & Materials Science in 2015 from the Indian Institute of Engineering Science & Technology, Shibpur, India, supported by Prof. A. K. Seal Memorial Undergraduate Academic Fellowship. His research has been published in high impact scientific journals including Advanced Functional Materials, ACS Nano, Nature Communications, PNAS, and JACS to name a few. His work has been recognized with several awards and honors, like multiple Baxter Young Investigator Awards, American Chemical Society PMSE Future Faculty Scholar, Alexander von Humboldt Research Fellowship, Carbon Journal Dissertation Award, and BMES Career Development Award. Through his mentoring and outreach activities, he has shown his strong commitment in enhancing diversity, equity, and inclusion in STEM.