Louisiana EPSCoR
ESTABLISHED PROGRAM TO STIMULATE COMPETITIVE RESEARCH VOL.13 NO.01

Cutting-edge technologies for interdisciplinary materials research

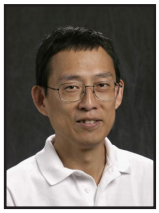
Bringing together different disciplines of science is at the core of the advanced manufacturing and materials research effort being conducted by the Louisiana Materials Design Alliance (LAMDA), consisting of researchers from five universities: Louisiana State University (LSU), Louisiana Tech University, Southern University, Tulane University, and University of Louisiana at Lafayette. The alliance is funded by a $20 million cooperative agreement with the National Science Foundation and support from the Louisiana Board of Regents.

LAMDA PhD student Saber Nemati working with Avizo for 3D reconstruction of tomography data at Louisiana State University.

This is an exciting era in advanced manufacturing research, bringing together Louisiana's lead researchers from several disciplines and partnering with industry and national labs. An important part of this research team is graduate and undergraduate students. Louisiana's bright minds perform critical research under the mentorship of LAMDA's primary investigators. One of LAMDA's key student researchers is Mr. Saber Nemati, a PhD student at LSU.

Nemati researches how to detect materials defects inside of advanced manufactured parts. "Currently, I am working on the applications of machine learning in materials engineering. Particularly, we are trying to apply novel intelligent methods for real-time monitoring of additive manufacturing parts using synchrotron/neutron beamline tomography for material characterization and microstructure analysis. In other words, we want to create an 'artificial materials specialist' who is as smart as an experienced engineer and as fast as a computer, and of course does not face the common safety issues that humans do," said Nemati.

"This is not only a hot field of study, but also an exceptional opportunity to deal with today's technological trends in research and development," added Nemati.



Dr. Shengmin Guo

This research is truly interdisciplinary, combining theoretical, experimental and numerical aspects of materials science, engineering, computer science, and physics fundamentals. Nemati belongs to a team who designs different polymer and alloy materials, algorithms, testbeds and specimens and then tests their strength with supercomputers. After the virtual testing, the experimental results are physically tested in the lab to verify the results.

Nemati works with Dr. Shengmin Guo, an expert in Additive Manufacturing, Dr. Xin Li, who is known for his expertise in Image Processing, and Dr. Les Butler whose research is focused on Tomography. "It is a great honor and a big opportunity for me to work under the supervision of these acknowledged experts," said Nemati.

"Is there any way to do this better?"

This was the recurring question that Nemati would ask himself, as a young

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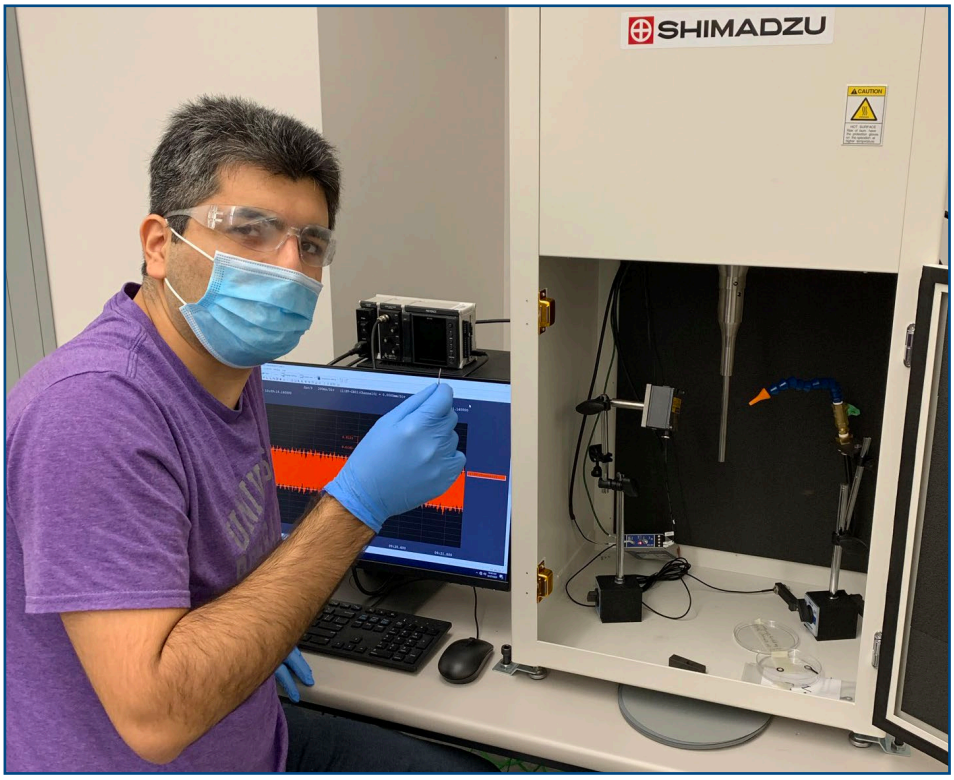
student who loved puzzle magazines and, later as an engineer, in ordinary situations, such as riding a public bus and thinking about improving the paper ticket process. This mindset led him to study mathematical sciences in high school and mechanical engineering in college in Iran where he grew up.

After acquiring the basic knowledge earning his undergraduate degree and a masters degrees in Mechanical Engineering, he broadened his experience by working in industry and facing the challenges of real-world problems. He later felt the need for a broader perspective, and earned his MBA with a focus on Strategic Management, which helps him have a bigger picture of the whole process, from identifying customer needs to production process to sales and marketing.

Ultimately, he wants to be an entrepreneur who can develop a sustainable relationship between science and industry. He has persistently paved the way to achieving this goal during his education and career.

He is currently working toward his goal of completing his PhD in Engineering Science at LSU. He decided on attending LSU when he visited



Saber Nemati performing high frequency ultrasonic fatigue testing of small key-shaped specimens for evaluating fatigue life of additive manufactured parts.

Dr. Guo's webpage, and saw that under the research goal it was written, "Provide challenges and opportunities for future engineers and high-tech leaders."

"I believe with his attitude, no other mentor can contribute more to my decision than him," said Nemati.

"The most challenging and exciting skill that I'm learning in this project, is having the ability to communicate with various scientists and experts from different backgrounds.

Normally, computer scientists and materials engineers do not have so much in common. But with LAMDA and its interdisciplinary nature, it is absolutely crucial to learn how to maintain a scientific communication among different groups," concluded Nemati.

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