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Advanced Manufacturing Game Changer

SCIENCE

LSU is leading an innovative \$20 million project that will introduce new technologies and materials to boost a range of manufacturing industries, with federal support from the National Science Foundation, or NSF.

3-D printing technology holds the potential to reinvent the manufacturing industry, but the materials currently available do not meet the needs for structural safety and integrity.

To solve this, LSU scientists and engineers, along with collaborators throughout the state, will be discovering and testing the composition, processing, microstructure, performance and structural integrity of materials that can be used in advanced 3-D printing.

"This game-changing work is at the frontiers of science, engineering and education. We are committed to connecting our research discoveries to industry, so they can have real-world impacts," said Michael Khonsari, the Dow Chemical Endowed Chair in Rotating Machinery in the LSU Department of Mechanical Engineering, who is the project director for the newly established Louisiana Materials Design Alliance, or LAMDA, in his capacity as Associate Commissioner for Research at Louisiana Board of Regents.

LAMDA is comprised of scientists and engineers at five Louisiana universities—Louisiana Tech, University of Louisiana Lafayette, Southern University A&M, Tulane University and LSU. The [Louisiana Board of Regents](#) is administering this grant.

"This is a great win for Louisiana and the economy that will provide a much-needed boost to the manufacturing industry in our state and across the U.S. We are thankful for the National Science Foundation's support of the research expertise at LSU and throughout Louisiana," said LSU Interim President Tom Galligan.

NSF has funded the project for five years.

"This project is a superb example of synergistic, inter-related research and educational activities that support a larger national scientific priority area," said NSF Established Program to Stimulate Collaborative Research Director Ann Stapleton.

LAMDA researchers will develop and use state-of-the-art machine learning, a form of artificial intelligence, to efficiently hone in on the specific materials that can deliver the best performance metrics and structural integrity for 3-D printing.

"Any trial and error in the lab would take days and years of design. This is why the team will use machine learning to figure out what type of materials to use, and how to optimize them. Essentially, LAMDA will develop a framework for material design guided by machine learning," Khonsari said.

At LSU, the researchers involved include co-Principal Investigator and the Jack Holmes Professor in Mechanical Engineering Shengmin Guo; co-Principal Investigator and the Major Morris S. & DeEtte A. Anderson Memorial LSU Alumni Professor of Mechanical Engineering Guoqiang Li; Assistant Professor of Mechanical Engineering Genevieve Palardy; the A. K. & Shirley Barton Professor of Mathematics Blaise A. Bourdin; LSU Chemistry Professor Leslie G. Butler; the Oskar R. Menton Professor of Electrical Engineering and the Center for Computation & Technology Xin "Shane" Li; the Smiley and Bernice Romero Raborn Chair in Mechanical Engineering Wen Jin Meng; Assistant Professor in the Division of Computer Science & Engineering Mingxuan Sun; Associate Professor in the Division of Computer Science & Engineering Jian Zhang; the Alexis and Marguerite Voohries Professor of Mechanical Engineering, the Richard J. and Katherine J. Juneau Distinguished Professor and Department Chair of Mechanical & Industrial Engineering Dimitris E. Nikitopoulos; LSU Department of Physics & Astronomy Professor Phillip T. Sprunger; and LSU Chemistry Professor John A. Pojman.

"This alliance brings some of the top talent at LSU and around the state together to do what we do best: discover, innovate, test and deliver. All along the way, LAMDA will work closely with key industry leaders and educate the workforce," said LSU Vice President of Research & Economic Development Sam Bentley.

In addition, the faculty will develop new courses and student-led LAMDA research projects to grow the skilled and diverse STEM workforce in Louisiana. Summer training programs for community college faculty will also provide them with educational tools in 3-D printing methods and software, which can be incorporated into community college classrooms.

The NSF grant will support 14 new faculty at the five universities that are part of LAMDA.

"We want an influx of new faculty as well as industry partners to come and work with us," Khonsari said.

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Provided by Louisiana State University

Publish Date:
 05-22-2020

