Six ME students presented at MSU's Spring Undergraduate Research Symposium

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April 14, 2023

Hosted by the Shackouls Honors College, the Spring Undergraduate Research Symposium offered students the opportunity to present research through poster and oral presentations on April 13 and 14. URS also invited evaluators to give feedback to student presenters, which was a new addition to the event. The students who presented were Berry Carter, Minjae Cho, Reese Dunne, Darrock Flynn, Leon Köhler, and Charlotte Thompson.

Reese Dunne, a senior mechanical engineer major from Starkville, MS, presented "Development and Implementation of a Magnesium-Based Finite Element Degradation Model for Hydroxyapatite-Coated Orthopedic Implants." His presentation focused on developing and implementing a finite element degradation model for HA-coated Magnesium alloys that could be used to reduce the need for implant removal surgeries and minimize pain associated with long-term implants.

Dunne said he foresees a positive impact being made in this research and how that kind of possibility has molded his future goals.

"If we continue this research and get degradable bone implants into a certain setting – that would be revolutionary. That sort of impact is what draws me to research in general. That's what I'm going to grad school for," Dunne said.

Darrock Flynn, a junior mechanical engineer major from Flowood, MS, presented "Computational Fluid Dynamics in a Perfusion Bioreactor." He discussed the potential mechanical bioreactors have for studying cell growth in 3D bone structures via perfusion by examining the fluid flow around and through specimens – simulating trabecular pig bone with computational fluid dynamics simulations.

Flynn said despite the difficulty, this research helped him utilize Ansys Mechanical and allowed him to do CFD work.

"I have a bit of grit when it comes to learning and working. Just because something is hard does not bother me. This has been very difficult and intimidating – but not impossible," Flynn said.

Charlotte Thompson, a junior mechanical engineer major from Pensacola, FL, presented "Construction of a Gecko Toe Angle Detachment Device for Estimating Adhesion Forces Among Gecko Species." She described a prototype toe angle detachment (TAD)

device that will allow evolutionary biology researchers to conduct physical and repeatable experiments to find and compare adhesion force among gecko species.

Thompson said she enjoys projects involving specially designed devices, especially if they are for a topic that draws her interest and helps other scientists.

“I really like being able to help develop something through engineering that helps other scientists to be able to accomplish something or find something that they’re curious about – because I’m really curious about helping them get to that,” Thompson said.

Minjae Cho, a junior mechanical engineer from Starkville, MS, presented, “Development of Parameter Dependent conditional Generative Adversarial Network (PDcGAN) Model for Multi-Phase Flow Prediction.” He said his research focuses on developing a deep learning framework using a conditional Generative Adversarial Network (cGAN) to predict the complex spray and air-fuel mixing in gasoline direct-injection (GDI) engines. He has overcome challenges but after extensive training on a GPU, the model can predict the morphology of fuels not included in the training data and will continue to improve in accuracy.

Cho said that the Research Symposium was a great opportunity to further his knowledge and practice his communication skills.

“Presenting my research at the Undergraduate Research Symposium allowed me to expand my understanding of computer programming and how it can be applied in mechanical engineering. Collaborating with Dr. Hwang and Dr. Mun also gave me the opportunity to enhance my communication and presentation skills,” Cho said.

Leon Köhler, a junior mechanical engineer from Moers, Germany, presented, “Hyperspectral Classification of Invasive Species by using Uncrewed Aerial Systems.” He discussed how his research focuses on hyperspectral imagery data acquired from a UAS to detect and classify four medium-to-large animals. This research will assist in accurately identifying invasice species, which can manage populations and protect native habitats.

Köhler said his research helped him to learn about more about important topics and fields of engineering.

“I deeply enjoyed working at the Geosystems Research Institute with Dr. Samiappan on this research. The research allowed me to dive deep into the fields of spectral imagery, data analysis, and artificial neural networks. All these topics have previously been unknown to me, and this research gave me the opportunity to discover those important fields of engineering,” Köhler said.