# AME team wins poster award at American Physical Society Division of Fluid Dynamics Conference

*SHINE participant Madeleine Yee shares her firsthand experience*

By Madeleine Yee

Original research posters, an award from an international conference, and a submitted paper where I am one of the first authors—all of this was possible through participation in USC Viterbi School of Engineering's Summer High School Intensive in Next-Generation Engineering (SHINE) program.

I always knew I wanted to pursue aerospace engineering. My father is also an aerospace engineer and received his Ph.D. from USC Viterbi. I've grown up around conversations ranging from analyzing a recent rocket launch to discussing the turbulence that happens when one stirs a coffee cup. From him, I gained immense knowledge about rockets and fluid dynamics.

I often think about the fluid dynamics around me and see it in my everyday life. Swim practices became more enjoyable after realizing how the water moves around me when I swim. My interest morphed into studying computational fluid dynamics (CFD). I used CFD for my science projects, where I modeled an arterial stent being used to reduce the effects of cholesterol buildup. Just completing science projects wasn't enough to fulfill my interest in fluid dynamics, so I began looking into research programs.

I am so grateful that I participated in SHINE. Although both opportunities I had with the program were online, I gained insightful information about the field of fluid dynamics and aerospace engineering. Learning from my graduate student mentors and Associate Professor Mitul Luhar enhanced the experience, something I wouldn't have received elsewhere. During SHINE20, I created CFD simulations modeling droplet sprays from the nose and mouth. Inspired by the COVID-19 pandemic and evaluating the effectiveness of CDC guidelines, I determined that six-feet social distancing was adequate, and masks can reduce droplet spray by up to 75 percent, depending on the mask type. Our research culminated in a student academic paper submitted to the American Institute of Aeronautics and Astronautics. Completing research on prevalent societal issues increased my interest in fluid dynamics and created a newfound love for conducting research.

During SHINE21, I worked with another SHINE student to classify hydrodynamics wakes into predetermined categories. Using machine learning to train and test the computer, we developed a code to classify the different wakes with around 85-90% accuracy. Our work was submitted to the American Physical Society Division of Fluid Dynamics's conference in November 2021 and won 2nd place in the student poster competition. Learning and understanding the process of machine learning was initially challenging but became manageable and accessible through the help of my mentor Vamsi.

It was through these experiences that I learned what research truly is. It isn't the classic high school version of choosing a topic and using the internet to browse websites and maybe read one academic article. Instead, research consists of looking into one subject, then taking an alternate path again and again until your research direction looks like a jumble of tangled wires nobody wants to undo. This process happened to me, and I am grateful that it did. When my original project was not feasible due to SHINE moving online, I considered other research topics. Through much deliberation and taking multiple paths, I eventually

settled on modeling how COVID spreads due to its immediate significance and feasibility to complete in an online format. Through the program, I learned that aerospace engineering, specifically fluid dynamics, is a field I want to pursue in college and eventually earn a Ph.D. in. I plan to continue my efforts in research and turn my passion for fluid dynamics into a successful career.