

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

SHINE participant Philbert Loekman shares his firsthand experience

By Philbert Loekman

When I board a plane, I am overwhelmed with the sense of nostalgia as I replay stories told by my parents. As a baby, I would persistently crawl towards the front of the aircraft in hopes of reaching the cockpit, but my dreams would be crushed by a kind flight attendant. As far back as I can remember, I had this fascination and addiction to staring out into the sky, watching these graceful behemoths, even as they appeared much smaller, as mere specks. I always questioned, what wizardry allows such a monstrous man-made creation to be able to free itself from the shackles of gravity and pierce the vast blue sky.

This unyielding passion led me to explore the world of aviation and eventually attain my student pilot's license, allowing me to fly the 1998 Cessna Skyhawk solo. When I fly—at least twice per week—there's this irreplicable sense of serenity that is unfathomable. Day or night, rain or no rain, gusts or doldrums, the ground always grows smaller as the ever-changing sky swallows me and as my vision fills with the endless hypnotic horizon. The limitations of where I can go and the places I can reach are all decided by how far I am willing to explore.

With this mentality instilled within me, when the opportunity arose to participate in USC SHINE, I did not hesitate. Not only has it created life-changing experiences that have further propelled my passion for aviation, but I have also gained invaluable knowledge regarding the process and how to conduct a successful research project.

The nature of our research topic was the classification of hydrodynamic wakes (spiral, planar oscillating, asymmetric non-oscillating, symmetric non-oscillating, and vortex street) by developing a Convolutional Neural Network (CNN). By implementing PyTorch, a machine learning library, and its various features such as Convolution Layers (Conv2d), which decreases the dimensions of an image while retaining its features, and Pooling Layers (MaxPool2d), which downsamples an image to the highest integer in the filter size, I was able to tweak these various parameters in order to train the neural network. I had the honor of assisting USC Viterbi graduate students Vamsi Krishna Chinta, Morgan Jones and Chan-Ye Ohh, fellow SHINE student Madeleine Yee, and Professor Geoffrey R. Spedding and Assistant Professor Mitul Luhar in the development of a CNN that had the ability to correctly classify 80 percent for numerical data.

This project is of importance because of the potential it has not only for its biological impact, but for national security, too. We would be able to track marine animals such as the female green sea turtle and track the migration of it through the seasons, giving us a better understanding of the ecological nature of the ocean. On the other hand, we could possibly identify threats that may be harbored in nearby waters. The possible benefits are endless for the entire world.

SHINE has prepared and exposed me to the research world in such a significant way that it will have lasting effects for the rest of my life. With such close connections with my mentors, I was

able to communicate in a way that made me more devoted and determined to achieve my goals. My only regret was not asking enough questions, but with this flaw already identified through this experience, I will have the ability to participate in future research projects and have a meaningful impact.