Velocimetry-based pressure field reconstruction and uncertainty quantification
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Time: 9:00 – 10:00 AM
Location: 362 Willard Blg.
Coffee and donuts will be provided

Abstract: Experimental techniques for non-invasive flow velocity measurements, such as particle image velocimetry (PIV), have become standard in research and industry. However, pressure measurement techniques, which are equally critical to experimentalists investigating fluid flow problems, are still at early stages of development. From these initials efforts, PIV-based pressure field reconstruction has emerged as one of the most promising techniques (Van Oudheusden, 2013). However, despite the fact that PIV-based pressure field reconstruction is a quantitative measurement tool, the uncertainty evaluation of this tool is currently insufficient (as an ironical analogy, consider using a weight scale that does not provide precision or accuracy information in its manual). Based on analysis of the Poisson equation, our research sets up a rigorous framework that decouples the error and true value of the measurements and allows direct analysis, rather than unrealistically assuming negligible error as has been done in the majority of past studies (Pan et al., 2016). These studies cannot only quantify the uncertainty in the reconstructed pressure field, but, on the other hand, can lead to more accurate PIV-based pressure field reconstruction techniques.

Biography: Zhao Pan is working as a postdoctoral researcher at Utah State University with Profs. Tadd Truscott and Barton Smith. Zhao performed his doctoral research in the Splash Lab and received his Ph.D. from Brigham Young University in May 2015. His dissertation addresses error propagation dynamics of the PIV-based pressure calculation. He has broad research interests including topics such as: PIV, bubbles, droplets, and fluid instabilities, as well as biofluids, especially flow and transport in plants. Prior to joining the fluid community, he worked in dynamics and controls during his undergraduate and master years. He also tasted material and heat transfer for a short time; however, after taking Prof. Christo I. Christov’s PDE class, Zhao dramatically changed his interest to fluid dynamics. He looks forward to connecting his various backgrounds with his future research in fluid dynamics. He enjoys art, food, and especially basketball, but now he is too fat to play well.

References