Translational AI Center (TrAC) Seminar Fall 2024

Ping Guo

September 18th at 11:00 AM (US Central Time)

More information and zoom link: https://trac-ai.iastate.edu/event/trac-seminar-series-ping-guo/

Deep learning enabled computer vision metrology: from strain estimation to form measurement

Abstract

The embryo of Industry 4.0 has been transforming manufacturing into an autonomous, adaptive, and responsive paradigm while setting a higher standard for efficiency, accuracy, and reliability. These new stringent demands in Industry 4.0 call for new capabilities of metrology systems that can precisely measure, intelligently sense, and autonomously inspect. My work on machine vision metrology is deeply motivated by the current and future needs of smart manufacturing. In this talk, I will cover two examples of deep learning-enabled machine vision metrology to illustrate novel contributions in addressing the major technical challenges in bringing deep learning to computer vision for manufacturing applications. The first example provides an end-to-end approach for the prediction of both workpiece displacements and strains during digital image correlation (DIC) for material characterization. The second example uses deep learning to enhance photometric stereo for potential in-process three-dimensional (3D) form measurement. One of the common challenges in these applications is the lack of high-quality data. I will demonstrate a combined physics-based and data-driven approach to synthesize realistic and large-scale datasets for the optimal performance of deep learning models.

Short Bio

Dr. Ping Guo is an Associate Professor in the Department of Mechanical Engineering at Northwestern University. He received his B.S. degree in Automotive Engineering from Tsinghua University in 2009 and his Ph.D. degree in Mechanical Engineering from Northwestern University in 2014. Before joining Northwestern University in September 2018, he spent four years at the Chinese University of Hong as an Assistant Professor. Dr. Guo's research interests include precision engineering, computer vision metrology, and additive manufacturing. He currently serves as the Associate Editor of SME Journal of Manufacturing Processes and ASME Journal of Micro and Nano Manufacturing. He is the recipient of F.W. Taylor Medal from CIRP (2023), Kornel F. Ehmann Manufacturing Medal from ASME (2021), Outstanding Young Manufacturing Engineer Award from SME (2020), Young Investigator Award from International Symposium on Flexible Automation (2018), Hong Kong Research Grants Council Early Career Award (2016). He is an elected Associate Member of the International Academy for Production Engineering (CIRP).

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