ABSTRACT
In the past two decades, meshfree methods have emerged into a new class of computational methods with considerable success. For instance, the need for high order quadrature and background grid has been circumvented, making it possible to eliminate the need for a mesh entirely. Meshfree collocation methods have also undergone significant development, which also offer a truly meshfree solution. Meshfree methods such as the Reproducing Kernel Particle Method (RKPM) offer arbitrary orders of continuities/discontinuities and locality in the approximation while allowing straightforward model refinement and physics-specific solution enrichment. These unique properties have expanded the horizon of computational mechanics and scientific computing applications well beyond what the mesh-based computational methods can offer such as modeling of man-made and natural disasters. A recent effort finds its new application in pixel-based data-driven computing, where the employment of smooth interpolants in an unstructured discretization can be utilized to reconstruct the local data manifold in a convex hull based on nearest neighbor material points to yield a better conditioned reduced-dimension data-driven optimization system for enhanced accuracy and robustness against noise and outliers in data sets. A data-driven simulation of heart valve tissues under finite deformation will be demonstrated.

BIOGRAPHY
J. S. Chen is currently the Inaugural William Prager Chair Professor of Structural Engineering Department, Professor of Mechanical and Aerospace Engineering Department, and the Director of Center for Extreme Events Research at UC San Diego. Before joining UCSD in October 2013, he was the Chancellor’s Professor of UCLA Civil & Environmental Engineering Department where he served as the Department Chair during 2007-2012. J. S. Chen’s research is in computational mechanics and multiscale materials modeling with specialization in the development of meshfree methods. He is the Past President of US Association for Computational Mechanics (USACM) and the Past Present of ASCE Engineering Mechanics Institute (EMI). He has received numerous awards, including the Computational Mechanics Award from International Association for Computational Mechanics (IACM), ICACE Award from International Chinese Association for Computational Mechanics (ICACM), the Ted Belytschko Applied Mechanics Award from ASME Applied Mechanics Division, the Belytschko Medal from U.S. Association for Computational Mechanics (USACM), among others. He is the Fellow of USACM, IACM, ASME, EMI, SES, ICACM, and ICCEES.