

Efficient iterative convolution-thresholding methods for interface related optimal design problems

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Interface related problems have a lot of applications in fluid dynamics, material science, image processing, shape and topology optimization, and so on. In this talk, we propose to use indicator functions to implicitly represent the interface, introduce a concave approximation to the energy/objective functional, and derive an unconditionally stable iterative method for interface related problems. We will introduce a topology optimization problem as one example for optimization cases. Some other applications including image segmentation, configuration of foam bubbles, optimal partition will also be presented.

Bio: Dong Wang is a tenured Associate Professor and Presidential Young Fellow at The Chinese University of Hong Kong, Shenzhen (CUHK-Shenzhen), where he previously served as a tenure track Assistant Professor from 2020 to 2026. Dong received his Ph.D. in Applied Mathematics from the Hong Kong University of Science and Technology in 2017, under the supervision of Prof. Xiao-Ping Wang, and his B.Sc. in Mathematics from Sichuan University in 2013. During his doctoral studies, he visited Prof. Qiang Du at Columbia University from Sep. 2016 to Mar. 2017. Prior to joining CUHK-Shenzhen, he was an Assistant Professor (Lecturer) in the Department of Mathematics at the University of Utah from 2017 to 2020.

His research interests lie broadly in computational mathematics, with a particular focus on mathematical modeling, high-performance algorithm design, and theoretical analysis for application-driven problems in materials science, image processing, topology optimization, and multiphase flows. He is also actively engaged in threshold dynamics methods and machine learning. In addition to his primary appointment, he serves as a Research Scientist at the Shenzhen International Center for Industrial and Applied Mathematics (SICIAM) of the Shenzhen Research Institute of Big Data (SRIBD), and as an Associate Professor at the Shenzhen Loop Area Institute (SLAI). He also holds several administrative roles: Assistant Dean for Education in the School of Science and Engineering (SSE) at CUHK-Shenzhen, Deputy Director of SICIAM, and Director of the University Collaboration Office (UCO) at SRIBD.