Clarkson University

Mathematics REU Speaker Series

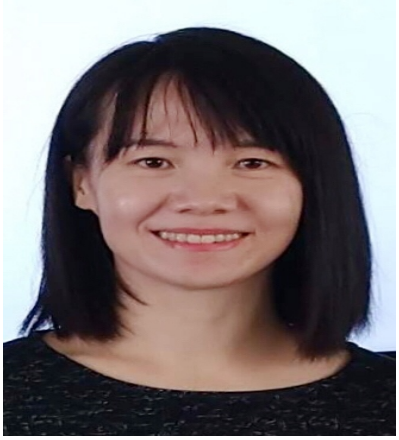
Summer 2022

Thursday June 16, 2022 @ 11 am in SC 356

Attend the talk via zoom:
https://clarkson.zoom.us/j/98680644309

Simulation and analysis of 3D micro-encapsulation using efficient threshold dynamics

Droplet-based microfluidics technology is important for bioengineering research and design. New novel micro-encapsulation techniques allow for the creation and analysis of uniform-sized microscale drop carrier particles (dropicles). However, reliability of the single-particle-based techniques depends on the particle structure. Therefore, design of particle structures that can encapsulate uniform-sized droplets becomes the key to technology development success. Since the difficulty of manipulation at the micron scale greatly limits the possibilities of particle shapes design through laboratory experiments, numerical simulation and analysis play a vital role in guiding microparticle design. To this end, we present an efficient volume preserving threshold dynamics method to compute the equilibrium surface energy configuration for micro-encapsulation based on amphiphilic microparticles. The validity and efficiency of this method are verified by comparing with other numerical methods and laboratory experiments. Through the comparative analysis of total interfacial energy for different particle dimension ratios, we assess the ability of particle structure to encapsulate microdropicles. This numerical model could be used to explore future design ideas for these particles before creating them in the lab.



Assistant Adjunct Professor
University of California
Los Angeles

Wen Li, Ph. D.

Dr. Wen Li is currently an Assistant Adjunct Professor (postdoc) in Applied Mathematics at University of California, Los Angeles, working with Prof. Andrea L. Bertozzi and Prof. Luminita A. Vese. She will join Fordham University this fall as a tenure-track Assistant Professor. She received her Ph.D. in Applied Mathematics at Clarkson University in May 2019, working under the supervision of Prof. Guangming Yao. She was also a Lecturer of Mathematics at Taiyuan University of Technology in China. During her doctoral study, her research focused on developing numerical methods for solving partial differential equations and utilizing them to solve real-world problems. During her postdoctoral appointment at UCLA, her research interests lie in image processing and microfluidics. Throughout, she has collaborated with experts in different disciplines, including environmental engineering, bioengineering and nanoscience. She is committed to using mathematics to describe, simulate, guide and promote natural science and engineering technology.

The Mathematics REU seminar series is weekly that has been supported by National Security Agency and National Science Foundation.

Please contact: Guangming Yao (gyao@clarkson.edu) or James Greene (jgreene@clarkson.edu) for more information.