

Mechanistic modeling of immune cell activation in cancer

Stacey D. Finley, Ph.D.

Gordon S. Marshall Early Career Chair

Associate Professor of Biomedical Engineering,

Chemical Engineering & Materials Science, and Quantitative and Computational Biology

University of Southern California

Abstract

My research group works in the area of mathematical oncology, where we use mathematical models to decipher the complex networks of reactions inside of cancer cells and interactions between cells. Immune cells use hundreds of biochemical reactions to respond to their environment, become activated, and kill cancer cells. Understanding the complexity of these reaction networks requires computational tools and mathematical models. We combine detailed, mechanistic modeling with machine learning to study these networks, better understand cancer and immune cells, and predict ways to control tumor growth. In this talk, I will present our recent work aimed at predicting the dynamics of immune cell behaviors across three scales: intracellular signaling pathways in CAR T cells, the collective behavior of a heterogeneous population of immune cells, and tumor-immune interactions at the tissue scale. Our models generate novel mechanistic insight into immune cell activation and predict the effects of immunotherapeutic strategies.

Biography

Stacey D. Finley is the Gordon S. Marshall Early Career Chair and Associate Professor of Biomedical Engineering at the University of Southern California. Dr. Finley received her B.S. in Chemical Engineering from Florida A & M University and obtained her Ph.D. in Chemical Engineering from Northwestern University. She completed postdoctoral training at Johns Hopkins University in the Department of Biomedical Engineering. Dr. Finley joined the faculty at USC in 2013, and she leads the Computational Systems Biology Laboratory. Dr. Finley has joint appointments in the Departments of Chemical Engineering and Materials Science and Quantitative and Computational Biology, and she is a member of the USC Norris Comprehensive Cancer Center. Dr. Finley is also the Founding Director of the Center for Computational Modeling of Cancer at USC. Her research is supported by grants from NSF, NIH, and the American Cancer Society.

Selected honors. 2016 NSF Faculty Early CAREER Award; 2016 Young Innovator by the *Cellular and Molecular Bioengineering* journal; Leah Edelstein-Keshet Prize from the Society of Mathematical Biology; Junior Research Award from the USC Viterbi School of Engineering; the Hanna Reisler Mentorship Award; 2018 AACR NextGen Star; 2018 Orange County Engineering Council Outstanding Young Engineer; Elected Fellow of the American Institute for Medical and Biological Engineering (2021)