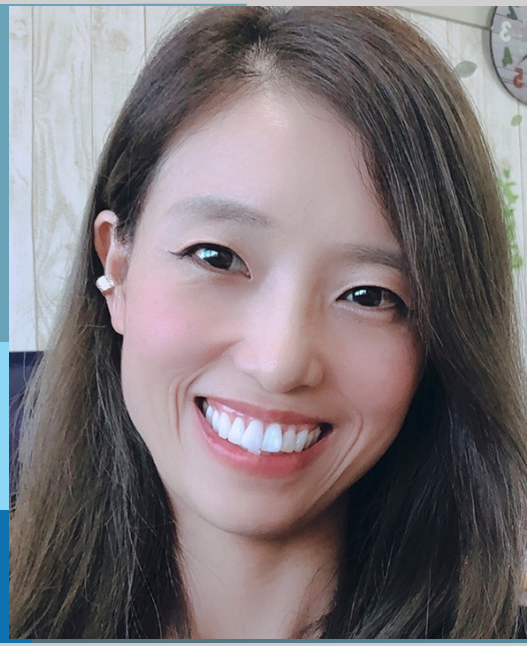
CMCF and CCBS Seminar Series

NSF-Simons Center for Multiscale Cell Fate Research
UC Irvine

Pattern Formation in Skin Diseases and Its Application to Personalized Treatment in Dermatology



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Tuesday ■ October 14, 2025 ■ 2 – 3 pm @ Rowland Hall 306

Skin diseases typically appear as visible information-skin eruptions distributed across the body. However, the biological mechanisms underlying these manifestations are often inferred from fragmented, time-point-specific data such as skin biopsies. The challenge is further compounded for human-specific conditions like urticaria, where animal models are ineffective, leaving researchers to rely heavily on in vitro experiments and sparse clinical observations.

To overcome the current limitations in understanding the pathophysiology of skin diseases, we propose a novel framework that connects the visible morphology of skin eruptions with the underlying pathophysiological dynamics in vivo, using a multidisciplinary approach that integrates mathematical modeling, in vitro experiments, clinical data, and data science. Furthermore, we will introduce an innovative methodology that combines mathematical modeling with topological data analysis and machine learning, allowing for the estimation of patient-specific parameters directly from morphological patterns of skin eruptions. This framework offers a new pathway for personalized analysis and mechanistic insight into complex skin disorders.