ENZYME ENGINEERING FOR SYNTHETIC BIOLOGY

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Synthetic biology aims to design novel or improved biological systems using engineering principles, which has broad applications in medical, chemical, food, and agricultural industries. Thanks to the rapid advances in DNA sequencing and synthesis, genome editing, artificial intelligence/machine learning (AI/ML), and laboratory automation in the past two decades, synthetic biology has entered a new phase of exponential growth. However, for many synthetic biology applications, finding the proper enzymes for the design of highly effective biological systems either by bioprospecting or engineering remains a challenge. In this talk, I will highlight our recent work to overcome this challenge. Examples include but are not limited to: (1) BioAutomata: a self-driving biofoundry for enzyme engineering, (2) ECNet: an AI tool for enzyme engineering, (3) CLEAN: an AI tool for enzyme function prediction, and (4) rapid generation of new-to-nature photoenzymes capable of catalyzing chemical transformations that are difficult or impossible by chemocatalysts.