Abstract: A fundamental challenge of biology is to understand the vast heterogeneity of cells, particularly how the spatial architecture of cells is linked to their physiological function. Unfortunately, conventional technologies such as fluorescence-activated cell sorting and the Coulter counter are limited in uncovering these relations and exploiting biomedical applications. In this talk, I will introduce Intelligent Image-Activated Cell Sorting, a new technology that performs real-time, intelligent, image-based sorting of cells at an unprecedented rate of >1000 cells per second (Nitta et al., Cell 2018; Isozaki et al., Nat. Protoc. 2019; Nitta et al., Nat. Commun. 2020; Mikami et al., Nat. Commun. 2020). This technology integrates high-throughput optical imaging, cell focusing, cell sorting, and deep learning on a hybrid software-hardware data-management infrastructure, enabling real-time automated operation for data acquisition, data processing, intelligent decision-making, and actuation. I will present a new class of applications in immunology, cancer biology, infectious disease, microbiology, and food science enabled by the technology.

Bio: Dr. Keisuke Goda is a professor in the Department of Chemistry at the University of Tokyo, an adjunct professor in the Institute of Technological Sciences at Wuhan University, and an adjunct professor in the Department of Bioengineering at UCLA. He obtained a B.A. degree from UC Berkeley summa cum laude in 2001 and a Ph.D. from MIT in 2007, both in physics. At MIT, he worked on the development of gravitational-wave detectors in the LIGO group which led to the 2017 Nobel Prize in Physics. After several years of work on high-speed imaging and microfluidics at Caltech and UCLA, he joined the University of Tokyo as a professor. His research group focuses on the development of serendipity-enabling technologies based on photonics, microfluidics, nanotechnology, and computational analytics to push the frontier of science (http://www.goda.chem.s.u-tokyo.ac.jp). He has published >300 journal and conference papers and received >30 awards including Japan Academy Medal, SPIE Biophotonics Technology Innovator Award, and Humboldt Foundation’s Philipp Franz von Siebold Award to name a few.