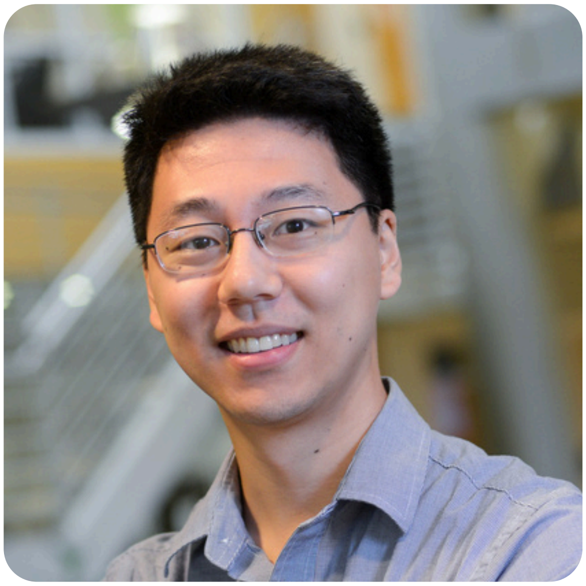
Penn Engineering
UNIVERSITY *of* PENNSYLVANIA
Chemical and Biomolecular Engineering

**Fall 2024 Seminar Series**

## ALBERT KEUNG

# "Scalable Access to the Hidden Topologies of Biology"

Wednesday
November 20, 2024
3:30 PM
Wu & Chen Auditorium



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## ABSTRACT

Biology is characterized by a diversity of phenotypes and functions that outpace the limited molecular diversity encoded in genomes. How this is achieved is a fundamental and enduring mystery of the cell. It is clear that networks defining how biological molecules interact can drive diverse and complex phenotypes, but the intermolecular interactions or edges of these networks are highly multidimensional and difficult to measure at scale. The predictive power of models depends not only on the identities of components and their edges, but on complex properties of those edges ranging from intermolecular specificities, quantitative binding affinities, rate constants for enzymatic reactions, the influence of post-translational modifications, cross-talk between components, and the spatiotemporal organization and dynamics of network components and activities. This talk will describe the development of scalable synthetic biology platforms to comprehensively map these edge properties of protein networks, applied to the human epigenome. We will also describe how these principles need to be considered and engineered in completely abiotic applications that leverage biomolecules; specifically, we will describe the engineering of extremely dense digital information storage and computing systems with DNA as the information medium. We will also touch on how these principles translate upward in spatial scale to biomedical applications in neurological disorders such as Angelman Syndrome and in the engineering of human cerebral organoid models of the developing brain.

## BIO

The Keung group engineers cellular and molecular platforms to understand how information is stored and accessed in biological systems. Their work includes engineering human stem cell models of neuroepigenetic disorders, synthetic biology platforms to study and harness the biochemical and dynamic diversity of eukaryotic gene regulation, and application of molecular biology to engineer scalable and extreme density DNA-based information storage and computing systems. His group's work has been recognized by the AIChE Langer Prize, NIH Avenir Award, ACS Synthetic Biology Young Innovator, CURE Angelman Syndrome Innovation Award, the NSF CAREER, Goodnight Early Career Innovator, and Simons Pivot Fellowship. Albert trained with David Schaffer and Sanjay Kumar at UC Berkeley (ChemEng PhD) and Jim Collins and Mo Khalil (Synthetic Biology Postdoc) prior to starting his research group at NC State in 2016.