MTH Seminar

Calabi-Yau Geometries, Dimers and Supersymmetric Gauge Theories

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(UNIST)

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String theory is an endeavor to unify the theory of the very large - gravitational physics - with the theory of the very small - quantum mechanics. In this endeavor, string theory gave birth to countless innovations in mathematics and in return gave new meaning to various mathematical developments during the past decades. For example, the discovery of Calabi-Yau geometries in mathematics led to their natural application in string theory in order to reduce string theory's 10-dimensional spacetime into what we observe in nature: 4-dimensional spacetime.

In this colloquium, I will overview the interplay between Calabi-Yau geometries and supersymmetric gauge theories that are realized in string theory. By doing so, we will see the appearance of dimers in string theory that also appear in chemistry to describe molecular structure and in physics as statistical mechanical systems. In mathematics, dimers are studied as a particular type of graphs and their connection to Calabi-Yau geometries is naturally realized through string theory. If time permits, the colloquium will conclude with a discussion on how the appearance of geometry and graphs in string theory leads to recent natural applications of machine learning and artificial intelligence in string theory and at the interface of mathematics and theoretical physics.

Bio: Professor Rak-Kyeong Seong obtained his Ph.D. in Theoretical Physics at Imperial College Lond on under the supervision of Professor Amihay Hanany. After postdoctoral fellowships in Korea and Sweden, he became an assistant professor at Tsinghua University in Beijing where he stayed until 2019. Following his work on applying machine learning in string theory, he moved to Seoul to join the AI Advanced Research Lab at Samsung SDS as a senior researcher. In 2021, he joined the Department of Mathematical Sciences at UNIST as an assistant professor.