香港浸會大學 HONG KONG BAPTIST UNIVERSITY

DEPARTMENT OF COMPUTER SCIENCE 計算機科學系

DEPARTMENT OF COMPUTER SCIENCE

SEMINAR

2026 SERIES

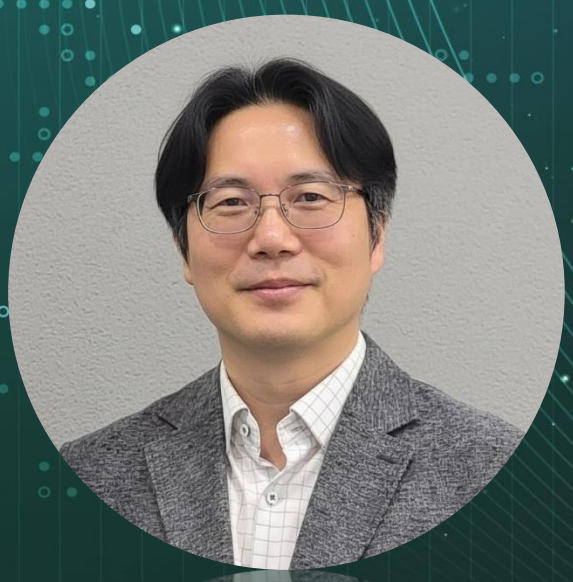
Probabilistic 4D Scene Reconstruction from Monocular Videos

DATE & TIME

10 FEB 2026 (TUE) 10:30 - 11:30 AM

VENUE

DLB637, 6/F, DAVID C. LAM BUILDING, SHAW CAMPUS



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ABSTRACT

Reconstructing dynamic 4D scenes from casually captured monocular videos is a challenging problem due to sparse observations, fast motion, occlusions, and the lack of reliable priors in real-world settings. In this talk, I present our recent efforts to advance 4D Gaussian Splatting (4DGS) by explicitly modeling uncertainty and dynamics in both geometric and probabilistic frameworks. I first introduce an uncertainty-aware regularization strategy that identifies poorly observed regions and selectively imposes additional priors, together with a depth- and scene-flow-based densification scheme that robustly initializes Gaussian primitives in fast-moving regions where structure-from-motion fails. Building on these insights, I then present GP-4DGS, a probabilistic formulation that models the motion of 4D Gaussian primitives using variational Gaussian Processes, enabling flexible, data-adaptive motion modeling, principled uncertainty estimation, and temporal extrapolation beyond observed frames. Finally, I briefly discuss our ongoing effort toward physics-aware evaluation of dynamic novel view synthesis, including the construction of a dataset designed to support future research on physically grounded 4D scene modeling.

SPEAKER'S BIOGRAPHY

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