THE UNIVERSITY OF HONG KONG

Seminar
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Toward physics-native intelligence: A path for world model, data structure and training algorithm

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Date: August 6, 2026 (Thursday)
Time: 11:00 a.m. – 12:00 n.n.
Venue: Room 612B, 6/F Haking Wong Building, The University of Hong Kong
Language: Putonghua

Abstract
As artificial intelligence evolves from vision and language to embodied systems such as autonomous driving and robotics, prevailing deep learning paradigms are facing significant challenges. This talk offers a systematic introduction of physics-native intelligence (Phi) and its design principles, as well as how to build its world model, data structure and training algorithms. Some representative physics-native algorithms will also be introduced, including (1) relativistic adaptive gradient descent (RAD) algorithm, which preserves symplecticity to ensure long-term training stability; (2) diffusion actor-critic with entropy regulator (DACER) algorithm, which endows the policy with the capability of multi-modal action distributions; (3) region-wise actor-critic-scenery (RACS) algorithm, which extends the standard binary iterative framework to a ternary one to handle safety constraints, simultaneously learning the feasible region and optimal policy with monotonicity and convergence guarantees; (4) bootstrap off-policy with world model (BOOM) algorithm, which enables bidirectional improvement between policy and world model, internalizing planning capabilities into the policy and thereby improving sample efficiency. Built upon physics-native principles, these algorithms form the core engine of embodied intelligence.

About the Speaker
Shengbo Li is a Professor at School of Vehicle and Mobility, and School of Artificial Intelligence, Tsinghua University. Before joining Tsinghua University, he has worked at Stanford University, University of Michigan, and UC Berkeley. His research has established a systematic framework for physics-native intelligence (Phi), and its world models, data structure, and training algorithms. On its basis, he and his team have contributed to absolute safety guarantees and ternary iterative mechanism for reinforcement learning, symplectic neural network optimizer, multimodal latent world model, geometry-aware Bayesian filter, as well as their applications in autonomous driving and robotics. His important awards include National Leading Talents in Sci. and Tech. Innovation in China, Youth Sci. & Tech Award of Ministry of Education, and Youth Sci. & Tech. Innovation Leader in Transportation Sector, National Sci. & Tech. Progress Award in China (Second Prize), National Award for Technological Invention in China (Second Prize), Grand Prize of Science and Technology Award of China in Automotive Industry, Natural Science Award of Chinese Association of Automation (First Prize). He also serves as the director of Technical Committee on AI of SAE-China, deputy director of Technical Committee on Vehicle Control and Intelligence of CAA, and the leader of AI working group in China Industry Innovation Alliance for ICVs.

- ALL ARE WELCOME -

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