Reconstruction of Full Decays using Transformers and Hyperbolic Embedding at Belle II

Speaker:	Boyang Yu (于博洋，LMU Munich)
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Abstract:

In analyses at Belle II, it is often helpful to reconstruct the whole decay process of each electron-positron collision event using the information collected from detectors. The reconstruction is composed of several steps which require manual configurations and suffers from high uncertainty as well as low efficiency. In this project, I am developing a software with the aim to reconstruct B decays at Belle II automatically with both high efficiency and high accuracy. The well-trained models should be tolerant to rare decays that have very small branching ratio or are even unseen during the training. To ensure high performance, the project is separated into several stages: particle level embedding, event level embedding and decay reconstruction. Inspired by the recent achievements in computer science, transformers and hyperbolic embedding are employed as building blocks with pre-training-fine-tuning framework, contrastive metric learning and knowledge transfer serving as training tools.

About the speaker:

Boyang Yu is a PhD student at Ludwig Maximilians University of Munich (LMU Munich). He obtained his B.S. and M.S. in Physics both from LMU Munich. He has developed the SmartBKG software based on graph neural networks to speed up generic Monte Carlo generations for studies of rare decays at Belle II. Currently he is working on the documentation of workflow management systems funded by German Ministry of Education (BMBF). He is also working on theanalyses of $B \rightarrow K\nu\nu$ decays as well as the HyperTagging project introduced in this talk.