Hi all,

Here's what you folks might find interesting today.

ML for Inference and Density Estimation

Physically Consistent Parameter Inference: Transparent Machine Learning Emulation in High Energy Physics and Cosmology

This paper builds an XGBoost-based emulator for complex, non-Gaussian likelihood landscapes in global fits, tackling the kind of high-dimensional parameter-space exploration that arises in flavour anomaly fits and cosmology. What makes it stand out is the use of SHAP values to keep the ML predictions physically interpretable -- ensuring feature importances align with known physics rather than being a black box. This might be interesting for you, Jingjing, as it sits at the intersection of ML-accelerated inference and interpretability, which connects to your interest in simulation-based inference workflows. The framework is demonstrated on semileptonic B-meson decays but designed to be adaptable to other phenomenological systems, which could make it a useful tool in broader SBI pipelines.

A Universal Distribution of Dark Matter in Milky Way-like galaxies and How to Infer It

This paper discovers a near-universal dark matter phase-space distribution across three independent simulation suites, revealed through a coordinate transformation, and validated using ML-based classifiers sensitive to full multivariate correlations. The authors then model this universal distribution with a normalizing flow trained on standardized phase-space data, with plans to apply it to Gaia and SDSS survey data. This is interesting for you, Jingjing -- the normalizing flow architecture for density estimation in a physics context is directly relevant to your interests in ML techniques for density modeling, and the use of classifiers to probe multivariate structure echoes density-ratio-estimation ideas. Note that David Shih is among the authors.

Quantum Computing for HEP Reconstruction

A Quantum Computing Approach to Track Reconstruction in Strip-Type Detectors

This paper formulates particle track reconstruction in strip-type gaseous detectors as a QUBO problem solved via quantum annealing, handling both single-track hit selection and multi-track cluster-triplet association in a single QPU submission. The QPU-based reconstruction achieves position and angular resolutions comparable to a Kalman filter for the single-track task, which is a meaningful benchmark. This might be interesting for you, Aritra, as it touches on quantum computing applied to HEP reconstruction -- while it uses quantum annealing rather than gate-based quantum circuits or Lorentz-equivariant architectures, it represents a practical exploration of where quantum computing could enter the HEP reconstruction pipeline.

A relatively quiet day for ML-in-HEP content. Until the next announcement!

P.S. In the most recent submission window: hep-ph: 47 papers hep-ex: 8 papers hep-th: 39 papers