Experiment/Theory Connections: Analysis Summary

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Ben Nachman

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BIDS
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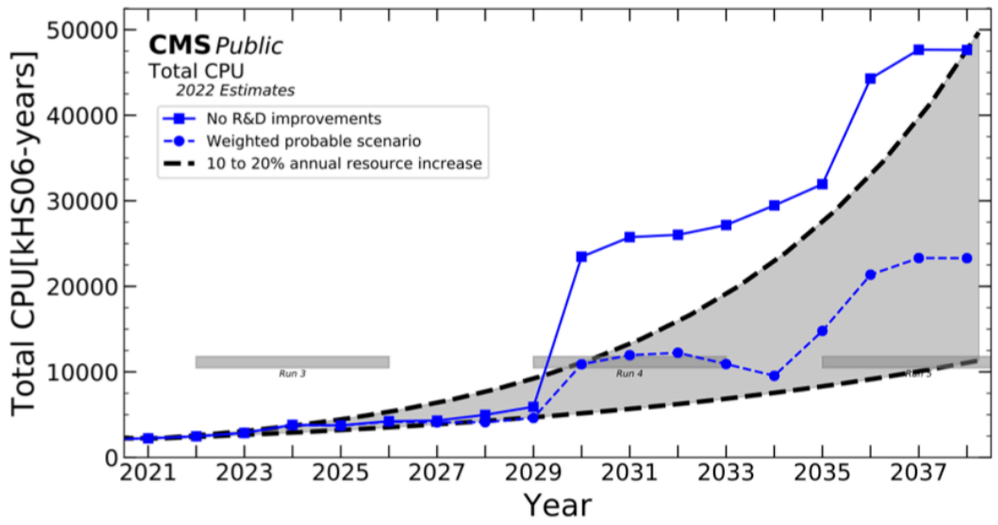
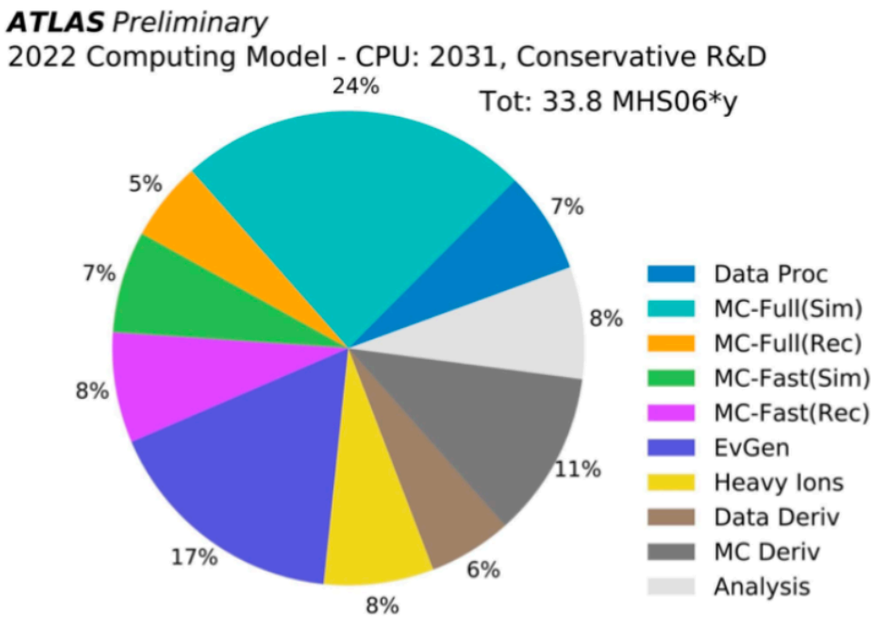
Fast simulations

David Shih

https://twiki.cern.ch/twiki/bin/view/CMSPublic/CMSOfflineComputingResults





CERN-LHCC-2022-005

- Full simulations (event generation + GEANT) are a potential bottleneck for LHC computing
  - Are there long-term projections for the EIC?
- Progress in GANs, VAEs, and Normalizing Flows
  - Which are most applicable for EIC detectors?

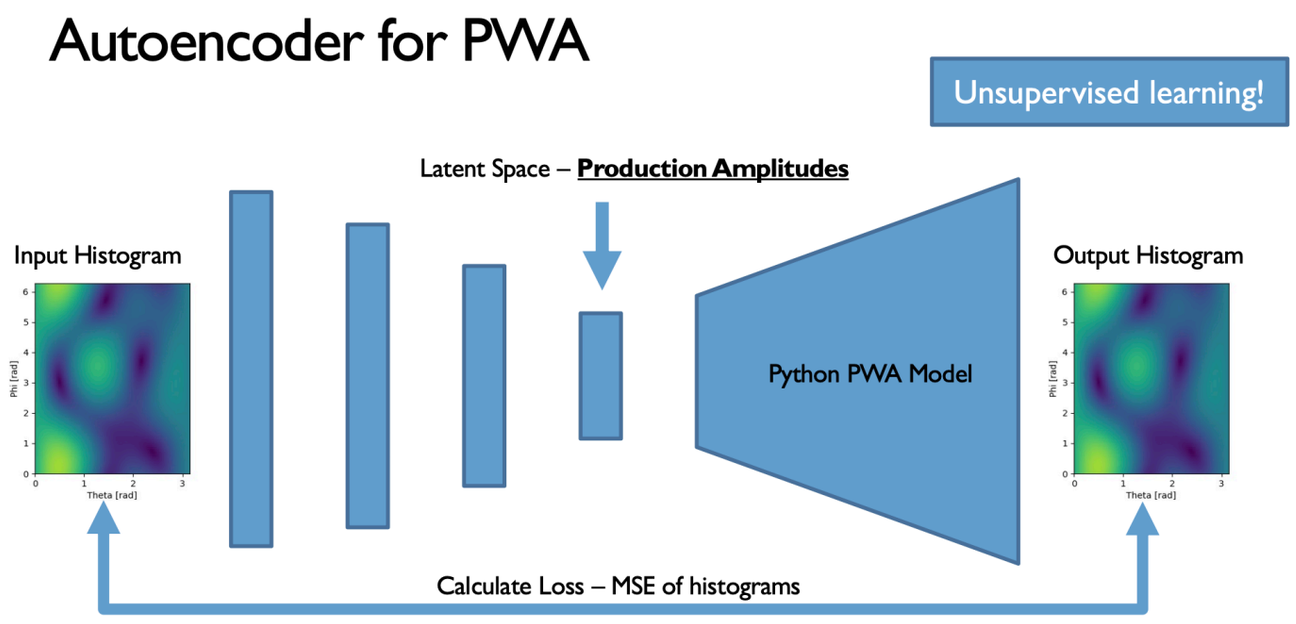
Spectroscopy Applications

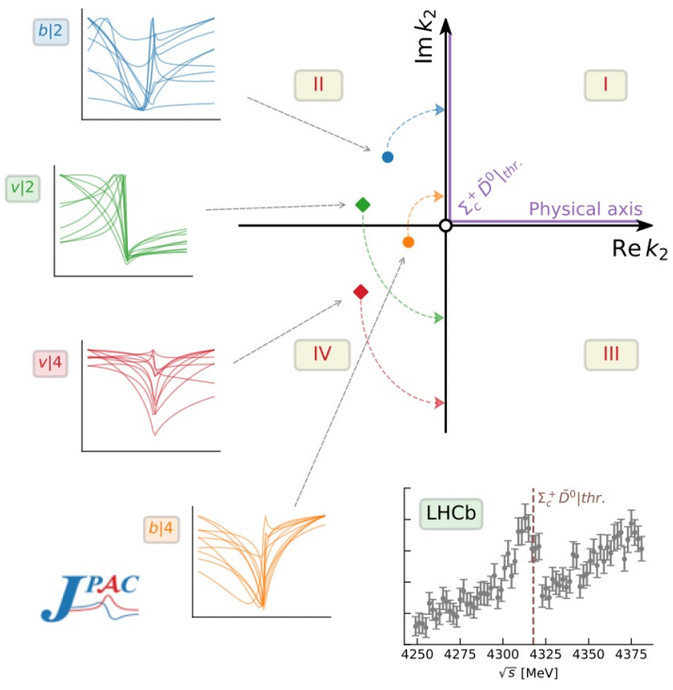
Will Phelps

- Represent intensity function by measured decay angles Ω (data) and production amplitudes V (fit parameters)

$$I(\Omega) = \sum_{k} \sum_{\epsilon_R} \sum_{l,|m|,l',|m'|} {}^{\epsilon_R}Y_l^{|m|}(\Omega)\ {}^{\epsilon_R}V^{k}_{l,|m|}\ {}^{\epsilon_R}V^{k*}_{l',|m'|}\ {}^{\epsilon_R}Y_{l'}^{|m'|*}(\Omega)$$

- Extracting resonance poles requires complex analysis: NN determines functional forms of amplitude's energy dependence

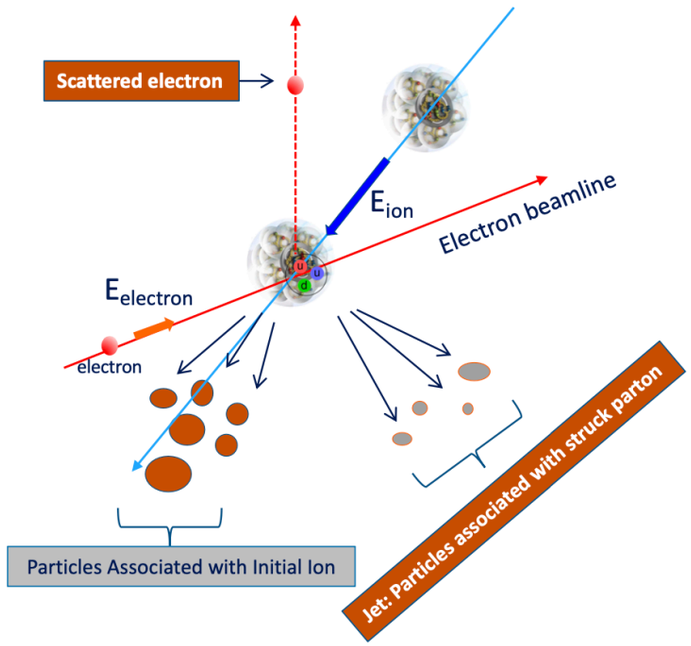




DIS and SIDIS kinematics

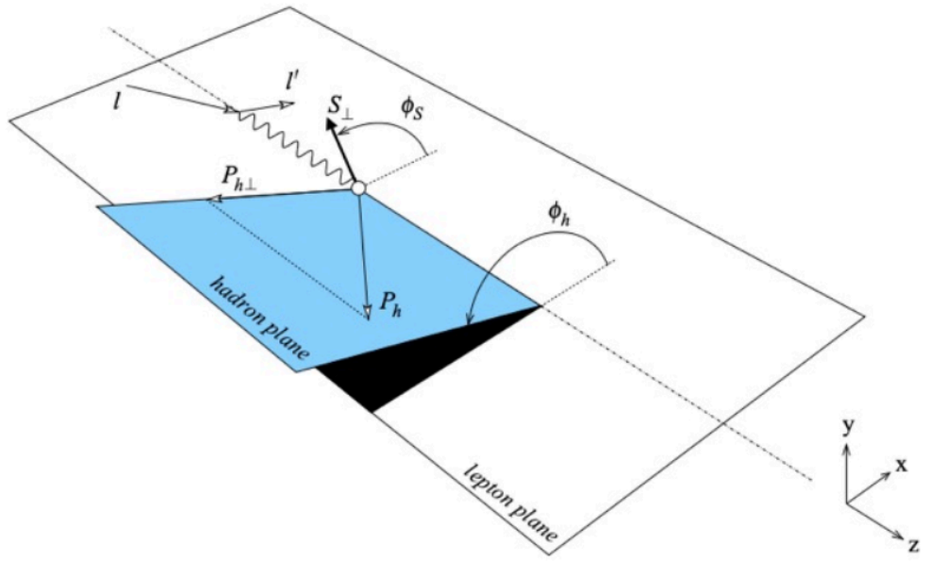
Connor Pecar

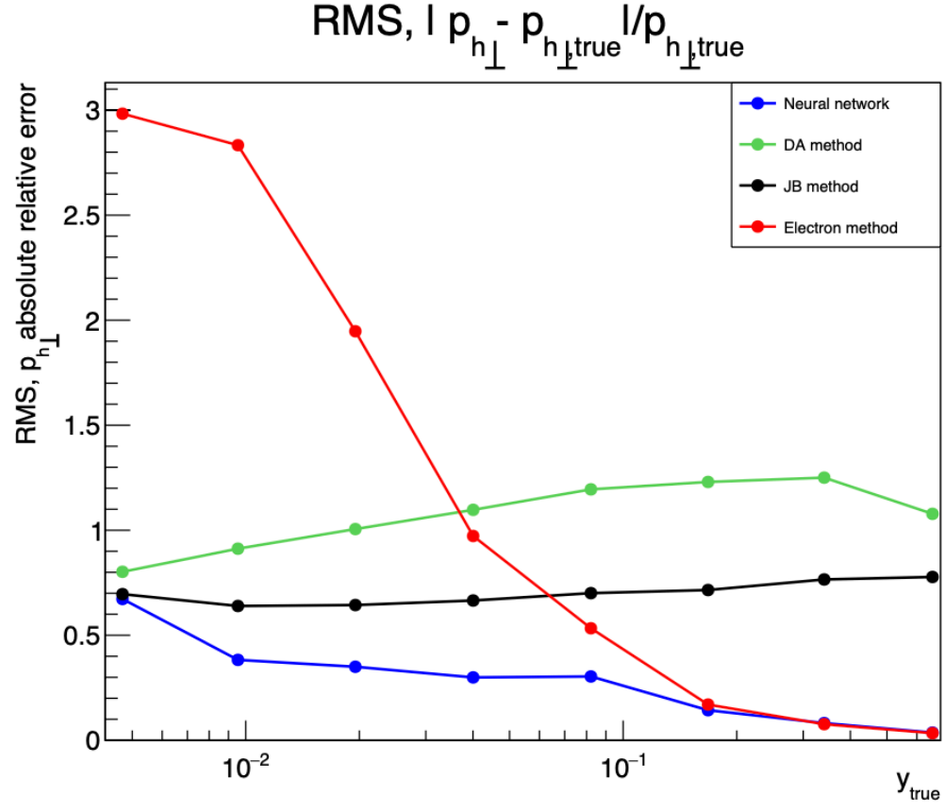
Inclusive (x, Q^2, y)



- Several inclusive studies with ZEUS, HERA and ECCE full simulation
- First SIDIS studies show significant improvement at low-y

Semi-inclusive (x, Q^2, y, $p_{h\perp}$, ϕ_h)





Unfolding

Anja Butter
Fernando Torales-Acosta
Vinicius Mikuni

Inverting the simulation chain

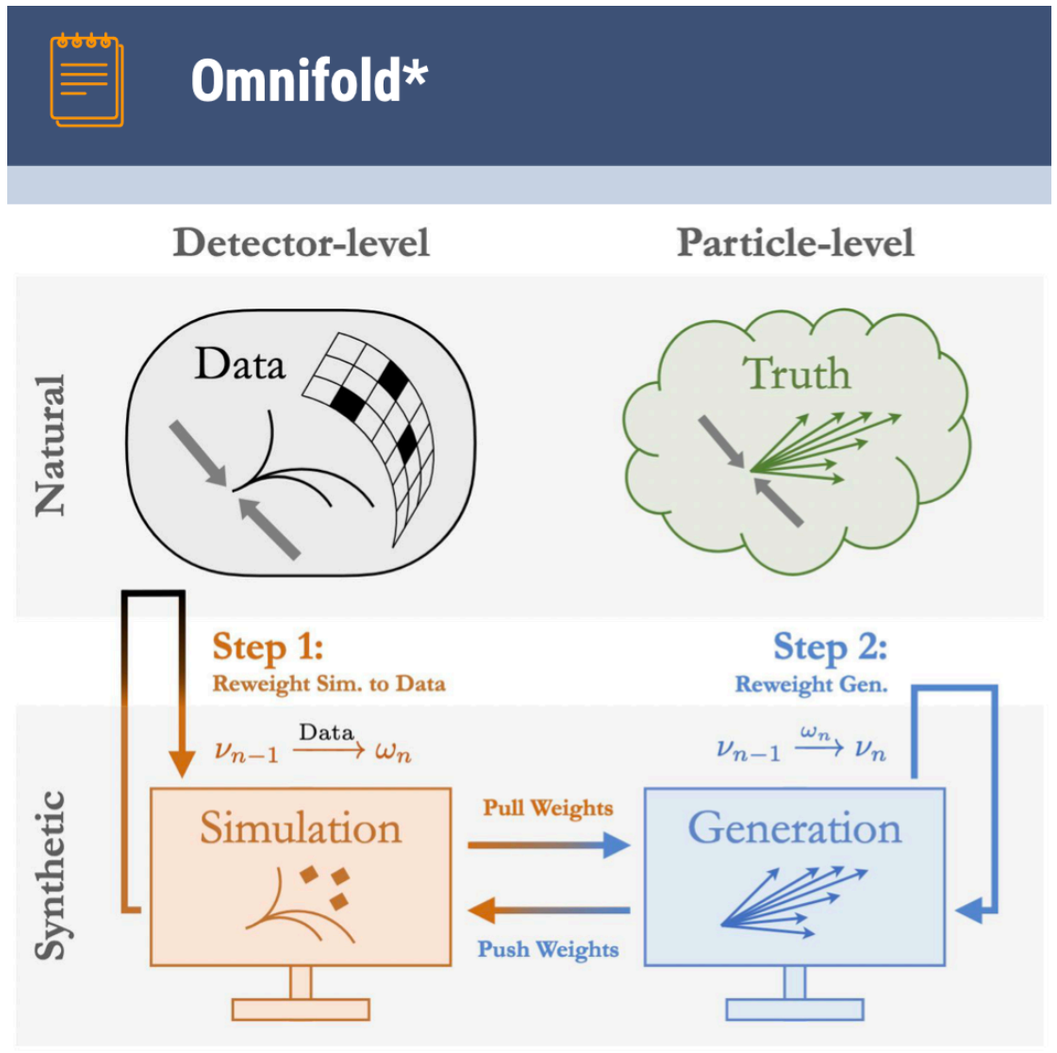
Classifier based aproach
Output: reweighted distribution of MC events

Density based approach
Output: probability density per unfolded event

VAE alternative:
OTUS by J. N. Howard et al.[2101.08944]

GAN+classifier:
MLEG by Y.Alanazi, et al. [2008.03151]

Tutorial



Event-wise unfolding

No deterministic mapping!
Check calibration of probability density for individual event unfolding