

The DNNLikelihood and more

Luca Silvestrini
INFN, Rome

- The Physics Problem
- The DNNLikelihood of arXiv:1911.03305
- Ongoing work beyond the DNNLikelihood
- Outlook

The Problem

- Publishing likelihoods is a crucial aspect of research activities (not only in physics):
 - allows for “full” usage of experimental results in combination with other experiments, phenomenology, etc.
 - allows for update of phenomenological analyses with more data/improved th inputs, etc.
 - see the white paper in arXiv: 2109.04981
- Likelihoods also enter as numerically demanding intermediate steps in experimental/phenomenological analyses, calling for an “accelerator”

The DNNLikelihood

- Parameterize complicated ($O(100)$ parameters, non-Gaussian) likelihoods using a DNN predictor:
 - MSE on LogLikelihood has physical meaning (KL divergence) and performs well
 - Robust results with huge speedup for Bayesian analyses
 - Tweaks needed for frequentist analyses

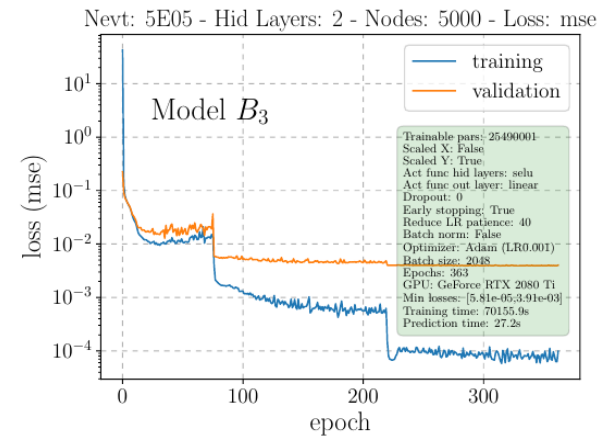
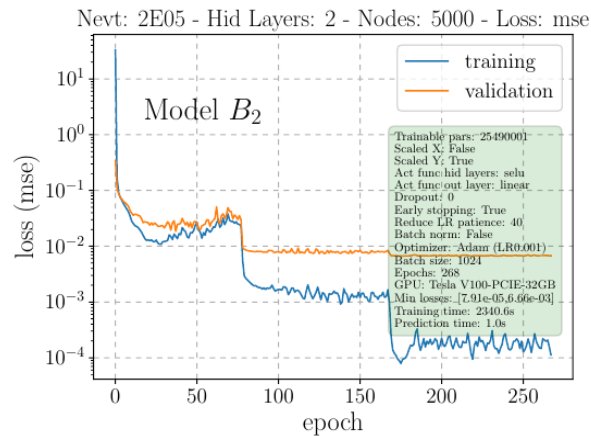
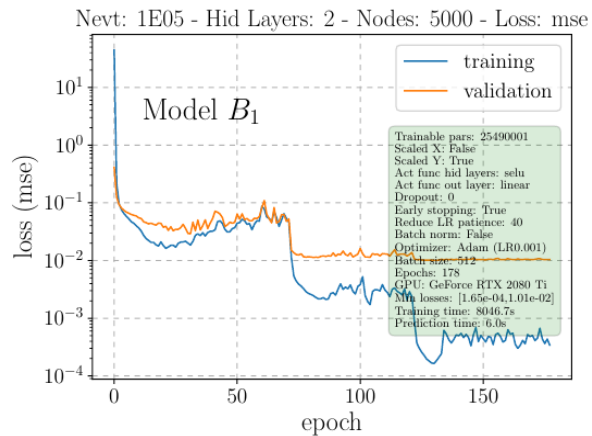
Ongoing work (R. Torre et al)

- Estimate the likelihood using Normalizing Flows given a sample
 - Excellent performance in a Bayesian context
 - Does not require explicit knowledge of the likelihood
 - Successfully tested on complicated likelihoods

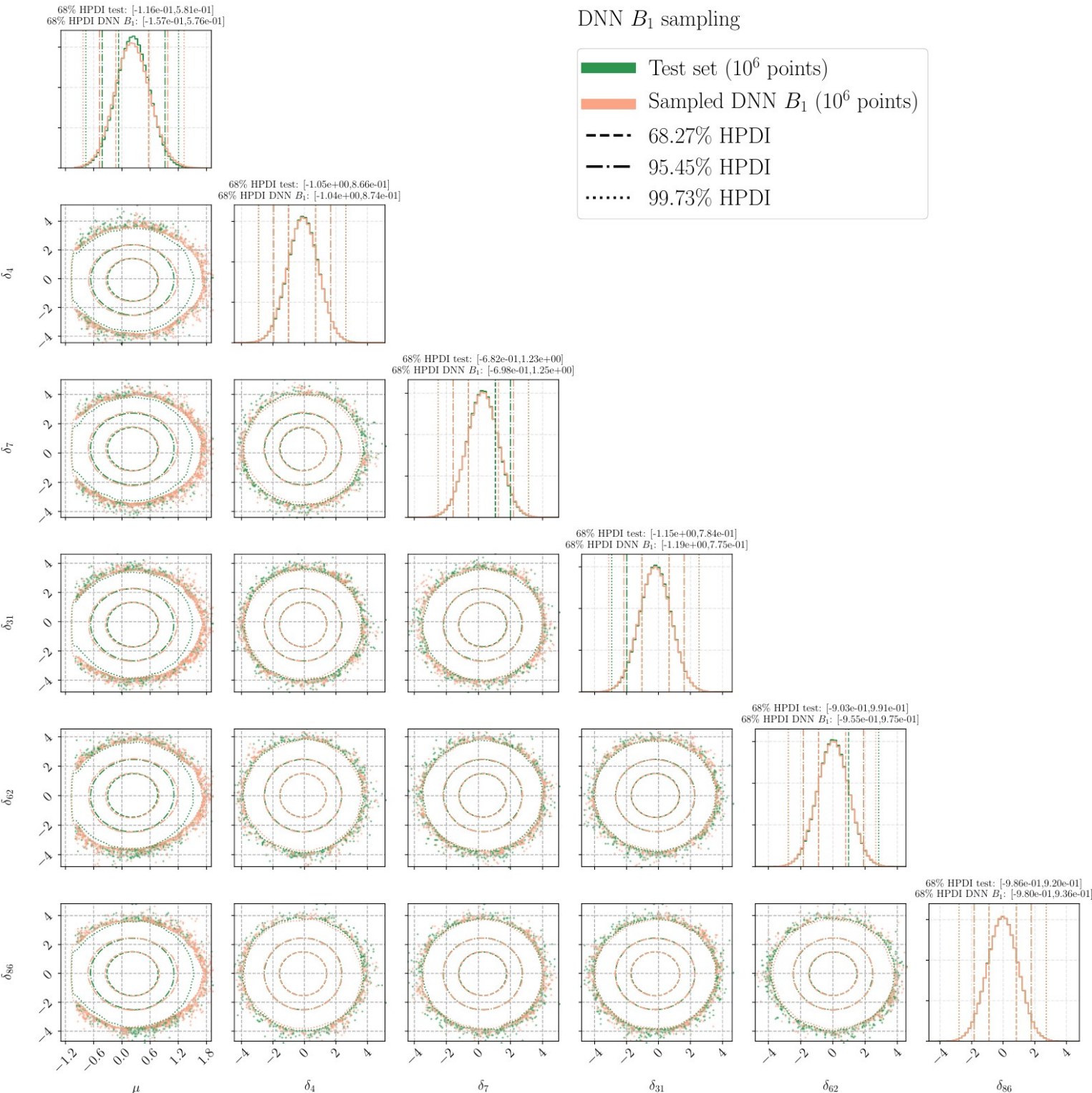
Outlook

- Large number of applications already possible:
 - speedup of MonteCarlo analyses (HEPfit, event generation, etc.)
 - publication of experimental likelihoods
- Ample room for improvements
 - can the Normalizing Flows estimate be improved when the likelihood is known?

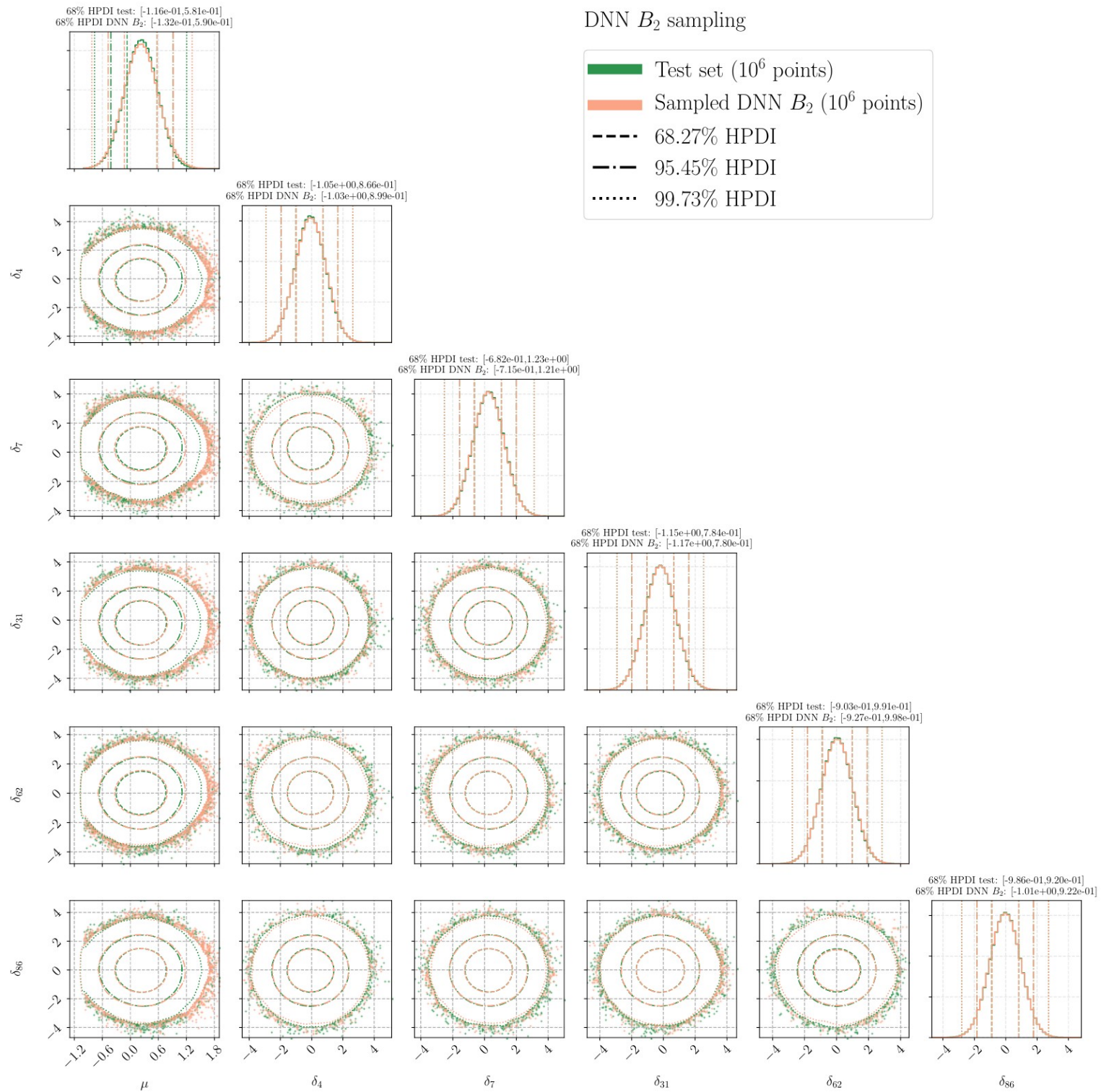
BACKUP



DNN B_1 sampling



DNN B_2 sampling



DNN B_3 sampling

