PHYSTAT 2-samples 2023 workshop - closing remarks
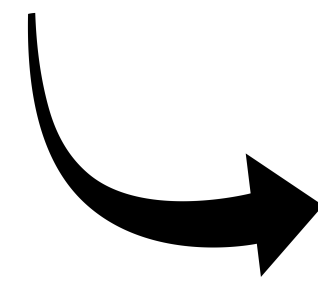
GOF question: is a sample $x_1,.., x_n$ from F described by postulated G?
H_0: G=F vs H_1: G≠F

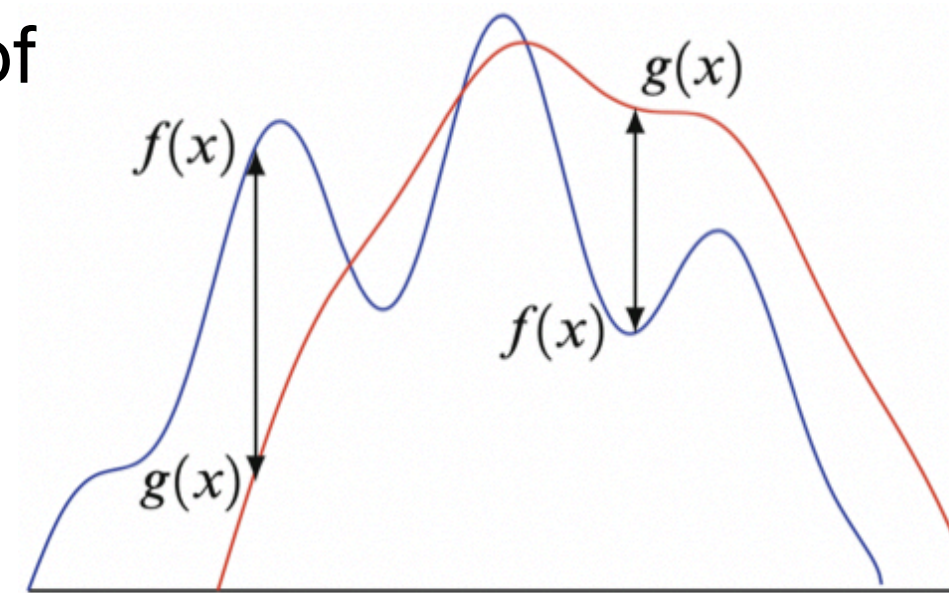2 samples question: do two samples follow the same Distribution

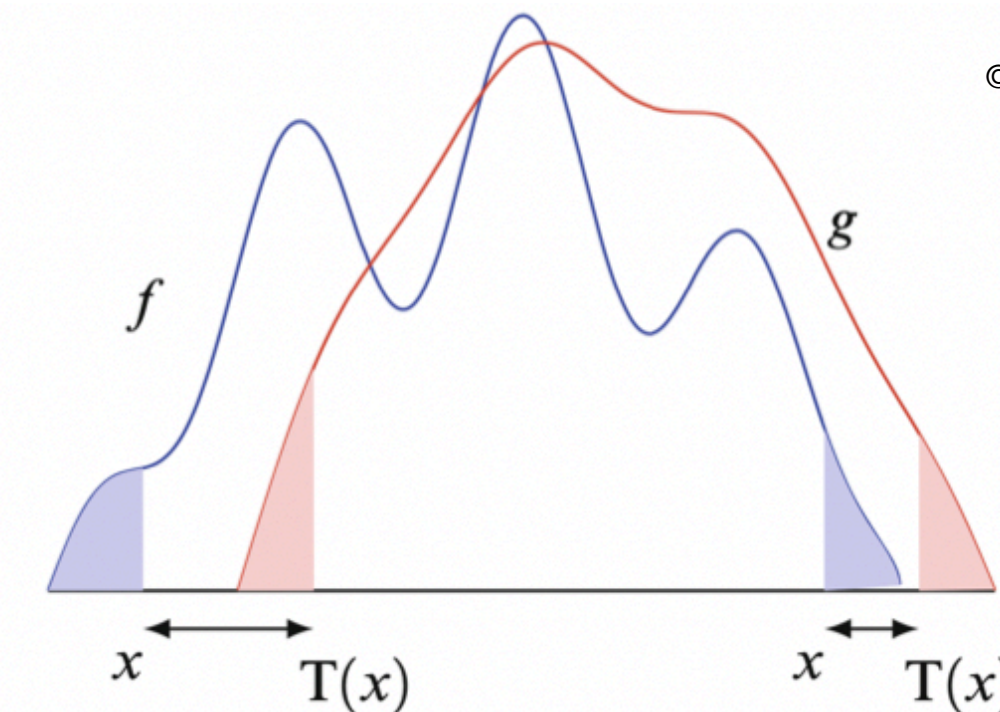At this workshop we have seen developments of tests: using multidimensional unbinned distributions

Trick: Smooth Kernel or NN estimation of f(x) and g(x) from the samples

Then use specific measures of distances

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Vertical distance of densities
→ Neyman-Pearson like
"χ^2" = $-2\ln(L/L_R)$

Cost of optimal transport: Wasserstein Distance
→ Transport in 1D equivalent to horizontal morphing using cumulants F and G
Kolgomorov-Smirnov like test?

Wish list:

- Further benchmark tests of presented methods for the various specific types of particle physics data analyses
- More visualisations of GOF tests in multi-dimensions e.g. with one- or two-dimenstional projections
- (How to) include systematic uncertainties of measurements in these tests?
- Practical software tools in gitlab
- Perhaps another workshop in ~2-3 years from now - the field seem to develop/emerge quickly!

Thanks to

Speakers:

Ben Nachman (Lawrence Berkeley National Lab.) "Range of Machine Learning methods in Particle Physics"
Gaia Grosso (Universita e INFN, Padova) "Goodness of fit by Neyman-Pearson testing"
Raghav Kansal (Univ. of California San Diego) "Applications to deep generative models"
Larry Wasserman (Carnegie Mellon University) "Optimal Transport for Goodness of fIt and 2-sample testing"
Sara Algeri (University of Minnesota) "Multivariate model assessment without chi-squared"
Arthur Gretton (UCL) "Kernel methods for 2-sample and goodness of fit testing"
Ann B Lee (Carnegie Mellon University) "Comparing distributions of high dimensional complex data"
Mikael Kuusela (Carnegie Mellon University) "Classifier-based 2 sample testing for model independent searches for New Physics "

Session chairs:

Mike Williams, Wolfgang Rolke, Pietro Vischia and Francisco Matorras

And to you, the patient audience!

From the organisers:

Louis Lyons (Imperial College (GB)), Olaf Behnke (Deutsches Elektronen-Synchrotron (DE)),
Ben Nachman (Lawrence Berkeley National Lab. (US)), Mikael Kuusela (Carnegie Mellon University (US)),
Pietro Vischia (Universidad de Oviedo and Instituto de Ciencias y Tecnologías Espaciales de Asturias (ICTEA)),
Raghav Kansal (Univ. of California San Diego (US))

The PHYSTAT saga carries on: Stay tuned for new events: seminars and workshops (next one probably in autumn on unfolding)

https://espace.cern.ch/phystat