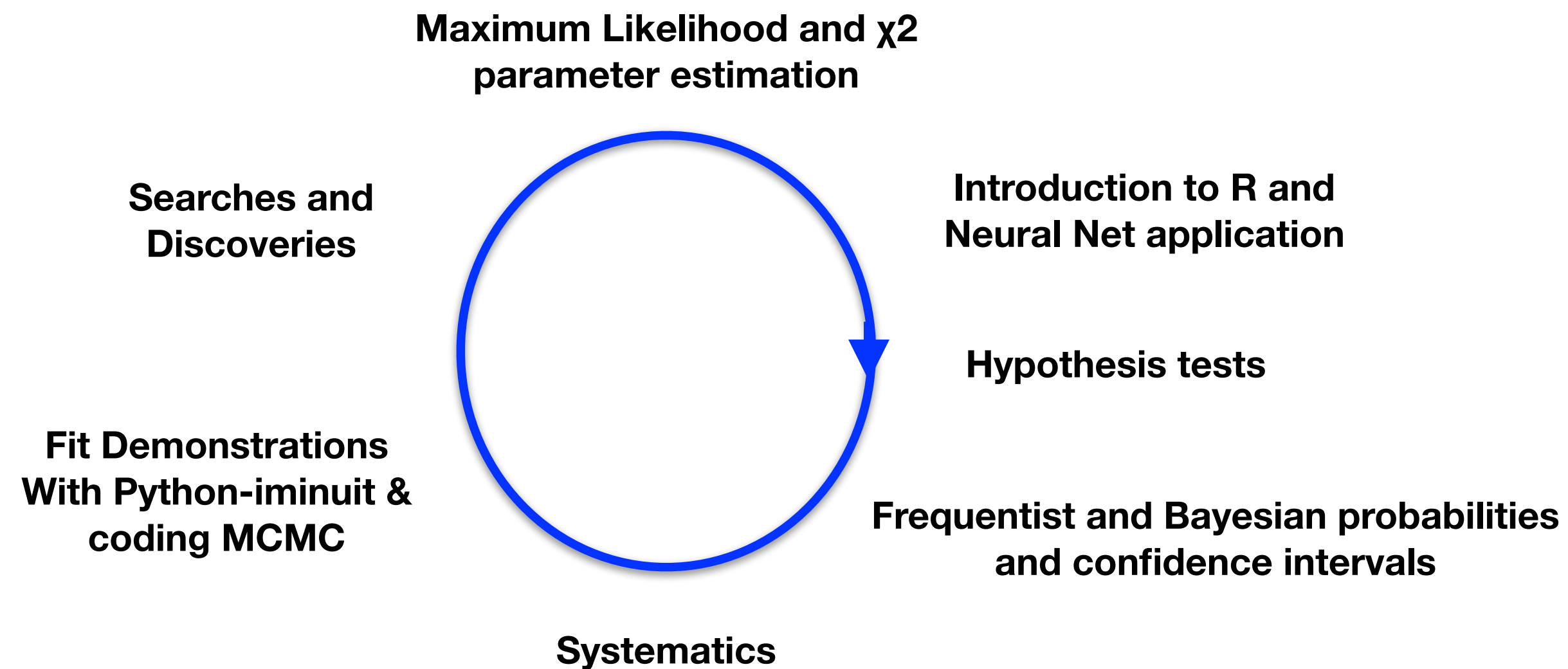


Aachen Online Statistics School 2023 - final words

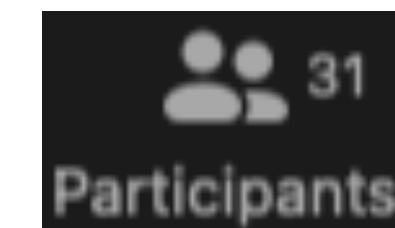
O. Behnke (DESY)
17.3.2023



Idea was to provide basic round-trip on key topics:



- Hope you took some key messages away, e.g. Roger: *"Systematic uncertainties are not mistakes"*
- Thanks to Glen, Louis and Roger for their superb lectures and demonstrations
- Thanks to you, the participants, for holding on and asking many questions!



- Please fill out and submit our brief questionnaire for evaluating the school <https://indico.desy.de/event/37562/surveys/462>

Some Key Messages:

Louis:

... don't combine profiled likelihoods, but combine the full likelihoods

Olaf:

... Least square fits have been performed for more than 200 k parameters

... Do at least two different GOF tests (e.g. chi2 and KS)

... Add parameters to your phenomenological background function until chi2 saturates and the GOF tests are fine

Roger:

... R is a super practical tool and helps you in applications like Neural nets to get an intuitive understanding on what's going on

... Systematic uncertainties are not mistakes

... All you need is equation 1 (error propagation)

... Upper limits with Poisson: say what you are doing and if possible give the raw numbers

Glen:

... Wilk's theorem predicts that the test statistics is distributed like a chi2-function with $\text{ndof} = \text{number of parameters}$ and this can be used to derive confidence regions (at any desired confidence level)

... if frequentist and Bayesian inference, aka profiling vs marginalising, agree then it is good, if not then they answer different question

... Python-interfaced-to-iMinuit demonstrations nicely illustrate frequentist and Bayesian (using MCMC) parameter estimation based on the likelihood function

... Asymptotic formulae work well for 5 sigma effects already with $b=20$