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Bayesian Methods in Nuclear Structure Physics

Friday 16 February 2018 17:00 (30 minutes)

The principle of Bayesian inference is used in many dierent elds of science, e.g. medicine
and computer science. The foundation of Bayesian inference lies in Bayes' theorem, which oers
a powerful alternative method for data analysis. Nevertheless, Bayesian inference is still rather
unpopular in elds like nuclear structure physics, where very sensitive detector systems are needed.
In
-spectroscopy, one of the essential experimental tools of nuclear structure physics, the state-of-
the-art detector systems are highly segmented High-Purity Germanium detectors like the Advanced
GAmma Tracking Array AGATA. Due to AGATA's Germanium shell without any Compton-
shielding,
-ray tracking algorithms are needed. The mathematical problem these
-ray tracking
algorithms are based on, forms a perfect example case for the benets of Bayesian inference over
standard statistical inference methods.
Using basic terms of probability theory, a short introduction into Bayesian inference is given and essential
principles are presented. In addition, a how-to approach of Bayesian inference to the principle of -ray tracking
is shown in the form of the Fuzzy Bayes Tracking algorithm. Possible diculties, as well as benets of Bayesian
inference are elaborated in detail.

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