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Seminarium Zakładu Energetyki Jądrowej i Analiz Środowiska (UZ3) Departament Badań Układów Złożonych (DUZ)

Wtorek: **31.05.2022**
11:30

Michał Jędrzejczyk

Reducing uncertainties in chosen neutron cross-sections through the use of Approximate Bayesian Computation

Abstract:

The multiplication factor (k_{eff}) is a key parameter describing the dynamics of nuclear reactors. The uncertainty in its calculated value usually amounts to 1-2%, measured in one relative standard deviation. It mostly originates from the imprecision with which neutron cross sections are known. Reduction of this value would open a possibility to create more optimal nuclear reactor designs. There is a large database of well-documented criticality benchmark experiments with precisely measured k_{eff} . It is called “International Handbook of Evaluated Criticality Safety Benchmark Experiments” and it is maintained by Nuclear Energy Agency. The goal of my research is to use the results of these experiments to decrease the uncertainties of neutron cross sections. In order to do that I am using a statistical tool called Approximate Bayesian Computation (ABC) and a criticality simulation software SCALE.

In this seminar, I will discuss neutron cross section uncertainties and their influence on calculated k_{eff} value. I will give an introduction to ABC and present a simple example of how it can be used to reduce the uncertainties of any mathematical model parameters. I will then show how I am applying it to reduce neutron cross sections’ uncertainties. I will discuss preliminary results, risks of using ABC and validation of results.

Serdecznie zapraszamy
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