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Inverse Uncertainty Quantification in nuclear engineering

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In the past, modeling of some of the nuclear reactors' operational parameters was done using conservative input values in cases where the uncertainty of inputs was not available or easily quantifiable. This approach led to deteriorated economical performance of the reactors, as conservative modeling outputs strayed far from actual operational conditions. Modern computing resources combined with Inverse Uncertainty Quantification (IUQ) methods allow quantifying uncertainties in input parameters for which previously only point estimates were known. IUQ is conducted by assimilating data from appropriate experiments or previously operated nuclear reactors. Quantifying inputs' uncertainty allows for switching from a conservative modeling style to the Best Estimate Plus Uncertainty (BEPU) standard in which we estimate the most likely value of the experimental result plus its uncertainty. BEPU methodology adheres to nuclear reactor licensing requirements while making the reactors' design more economical.
In this seminar, I introduce IUQ in the context of nuclear reactor engineering, focusing on the Bayesian IUQ methods.

Presenter(s) : JĘDRZEJCZYK, Michał (National Centre for Nuclear Research)