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Tutorial_9: Introduction to Integrated Data Analysis and Validation

Friday, 10 September 2021 09:00 (45 minutes)

A major challenge in nuclear fusion research is the coherent combination of data from heterogeneous diagnostics and modelling codes. Measured data from different diagnostics often provide information about the same subset of physical parameters. Additionally, information provided by some diagnostics might be needed for the analysis of other diagnostics. A joint analysis of complementary and redundant data allows, e.g., to improve the reliability of parameter estimation, to increase the spatial and temporal resolution of profiles, to obtain synergistic effects, to consider diagnostics interdependencies and to find and resolve data inconsistencies. Modelling codes may provide additional physical information allowing for an improved treatment of ill-posed inversion problems. A coherent combination of all kind of available information within a probabilistic framework allows for improved data analysis results.

The concept of Integrated Data Analysis (IDA) in the framework of Bayesian probability theory will be introduced and contrasted with conventional data analysis. Applications from nuclear fusion research will highlight various aspects of IDA and the respective benefits.

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