FusionEPTalks

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Title: Foundations & applications of modern data science in fusion

Speaker: Geert Verdoolaege

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Abstract: In parallel with a similar evolution in society at large, modern data science is making an increasingly significant impact on the worldwide activities for the development of fusion energy. A fusion device is a source of lots of complex data, not only from plasma diagnostics, but also from a host of sensors that monitor various machine subsystems and components. Analysis of these data, possibly from multiple devices and supplemented with data from plasma modeling, requires adequate techniques from statistics and (Bayesian) probability, in order to cope with the various sources of uncertainty. Recent machine learning techniques also have begun to make their appearance in many applications in fusion, including pattern recognition, prediction and anomaly detection. In this talk, I will first discuss the foundations of data science allowing this type of analysis. I will then present a number of recent applications, such as robust estimation of scaling laws, probabilistic characterization of plasma instabilities, sensor fusion and predictive maintenance in a fusion device.

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