

Deep Neural Network Based Reconstruction of Plasma Properties for Wendelstein 7-X

^{1,2}, *Marko Blatzheim, ¹ Daniel Böckenhoff, & ¹the Wendelstein 7-X Team

* lead presenter

¹ *Max Planck Institute for Plasma Physics, Greifswald, Germany*

² *Institute for Mathematics, University of Rostock, Germany*

* marko.blatzheim@ipp.mpg.de

The experimental stellarator Wendelstein 7-X is intended to perform long term operation with fusion relevant plasma conditions. It has been shown for the first series of experiments, that convolutional neural networks (CNN) were able to find nontrivial connections between the heat fluxes arising at the plasma facing components (PFC) and the magnetic topology. For the following configuration of the PFCs this capability was also demonstrated by CNNs in simulations for more complex magnetic topologies. Furthermore, deep neural network architectures such as Inception-ResNets surpassed the CNNs in terms of error reduction for the price of higher training and computation times.

It is currently investigated, if the reconstruction of magnetic topology is possible for the latest experiments. This would help to control the heat flux, which is a key issue for long term operation.