XIV Serbian Conference on Spectral Line Shapes in Astrophysics
Bajina Bašta, Serbia, June 19 - 23, 2023
Book of Abstracts, Eds. Luka Č. Popović, Nataša Bon, Edi Bon and Sylvie Sahal-Bréchot

APPLICATION OF DEEP-LEARNING TO LINE SPECTRA IN MAGNETIC FUSION PLASMAS

M. Koubiti

Aix-Marseille Univ, CNRS, PIIM UMR 7345, F-13397 Marseille Cedex 20, France

E-mail: mohammed.koubiti@univ-amu.fr

This paper discusses the use of deep-learning, a subfield of artificial intelligence, in plasma physics in particular its coupling with spectral features of emission lines in magnetic fusion. In our previous work [1-2] we have demonstrated the proof-of-principle of a new technique to determine the isotopic ratio in hydrogen-deuterium fusion plasmas. In this technique, instead of fitting whole spectra, it is suggested to provide only some few spectral features to an artificial neutral network algorithm from TensorFlow platform [3] to infer the isotopic ratio in a hydrogen-deuterium plasma. In the present paper, we make a further step by confronting the technique to the more complex case of deuterium-tritium (DT) plasmas by considering features of the Dα/Tα line spectra. This complexity is due to the highest proximity of the Dα and Tα lines as compared to Dα and Hα which is not favorable in terms of Zeeman splitting for a same magnetic field strength. The paper discusses also in a more general manner the application of deep-learning techniques to emission lines in magnetic fusion plasmas.

References

[1] M. Koubiti, M. Kerebel, Appl. Sci. **12** (2022) 9891.

[2] M. Koubiti, M. Kerebel, J. Phys. Conf. Ser. **2439** (2023) 012016.

[3] TensorFlow: https://www.tensorflow.org/guide.