Artificial Neural Networks for Unfolding Procedures in Neutron and Photon Activation Measurements

Nikola Jovancevic[1], Strahinja Ilic[2]

[1]*University of Novi Sad, Trg Dositeja Obradovica 3, Novi Sad, 21000, Serbia*

[2]*Faculty of Technical Sciences, University of Novi Sad, Trg Dositeja Obradovića 6, 21000 Novi Sad, Serbia*

Activation methods play a crucial role in measuring cross-sections for neutron and photon induced nuclear reactions. In this study, we propose the utilization of artificial neural networks (ANNs) for the unfolding procedure in these measurements [1,2,3]. Traditionally, unfolding techniques such as SANDII, GRAVEL, and MAXED algorithms have been employed to obtain cross-section values from saturation activity measurements via gamma spectroscopy [4,5,6]. Here, we explore the potential of ANNs as an alternative approach for unfolding. Preliminary results from tests conducted on the measurement of neutron and photon-induced reactions on indium are presented, demonstrating the efficacy of ANNs in this context.

1. N. Jovancevic, L. Daraban, and S. Oberstedt, Nuclear Instruments and Methods in Physics Research Section A: Accelerators, Spectrometers, Detectors and Associated Equipment 739, 68 (2014).
2. N. Jovančević, L. Daraban, H. Stroh, S. Oberstedt, M. Hult, C. Bonaldi, W. Geerts, F.-J. Hambsch, G. Lutter, G. Marissens, et al., The European Physical Journal A 52, 148 (2016).
3. S. Ilić, N. Jovančević, L. Daraban, H. Stroh, S. Oberstedt, M. Hult, C. Bonaldi, W. Geerts, F.-J. Hambsch, G. Lutter, G. Marissens, M. Vidali, and D. Knežević, The European Physical Journal A 56, 202 (2020).
4. M. Reginatto and P. Goldhagen, Health physics 77, 579 (1999)
5. W. N. McElroy, S.Berg, and T. Crockett, Los Alamos National Laboratory report, AFWL-TR-67-41 I-IV (1967).
6. M. Matzke, Report PTB-N-19 I-IV (1994).