



SEMINAR
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Thematic Line INVERSE PROBLEMS IN HEALTH SCIENCES

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Hypergeometric activation functions in Convolutional Neural Networks (CNN)

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Nowadays, there is no doubt about the key role played by activation functions in the training process of Convolutional Neural Networks (CNN). In the last few years the deep learning community has directed attention to the development of efficient and well-performing activation functions. The results presented in this talk are part of resultss obtained in the framework of the project *Hypergeometric Functions and Machine Learning in the Diagnosis Process* (Ref: CPCA-IAC/AV/475089/2022) with the support of FCT and Google.

Our main purpose is to introduce a general family of activation functions defined in terms of hypergeometric functions, which allows for a training process with several parameters but directed to a specific goal. Special attention will be given to the Bessel-type activation functions which are a sub-family of the activation functions introduced. Further, for quaternionic convolutional neural networks we introduce a proper definition of threshold function and prove some theoretical results (e.g. a universal approximation theorem). The numerical implementation led us to good results in terms of accuracy and loss. Concerning real practical applications, we give some results (ongoing work) on the particular use of Bessel activation functions for classification tasks involving real X-ray images.

At the end of the talk, we give some future lines of research.

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