



The Abdus Salam  
**International Centre  
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**Eigenvalue distribution for non linear models  
of random matrices**  
(joint work with L. Benigni)

**Abstract**

The talk concerned with the asymptotic empirical eigenvalue distribution of a non linear random matrix ensemble. More precisely we consider  $M = \frac{1}{n} Y Y^T$  with  $Y = f(WX)$  where  $W$  and  $X$  are random rectangular matrices with i.i.d. centered entries. The function  $f$  is applied pointwise and can be seen as an activation function in (random) neural networks. We compute the asymptotic empirical distribution of this ensemble in the case where  $W$  and  $X$  have sub-Gaussian tails and  $f$  is smooth. This extends a result of [PW17] where the case of Gaussian matrices  $W$  and  $X$  is considered. We also investigate the same questions in the multi-layer case, regarding neural network applications.