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Riesz bases, neural networks and approximation theory

We consider the trigonometric-like system of piecewise linear functions introduced recently by Daubechies, DeVore, Foucart, Hanin, and Petrova. We provide an alternative proof that this system forms a Riesz basis of $L_2([0, 1])$ based on the Gershgorin theorem. We also generalize this system to higher dimensions $d > 1$ by a construction, which avoids using (tensor) products. As a consequence, the functions from the new Riesz basis of $L_2([0, 1]^d)$ can be easily represented by neural networks. Moreover, the Riesz constants of this system are independent of d , making it an attractive building block regarding future multivariate analysis of neural networks.

This talk is based on joint work with Jan Vybíral.