

Speaker: Domenico Marinucci (University Roma Tor Vergata)

Title of the Talk: The Geometry of Random Neural Networks

Abstract: In this talk we try to show how tools from spherical harmonic analysis, stochastic geometry and random fields can be exploited to investigate the structure and properties of deep neural networks. More precisely, we study the geometric properties of random neural networks by investigating the boundary volumes of their excursion sets for different activation functions, as the depth increases. We prove that, for activation functions which are not very regular (e.g., the Heaviside step function), the boundary volumes exhibit fractal behavior, with their Hausdorff dimension monotonically increasing with the depth. On the other hand, for activations which are more regular (e.g., ReLU, logistic and tanh), as the depth increases, the expected boundary volumes can either converge to zero, remain constant or diverge exponentially, depending on a single spectral parameter which can be easily computed.

Based on joint works with Simmaco Di Lillo, Michele Salvi and Stefano Vigogna