

CRUNCH Seminars at Brown, Division of Applied Mathematics

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**Gaussian Processes Kernels and Neural Tangent Kernel of Deep
Neural Networks**

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The relation between neural networks and Gaussian processes has been studied since the Ph.D. thesis of Radford M. Neal. An equivalence between these two approaches was derived by him, for the case of one layer networks in the limit of infinite width. This also inspired recent works on equivalence between deep neural networks and GP, thus connecting them to kernel methods. On the other hand, another kernel called neural tangent kernel (NTK) emerges in gradient descent of neural network in the limit of infinite width. We provide rigorous derivation of the convergence of these two kernels and their connections. Furthermore, we discuss them in the context of physics-informed neural networks and use numerical experiments to illustrate their practical behaviors.