

1145-41-1715

Philipp Christian Petersen* (pc.petersen.pp@gmail.com). *Expressivity and structure of neural network spaces.*

Novel machine learning techniques based on deep learning have reported remarkable results in many areas such as image classification, game intelligence, or speech recognition. In this talk, we will demonstrate that neural networks are immensely powerful approximators, but this implies massive theoretical problems in the optimisation.

One intriguing aspect of the underlying neural network architecture is that it facilitates the representation of complex functions using considerably fewer parameters than more classical approximation methods. Moreover, neural networks have been shown to possess the flexibility to adapt to unknown low dimensional structures. We will present some novel results of neural network approximation with a focus on dimension reduction. It is conceivable that the high expressivity of neural networks increases the complexity of optimising over this set. We analyse certain topological aspects of this set and will, indeed, observe that the set of neural networks is not particularly suitable for optimisation. Precisely, we will observe that the set of neural networks is not convex, not closed and cannot be stably parametrised for all practically relevant activation functions. (Received September 24, 2018)