



COLLOQUIUM

Nonsmooth differentiation in deep learning: a mathematical approach

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Abstract

Modern problems in AI rely crucially on nonsmooth algorithmic differentiation (e.g., backpropagation). We will recall the importance of this approach in the training of neural networks, and we will then show how nonsmooth backpropagation can be modeled mathematically. Our approach leads to introducing a new-old regularity property called path-differentiability and a new sort of «weak gradients» called conservative fields. Many Lipschitz continuous functions are path differentiable: convex, concave, or semi-algebraic functions. Path-differentiability and conservativity reveal surprising relationships between the famous backpropagation algorithm and Whitney stratification.

Our results are applied to establish the convergence of the training phase of neural networks –*as implemented in practice*– by «stochastic gradient descent.»

Joint work with E. Pauwels, Toulouse.

Date: May 26, 2021 (Wednesday)
Time: 4:00 – 5:00 pm (Hong Kong Time)
Venue: ZOOM: <https://hku.zoom.us/j/>
Meeting ID: 971 9376 0042
Password: 20210526

All are welcome