



Seminar Hora Informaticae

Institute of Computer Science, Prague

Tuesday, October 22, 2024, 14.00 – 15.30 (2 – 3:30 PM) CEST

Meeting Room 318, Address: Pod Vodárenskou věží 2, Prague 8

!!! NEW ZOOM !!!

Meeting ID: 914 0834 4018, Passcode: 668534

<https://cesnet.zoom.us/j/91408344018?pwd=x2QlZ4F42BxlMSmWc1HOwHHA7Uw7PN.1>



Věra Kůrková, Institute of Computer Science, Prague:

!!! NEW TOPIC !!! Approximation and classification by ReLU networks of increasing depth.

Mathematical theory of neural networks partially overlaps with nonlinear approximation theory. In the lecture, we will apply methods of approximation theory to currently popular deep neural networks with rectified linear units (ReLU). We will focus on the approximation properties of their sets of input-output functions from the point of view of their depth and input dimension. We will derive lower bounds on the measure of their nonlinearity characterized by the Kolmogorov width. We will also analyze the influence of network depth on the almost deterministic behavior of the approximation errors in the classification of large data sets.

References:

[1] V. Kůrková: Some comparisons of linear and deep ReLU network approximation. In ICANN 2024, LNCS 1525, Eds. M. Wand et al.(pp. 231-240), Springer, 2024.

[2] V. Kůrková, M. Sanguineti: Approximation of classifiers by deep perceptron networks, Neural Networks 165: 654–661, 2023.

Věra Kůrková (www.cs.cas.cz/~vera) is a senior scientist from the Department of Artificial Intelligence, Institute of Computer Science of the Czech Academy of Sciences. She received PhD. in mathematics from the Charles University, Prague, and DrSc. (Prof.) in theoretical computer science from the Czech Academy of Sciences. She has been affiliated with the Institute of Computer Science since 1990 (in 2002-2008 she was the Head of the Department of Theoretical Computer Science). In 2010, she received the Bolzano Medal for her contribution to mathematical sciences from the Czech Academy of Sciences.

Her main research interests are mathematical theory of neurocomputing and machine learning. Her work includes analysis of capabilities and limitations of shallow and deep networks, dependence of network complexity on increasing dimensionality of computational tasks, connections between theory of inverse problems and generalization in machine learning, and nonlinear approximation theory.

She has been a member of the Board of the European Neural Network Society since 2008 (in 2017-2019 she was its president) and of the editorial boards of the journals Neural Networks, Neural Processing Letters, and Applied and Computational Harmonic Analysis. She has been involved in organization of conferences ICANN and EANN in various roles (general chair, co-chair, or honorary chair).

HORA INFORMATICAЕ (meaning: TIME FOR INFORMATICS) is a broad-spectrum scientific seminar devoted to all core areas of computer science and its interdisciplinary interfaces with other sciences and applied domains. Original contributions addressing classical and emerging topics are welcome. Founded by Jiří Wiedermann, the seminar is running since 1994 at the Institute of Computer Science of the Czech Academy of Sciences in Prague.

<https://www.cs.cas.cz/horainf>