Seminar Hora Informaticae   Institute of Computer Science, Prague

Tuesday, May 2, 2023, 14.00 – 15.30 (2 - 3:30 PM) CET

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

ZOOM: https://cesnet.zoom.us/j/95478234977?pwd=dXoyekFHbDJ0MkNrTjVVS3F2STZqUT09

Meeting ID: 954 7823 4977 ,   Passcode: 712564

Vít Fojtík, Bavarian AI Chair for Mathematical Foundations of AI, LMU Munich:

Computability of Neural Network Problems.

Despite the overwhelming success of deep learning methods in practice, an increasing number of concerns is being raised concerning the reliability of neural networks and therefore the safety of their employment in various applications. These uncertainties, also reflected in the current EU AI Act proposal and the highly publicised open letter Pause Giant AI Experiments, result from a lack of theoretical understanding and performance guarantees. A fundamental example of this is a series of recent results implying that for many continuous problems, including practical applications such as MRI scanning and 3D image reconstruction, there exists no algorithm on digital hardware with unlimited resources that could guarantee correct learning of a solving neural network, even in cases where such a network exists. In this talk we discuss some of these issues, as well as attempts to resolve them and their relevance to practice.

References:

[1] Colbrook, M. J., Antun, V., & Hansen, A. C. (2022). The difficulty of computing stable and accurate neural networks: On the barriers of deep learning and Smale's 18th problem. *Proceedings of the National Academy of Sciences*, *119*(12), e2107151119.

https://www.pnas.org/doi/10.1073/pnas.2107151119

[2] Boche, H., Fono, A., & Kutyniok, G. (2022). Limitations of deep learning for inverse problems on digital hardware. *arXiv preprint arXiv:2202.13490*. https://arxiv.org/abs/2202.13490

[3] Berner, J., Grohs, P., & Voigtlaender, F. (2023). Learning ReLU networks to high uniform accuracy is intractable. In *The Eleventh International Conference on Learning Representations*.
 https://openreview.net/forum?id=nchvKfvNeX0

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Vít Fojtík is a doctoral student at the Ludwig-Maxmilians-Universität Munich in the group of Professor Gitta Kutyniok. His research focuses on the expressive power of neural networks, as well as applications of topology, algebra and logic in machine learning research.

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HORA INFORMATICAE (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