THE CATHOLIC UNIVERSITY OF AMERICA
Washington, DC 20064

SEMINAR IN FUNCTIONAL ANALYSIS

AND RELATED AREAS

Wednesday, November 30, 2022

4:45 p.m. - 6:30 p.m.

SPEAKER: Professor Věra Kůrková
Institute of Computer Science of the Czech Academy of Sciences

TITLE: Some implications of high-dimensional geometry for classification by neural networks

ABSTRACT: Computational difficulties of multidimensional tasks, called the ``curse of dimensionality'', have long been known. On the other hand, almost deterministic behavior of some randomized models and algorithms depending on large numbers of variables can be attributed to the ``blessing of dimensionality''. These phenomena can be explained by rather counter-intuitive properties of geometry of high-dimensional spaces. They imply concentration of values of sufficiently smooth functions of many variables around their mean values and possibilities of reduction of dimensionality of data by random projections.
In the lecture, it will be shown how these properties of high-dimensional geometry can be employed to obtain some insights into suitability of various types of neural networks for classification of large data sets. Probabilistic bounds on network complexity will be derived using concentration properties of approximation errors based on Azuma and McDiarmid inequalities. Consequences for choice of network architectures will be analyzed in terms of growth functions and VC dimensions of sets of network input-output functions. General results will be illustrated by examples of deep perceptron networks with various piecewise polynomial activation functions (ReLU, RePU).

PLACE: Aquinas Hall, room 108. The talk will be on Zoom as well (from 4:45 p.m. to 6:30 p.m. ET). The corresponding link will be sent to everyone in advance.

ORGANIZERS: V. Bogdan (The Catholic University of America), P. Kainen (Georgetown University), R. Kalpathy (The Catholic University of America), and A. Levin (The Catholic University of America).

Tel: 202-319-5221, 202-319-5222.   Fax: 202-319-5231. E-mail:levin@cua.edu
Web page:

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