Seminar Hora Informaticae   Institute of Computer Science, Prague

Tuesday, May 14, 2024, 14.00 – 15.30 (2 – 3:30 PM) CEST

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

ZOOM Meeting ID: 954 7823 4977 ,   Passcode: 712564

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

Filip Šroubek and Tomáš Karella, Institute of Information Theory and Automation, Prague:

Equivariance and Invariance in Neural Networks.

In the rapidly evolving field of neural networks, achieving robustness against various geometric and radiometric transformations like rotation, scale, noise, or blur is crucial. This seminar begins by exploring why this robustness is important and how it is traditionally addressed through training neural networks with augmented datasets. We will define and differentiate between two key concepts: invariance, where the neural network output remains constant despite transformations to the input, and equivariance, a property where transformations to the input result in similar transformations in the output. The seminar will delve into the advantages of equivariance in neural networks, particularly its efficiency in encoding features and the ability to achieve enhanced performance with fewer parameters. Participants will leave with a deeper understanding of these concepts and their practical implications in the field of neural networks.

References:

(1) Taco S. Cohen, Max Welling: Group Equivariant Convolutional Networks,
https://arxiv.org/abs/1602.07576
(2) Daniel E. Worrall, Stephan J. Garbin, Daniyar Turmukhambetov, Gabriel J. Brostow: Harmonic Networks: Deep Translation and Rotation Equivariance, https://arxiv.org/abs/1612.04642
(3) Maurice Weiler: Equivariant and Coordinate Independent Convolutional Networks,
https://maurice-weiler.gitlab.io/cnn_book/EquivariantAndCoordinateIndependentCNNs.pdf

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Filip Šroubek (https://www.utia.cas.cz/cs/people/sroubek) received the M.Sc. degree in computer science from the Czech Technical University, Prague, Czech Republic in 1998 and the Ph.D. degree in computer science from Charles University, Prague, Czech Republic in 2003. From 2004 to 2006, he was on a postdoctoral position in the Instituto de Optica, CSIC, Madrid, Spain. In 2010/2011 he received a Fulbright Visiting Scholarship at the University of California, Santa Cruz. In 2014, he became a research professor in Physico-Mathematical Sciences (Informatics and Cybernetics) at the Czech Academy of Sciences. In 2016, he became an associate professor at the Faculty of Mathematics and Physics, Charles University. Currently he is the deputy head of the Department of Image Processing.

Tomáš Karella(https://www.utia.cas.cz/people/karella) is a Ph.D. student deeply passionate about computer vision and also a proud member of Fast Minds. His research focuses on the efficient training of deep learning models, leveraging a priori knowledge about the task at hand. Specifically, he is engrossed in topics like invariance, equivariance and robustness against expected transformations of the input data. A significant thrust of his work is to construct explainable networks that can ensure certain desired properties. Beyond the academic realm, he is intrigued by the application of computer vision in nuclear energetics. This exploration is undertaken in collaboration with CVŘ.

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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.

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