

FINAL REPORT

Project title: “Mezinárodní letní školy 2017-2018 na téma hlubokého učení a vizuální analýzy dat“ / International Summer Schools 2017-2018 on Deep Learning and Visual Data Analysis

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Partners: Faculty of Electrical Engineering and Computer Science of the VSB–Technical University of Ostrava (Czech Republic), Faculty of Computer Science of the University of Vienna (Austria)

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The project International Summer Schools 2017-2018 on Deep Learning and Visual Data Analysis (further referred to as „Summer School“) was prepared, submitted, and implemented jointly by the Faculty of Electrical Engineering and Computer Science of the VSB–Technical University of Ostrava (“FE ECS VSB-TUO”) and the Faculty of Computer Science of the University of Vienna (“FCS UV”).

The project followed the cooperation of the partner institutions. In November 2016, a workshop on Machine Learning, Data Mining, Data Processing, and Image Processing took place at the VSB-Technical University of Ostrava. In February 2017, another workshop on Visual Data Mining and Applications took place at the University of Vienna.

The main objective was to organize a Summer School for both partners’ students who are focusing on advanced data processing algorithms, and visualization. The participants were mainly Ph.D. or master students of both partner universities. They were accepted after their registration on the website of the Summer School, which was set up and regularly updated (<http://dap.vsb.cz/cass2017/>). The selected students contributed a small fee (1000 CZK for Czech participants, 80 EUR for Austrian participants) before the event took place. The students covered the travel costs to Ostrava (Czech participants) and Vienna (Austrian participants).

There were 30 participants (15 Czech students and 15 Austrian students) covered from the Aktion grant. Students from other Czech universities (e.g. Czech Technical University Prague, Tomas Bata University Zlin) and Austrian universities (Technical University Vienna, Johannes-Kepler University Linz) also participated in the Summer School. Further participants came from the hosting university, the University of Bergen (Norway), the University of Zilina (Slovakia), and a German private company.

The lectures held by the Czech lecturers were focused on the areas of Deep Learning, Neural Networks and identification of objects in 2D and 3D images. The introductory lectures concentrated on the basic description of the deep learning principles. The latter lectures dealt

with the identification of objects and its application for augmented reality in industry. The last lectures focused on reservoir computing and deep neural networks.

The main contents of the lectures were:

- Basic mathematical principles
- Neural networks and extension to deep neural networks
- Principles of reservoir computing
- Application of deep learning in text mining and image analysis
- Object identification in images
- Object identification in 3D environments

The lectures on image and 3D data analysis were added (held by Radovan Fousek, Tomas Fabian, Eduard Sojka) instead of the lectures on parallelization of Deep Learning, due to unavailability of the planned lecturer (Petr Gajdos).

Moreover, a lecture presenting work of the Fraunhofer Institute for Machine Tools and Forming Technology IWU (held by Dieter Weise) was added, to present application areas where deep learning techniques are utilized. The Fraunhofer Institute IWU also was a partner of the Summer School.

The group from Vienna was presenting an introduction into basics of visual data analysis and visualization. The lectures gave an overview over a number of different specific visualization tools that have been created to help different users to model with data and simulations. After that, the goal was to lay the foundations for good and principled visualization design in a string of lectures, covering, e.g.,

- A taxonomy of data types and user tasks, arguing that a proper design of a visual analysis tool has to be guided by understanding what data to visualize for what purpose;
- An overview over visual encoding principles, where the idea of marks and channels were introduced and different guidelines about their use was discussed;
- The principle of faceting into multiple views as an essential way to conquer complex data analysis tasks;
- An introduction to the methodology of design studies as a workflow to create novel visual tools together and for domain scientists or analysts.

There were changes in the team of the Austrian lecturers, too. The representative of the FCS UV Michael Sedlmeier was not able to attend the Summer School. Formerly planned lectures were held by Torsten Möller and Thomas Torsney-Weir. Finally, two lectures highlighted recent developments in visual data analysis for simulation environments and deep neural networks as well as recent developments in visual computing in medicine. The last lecture was held by the guest lecturer Hans-Christian Hege from the Zuse Institute in Berlin. He presented visual computing in general and then focused on the important task of anatomy

reconstruction, where deep learning can be successfully utilized in several steps, like image registration, image segmentation and grid generation.

The team also created a data challenge where 100 000 different neural networks had to be analyzed with the help of a visual analysis tool, with the task to find correlations and other insights in the hyperparameters of these different neural networks.

The participants were accommodated at the students' dormitory, which is a part of the campus of the VSB-TUO and is situated about 5 minutes from the venue. The Summer School took place in the Innovation Support Centre. The students were accommodated in double-rooms where we were teaming up Czech and Austrian participants on purpose to improve the contact among participants. The Austrian lecturers stayed the whole time of the Summer School and the expenses of their stay was partly covered from the grant.

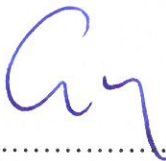
The meals for the participants (breakfast and lunch) were served in the same building where the lectures were held, so there was no need to move or transport the group. The meal allowance was calculated for the Austrian lecturers for the whole Summer School.

There were 2 excursions added to the programme of the Summer School. The first technical excursion was organized to the Dolní Vítkovice Area, a former industrial area of the City of Ostrava. The second excursion was to the City of Olomouc, which hosts an UNESCO monument (Holy Trinity Column from 18th century, the most outstanding example of a type of monument specific to central Europe). The costs of the excursion were covered by the funding.

Last but not least, the partners thank the Aktion Programme Czech Republic-Austria for financial support of the Summer School.

The program of the Summer School, the list of participants, a selection of pictures, and the results of the evaluation survey are attached to this report as separate documents.

In Ostrava, 16. 11. 2017



Prof. RNDr. Václav Snášel, CSc.

President of VŠB-TUO, Director of the Summer School