**BSc or MSc project: Recognition of handwritten Han characters (Hanzi) via spatiotemporal convolutional on distance matrices**

Betreuung: Prof. Dr. Philipp Doebler und Dr. He Huang

21.3.2025

Recently, Huang and Doebler (2024) investigated the recognition of handwritten digits from 0 to 9. The STKNet-approach first computes distance matrixes with the pointwise Euclidian distances of the points of the handwriting trajectories. Based on these matrices, a custom convolutional neural network architecture with a contrastive loss function finds distances between the trajectories. Then kNN clustering can be used to classify new digits. Huang and Doebler could show that far less training data is needed compared to approaches using pixel images for the recognition of digits. Chinese characters (Hanzi) are used to write Chinese and many other Asian languages. In contrast to digits or roman letters, far more Hanzi exists and their handwritten trajectories are more complex, with a single character composed of several strokes.

In this thesis, the candidate builds on existing python code to apply the STKNet+kNN approach to more than ten symbols. A subset of Hanzi will be used based on the HSK 3.0 (Hànyǔ Shuǐpíng Kǎoshì) learner levels stratified by the number of strokes. Data comes from CASIA Online Handwriting Database (CASIA-OLHWDB), which has a large number of writers and samples.

Some working knowledge of python is essential. The implementation of STKNet is in tensorflow and keras, so the candidate is expected to familiarize themselves with these packages. The investigation during an MSc thesis is expected to involve larger datasets compared to a BSc thesis. MSc level candidates are also expected to evaluate the approach more thoroughly, involving comparisons to other existings methods.

**References**

Huang H., and Doebler, P. (September, 2024). Trajectory-based Handwriting Recognition via Spatiotemporal Convolution on Distance Matrix. AIPR. Xiamen, China.