Abstract: Pan-tumor CAnine CuTaneous Cancer Histology (CATCH) Dataset

Frauke Wilm[1,2], Marco Fragoso[3], Christian Marzahl[1], Jingna Qiu[2], Chloé Puget[3], Laura Diehl[3], Christof A. Bertram[4], Robert Klopfleisch[3], Andreas Maier[1], Katharina Breininger[2], Marc Aubreville[5]

[1]Pattern Recognition Lab, Friedrich-Alexander-Universität Erlangen-Nünberg, Germany
[2]Department AIBE, Friedrich-Alexander-Universität Erlangen-Nürnberg, Germany
[3]Institute of Veterinary Pathology, Freie Universität Berlin, Germany
[4]Institute of Pathology, University of Veterinary Medicine, Vienna, Austria
[5]Technische Hochschule Ingolstadt, Ingolstadt, Germany
frauke.wilm@fau.de

The identification of tumor regions on cutaneous tissue sections and the subsequent differentiation into individual tumor subtypes are routine tasks for veterinary pathologists. However, manual tumor delineation can be time-consuming and morphological similarities of tumor types can make the subtyping task difficult. Deep learning-based algorithms have been successfully applied for both tasks but require a large amount of annotated data to learn robust representations. Acquiring the annotations necessary to train these algorithms can be time-consuming and requires expert knowledge. Publicly available datasets reduce this annotation overhead and allow for a comparison of image analysis algorithms trained for the task at hand. We published a publicly available dataset of 350 whole slide images (WSIs) of seven different canine cutaneous tumors. These were annotated for the tumor subtypes and additionally six skin tissue classes. Overall, the database includes 12,424 polygon annotations for 13 classes, which exceeds most publicly available datasets in annotation extent and label diversity. In our dataset report, we validated the provided annotations through inter-rater experiments on a subset of the presented dataset, where three pathologists demonstrated high consistency in labeling tissue structures, especially for tumor annotations. Furthermore, we performed a technical validation by first training a deep neural network for tissue phenotyping. The model segmented the WSI into tumor and five skin tissue classes, where we achieved a class-averaged Jaccard coefficient of 0.7047 and a Jaccard coefficient of 0.9044 for tumor in particular. Afterward, we classified the segmented tumor regions into the tumor subtypes and achieved a slide-level accuracy of 0.9857. These baseline results provide a starting point for the development of more advanced algorithms. Previous works have shown that canine and human cutaneous tumors share various histologic patterns, which extends the added value of the presented dataset beyond veterinary pathology [1].

References

1. Wilm F, Fragoso M, Marzahl C, Qiu J, Puget C, Diehl L et al. Pan-tumor CAnine cuTaneous Cancer histology (CATCH) dataset. Sci Data. 2022;9:588.

T. M. Deserno et al. (Hrsg.), *Bildverarbeitung für die Medizin 2023*,
Informatik aktuell, https://doi.org/10.1007/978-3-658-41657-7_45