Type: Master Thesis

Title: Automatic Detection of Esophageal Cancer in Whole Slide Images

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Keywords: computational pathology, medical machine learning, artificial intelligence, cancer detection

Summary

To develop an AI algorithm for the automatic detection of Esophageal Adenocarcinoma (EAC) in Whole Slide Images (WSI) of biopsies of the esophagus.

Problem

Little is known about the progression from Barrett Disease over low-grade and high-grade dysplasia to EAC. To investigate the progression status and co-relation of Barrett Disease to EAC, automatic screening for signs of cancer is needed.

Goal

In this proof-of-concept study, we aim to explore the ability of AI to detect EAC in esophagus biopsies. For this, we will develop a machine learning algorithm for the automatic detection of EAC in digital whole-slide-images (WSI, see Figure 1) of biopsies of patients with Barrett disease. Weakly supervised learning for cancer detection shall be incorporated to solve that task*(1)*. For this, the WSI have to be tiled into patches using tools such as openslide*(2)* or monai[1]. Machine learning tools will be applied using Python.

Data Used

4700 WSI of 1200 biopsies of 850 patients. It is estimated that < 10% of the patients show EAC.

Computing Resources

The student will use the group's computing infrastructure and the LRZ high performance computing cluster for AI (GPU-based).

[1] https://docs.monai.io/en/stable/index.html

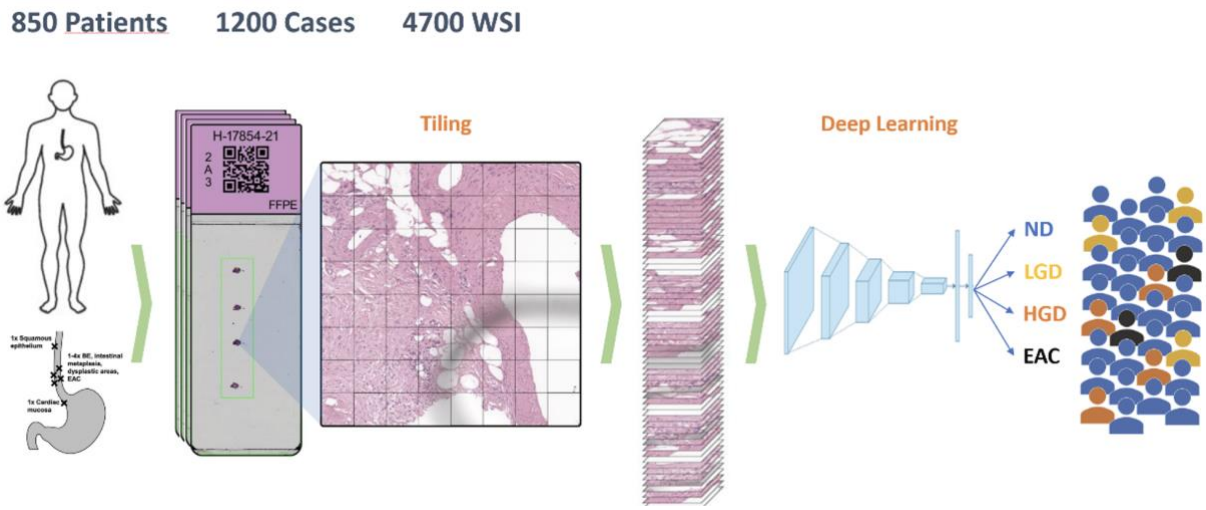

Figure 1: Workflow of automatic EAC detection. In the biopsies taken from a patient, diverse grades of dysplasia (no, low grade, high grade) can be found. In this project, we are only interested in EAC or no EAC (binary classification).

References

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2. A. Goode, B. Gilbert, J. Harkes, D. Jukic, M. Satyanarayanan, OpenSlide: A vendor-neutral software foundation for digital pathology. *J Pathol Inform* **4**, 27 (2013).

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