Type: Master Thesis

Title: Restriping detection

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Keywords: Digital pathology, Restriping, Feature selection

Problem

Digital pathology includes digitization of whole slide images (WSI). In this process, tissue slides are scanned at high resolution of 0.25 µm/px to make the tissue slides digitally available. While this procedure is very efficient, there are numerous artifacts that inhibit the fast scanning of slides. One artifact is restriping. This happens when the scanner scans particular stripes multiple times. This is logged during scanning time, and this prolongs scanning time.

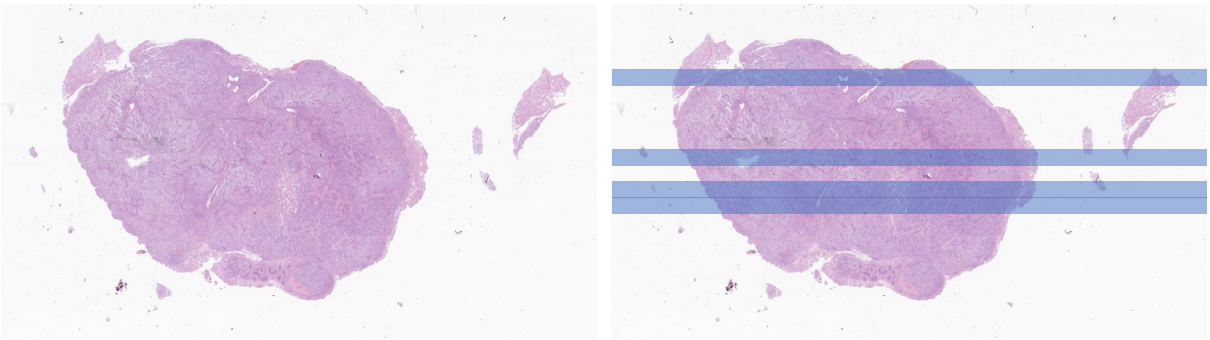

Figure 1 - Scan (left) and restripe events on that scan. These stripes have been scanned multiple times, leading to extended scanning time. The big question is why?

Goal

With this thesis we want to analyze the restriping event and find possible features and causes.

This goal should be achieved by relating restriping events with technical features from scanning settings and with image features from pathology.

First, restriping events should be visualized on digital whole slides for better interpretation.

Then, machine learning tools such as random forests shall be used to relate handcrafted features with the events (e.g. find particular scanner settings, or tissue settings causing restripes).

Further, deep learning methods shall be used to relate image features with the events (i.e. train an image classifier for differentiation of restriped patches vs regular patches).

Bonus: Correlate restripe events with other artifacts such as blurriness or air bubbles.

Data

Since summer 2023 we are systematically collecting restriping events in digital whole slide. This includes the number and the position of restripes in every single whole slide image. In general, we are scanning 1000 images per day and all images can be used for this project.

Computing Resources

The student will be able to use the LRZ computing cluster and our own group's internal computing infrastructure.

Requirements

This project requires basic experience with the statistical language such as R or Python, interest in visualization, interest in working with large images and basic knowledge of machine learning.

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