Type: Bachelor Thesis

Title: Quantifying Efficiency in Pathology

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Keywords: Digital pathology, SQL, Database, Efficiency, Performance metrics, Visualization

Summary

Pathology investigates human tissue in order to diagnose and quantify diseases. For this, tissue specimens are processed and stained according to standard protocols, and finally assessed by pathologists writing a pathology report about the tissue. This processing pipeline is tracked for every sample in a SQL-based laboratory information system (LIS). A fast turnaround time (TAT, time from accessioning a sample to its report) is critical for the clinical workflow. To help in the department's digital transition, this project aims to quantify our TAT and time needed to process the tissue samples to identify potential optimization opportunities in the individual steps.

Problem

The processing pipeline of patient's tissue consists of several key steps (ordering, accessioning, cutting, embedding, slicing, staining, and pathologist's reivew / reporting). This chain of procedures takes one to six days and is being tracked in the LIS via barcodes. In our current transition to digital pathology, an additional step is scanning of the slides, ideally after staining and before review (=prospective scanning). This scanning process can introduce additional delay depending on the workload, which can be problematic, as the TAT needs to be as small as possible for an efficient clinical workflow and for timely patient care.

Goal

This project aims to quantify our department's TAT for our cases over the last three years. Overall TAT as well as TAT of individual steps in the pipeline shall be aggregated, visualized and analyzed, for individual cases, groups of cases (histology, cytology, neuropathology, external cases, etc…) and groups of stainings (standard, immunohistochemistry, special stains, etc…). The necessary data are encoded and stored in a complex SQL database of the LIS. Additionally, the TAT shall be set in relation to the time needed for scanning. This information is stored in the SQL data base of the image management system.

The successful project quantifies all mentioned TAT, creates meaningful, interpretable data visualizations, and identifies possible bottlenecks in our tissue processing pipeline. Finally, a rough estimation of expected additional processing time for scanning should be given.

Data

The student will work on real-world data of our LIS processing 35k cases per year. The student will be trained on how to work with clinical (medical) data, and appropriate measures are expected. For reports and publications, data will be anonymized and aggregated.

Computing Resources

The student will use the clinical terminal server to read-access our clinical database.

Requirements

Knowledge in or interest in learning of: SQL, data bases, pathology, debugging, visualization, analytical thinking.

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