

Computation Pathology – KfK-Praktikum / KfK-Seminar / Masterarbeit at the Computation Pathology Lab

Motivation:

At the Dept of Pathology, we work mainly with patient tissue specimens taken for diagnostic reasons. These ultra-thin tissue sections are (immuno-)stained for detecting proteins/nucleic acids as well as used for genetic analyses (RNA-sequencing).

By investigating these staining patterns, pathologists derive a diagnosis and potentially affect patient treatment.

Nevertheless, this manual pattern matching could be automated using methods of computer vision and artificial intelligence to improve diagnostic accuracy, disease prognostication, and leverage multi-paradigm imaging.

We are a team of with background in medicine, informatics, and analytical chemistry who mainly investigate kidney, and urological pathologies using 10,000s of digital whole slide images (WSIs) and electronic health records (EHR).

Topics/tasks:

- Coding of semi-structured pathologist reports into established schemas (KIBICO, <https://kibico.org>, SNOMED-CT) and developing natural language processing (NLP) pipelines (spaCy, BERT).
- Content-based image retrieval: mapping pathological concepts to images to quickly find them in a large slide archive.
- Towards objective image qualifiers: pathologists grade tissue changes by arbitrary schemas; we are working on describing structural/cellular changes by numerical measures to increase accuracy.
- Algorithms for everyone: developing web-based (Vue/node.js) frontends for common analysis tasks (including genomics) as well as integrating segmentation/classification into cytomine (<https://cytomine.org/>) slide viewer.
- Data management / reproducible research: data pipeline developing/testing, refactoring, continuous integration/development, containerization (Docker)
- Going large: deploying/training algorithms on high-performance compute (HPC) clusters
- I can't decide: any combination of the above topics or your own ideas/suggestions.

We offer:

- Working on relevant research question(s) regarding one/more of the above topics.
- Access to data sets and compute capabilities.
- Regular meetings and supervision throughout the project.
- Flexible and welcoming work atmosphere.

Qualifications:

- Experience in programming (mostly python, javascript, SQL), object-relational mapping, version control software (git), linux command line
- Motivation, willingness to document work and reporting