

Master- oder alternativ Bachelor-Arbeit auf dem Gebiet der digitalen Pathologie zu vergeben:

Automated analysis of immunohistochemically stained tissue microarrays for molecular subtyping of colorectal cancer samples

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Background:

Tissue microarrays (TMA) provide the possibility to immunohistochemically stain tumor tissue from many patients on one slide in a comparable fashion.

Recently we developed toolbox (publication in preparation) in MATLAB [1] (based on an Omero-Server [2, 3]) to automatically number and register TMA-cores in sequential whole slide image (WSI) with different staining (e.g. hematoxylin and eosin stain (HE), cytokeratin [4]).

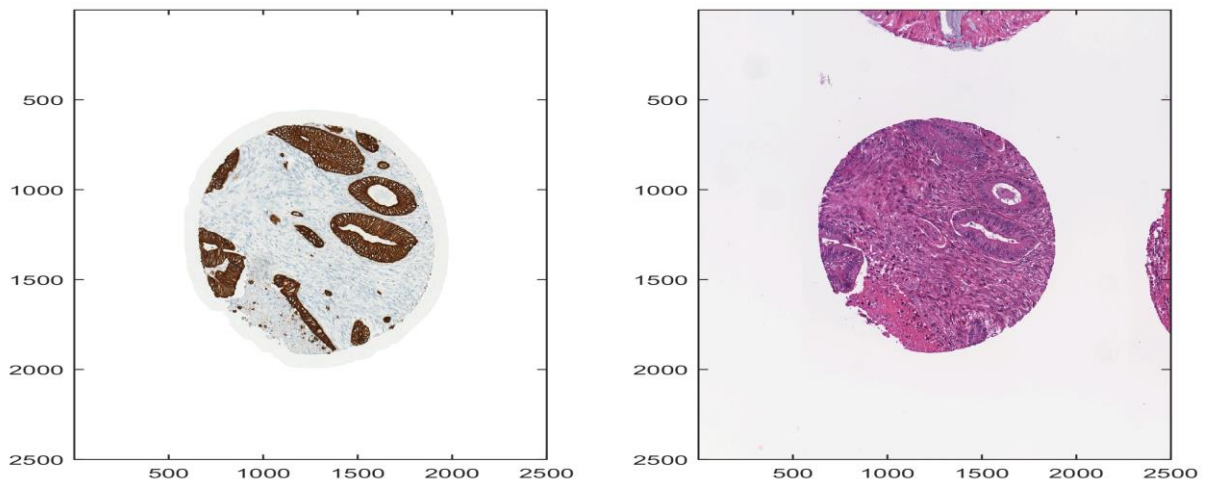


Fig.1 : One TMA-core with different staining on two sections

By usage of a custom-written MATLAB-toolbox TMA-cores can be automatically numbered and found on sequential sections. A) shows the immunohistochemistry (IHC) stain and B) shows the HE-staining for one core.

Objective:

In a recent publication by Trinh et al. [5] a method to automatically segment and analyze immunistochemical (IHC) staining in colorectal cancer (CRC) has been presented. Furthermore they could map these morphological finding to known molecular subtypes.

For the herein proposed project their freely available IHC-tool should be combined with our TMA-toolbox to analyze a huge study collective. In the next step, the IHC-analysis could be enlarged and/or texture analysis of the HE-image could be added.

Task / Workflow to establish:

- Adapt the existing TMA-toolbox to new study collective
- Apply the approach by Trinh et al. to every TMA-core in the collective
- Summarize the results in a R-database [6] calculating basic descriptive values

Requirements:

- Some experience in MATLAB and image processing
- Basic knowledge of R

Literature:

1. *MATLAB and Statistics Toolbox Release 2016b*. 2016, The MathWorks, Inc., Natick, Massachusetts, United States.
2. *The Open Microscopy Environment*. Available from: <https://www.openmicroscopy.org/site>.
3. *OMERO.matlab toolbox*. Available from: <http://www.openmicroscopy.org/site/support/omero4/developers/Matlab.html>.
4. *Immunohistochemical Staining Methods*. Education guide. 2013.
5. Trinh, A., et al., *Practical and Robust Identification of Molecular Subtypes in Colorectal Cancer by Immunohistochemistry*. Clin Cancer Res, 2017. **23**(2): p. 387-398.
6. R. 2017; Available from: <https://cran.r-project.org/>.
1. *MATLAB and Statistics Toolbox Release 2016b*. 2016, The MathWorks, Inc., Natick, Massachusetts, United States.
2. *Immunohistochemical Staining Methods*. Education guide. 2013.
3. Trinh, A., et al., *Practical and Robust Identification of Molecular Subtypes in Colorectal Cancer by Immunohistochemistry*. Clin Cancer Res, 2017. **23**(2): p. 387-398.
4. R. 2017; Available from: <https://cran.r-project.org/>.
1. *MATLAB and Statistics Toolbox Release 2016b*. 2016, The MathWorks, Inc., Natick, Massachusetts, United States.
2. Trinh, A., et al., *Practical and Robust Identification of Molecular Subtypes in Colorectal Cancer by Immunohistochemistry*. Clin Cancer Res, 2017. **23**(2): p. 387-398.
3. R. 2017; Available from: <https://cran.r-project.org/>.