

## Investigation and Implementation of Deep Neural Network models in Whole Slide Images

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In the last decades, machine learning-based computer-aided diagnosis is getting to play a vital role in medical studies such as histopathological image analysis. Although many researchers have focused on developing machine learning algorithms, there are still open following issues: the immense size of the histopathological images, quality of training and validation data, lack of interpretability of the models [1].

Histopathological images, Whole Slide Images (WSIs) with typical resolutions of  $100,000 \times 100,000$  pixels, are obtained by digitizing conventional microscopy images [2]. Annotated WSIs are used to feed machine learning algorithms. However, dimension reduction has to apply before feeding the algorithms.

Related to the learning model issues, the methods should consider the vulnerability to adversarial attacks.

The aim of the thesis project is to investigate current machine learning methods as well as WSI issues and to reimplement them. Implementation can be performed in Matlab or Python, depending on the experiences of the student.

Having the following is to help the student during the study; programming knowledge, basic knowledge on machine learning as well as image processing.

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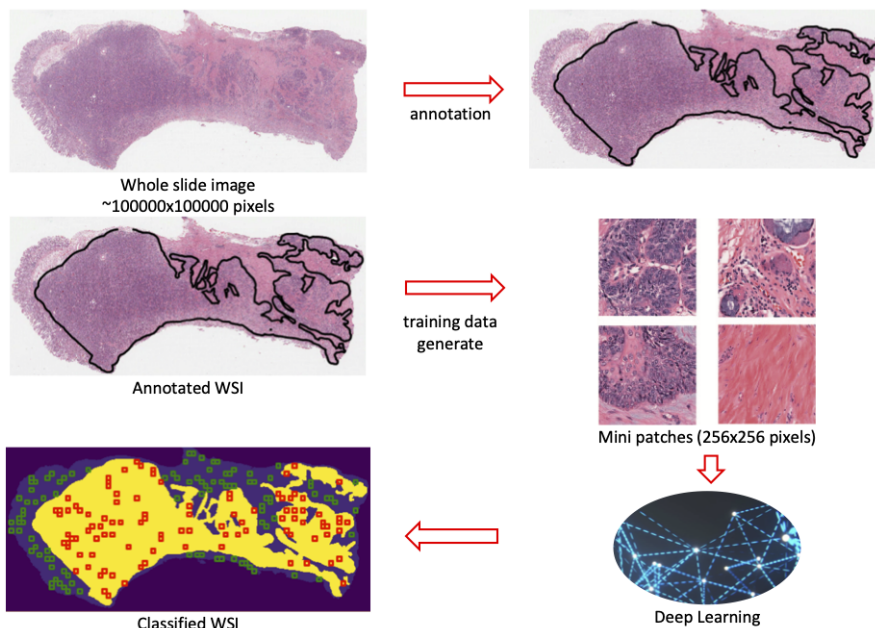


Figure 1. The workflow of the WSI analysis using deep learning models.

## References

- [1] Srinidhi CL, Ciga O, Martel AL. Deep neural network models for computational histopathology: A survey. arXiv preprint arXiv:1912.12378. 2019 Dec 28
- [2] Dimitriou N, Arandjelović O, Caie PD. Deep learning for whole slide image analysis: An overview. *Frontiers in Medicine*. 2019;6.

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