

# Deep Learning



## Master thesis: Creating Diagnostic Model for Assessing the Success of Treatment for Eye Melanoma

The chair for computer aided medical procedures (CAMP) in Technical University Munich (TUM) together with the Ophthalmology department in Ludwig Maximilian University (LMU) offer a **Master Thesis** opportunity. The work will be supervised by an inter-disciplinary team consisting of members at CAMP, physicians at LMU's ophthalmology department and experts from Zeiss.

An eye melanoma, also called ocular melanoma, is a type of cancer occurring in the eye. Patients having an eye melanoma typically remain free of symptoms in early states. In addition, it is not visible from the outside, which makes early diagnosis difficult. The choroidal melanoma, which is located in the choroid layer of the eye, is the most common primary malignant intra-ocular tumor in adults. At the same time, intra-ocular cancer is relatively rare – only an estimated 2,500 - 3,000 adults were diagnosed in the United States in 2015. Treatment usually consists of radiotherapy or surgery if radiotherapy was unsuccessful. For larger tumors, radiation therapy may be associated with some loss of vision. Currently, it is unknown which factors lead to the development of such cancer and which factors determine whether a patient is responding to radiotherapy.

In this master thesis project, the objective is to analyze data from approximately 200 patients, treated at the ophthalmology department at Ludwig-Maximilians University hospital. Treatment consisted of a single-session, frameless outpatient procedure with the Cyberknife System by Accuray. Using pre-procedural data and information collected during follow-up, the aim is to identify factors predictive of a patient's response to treatment and the impact on a patient's visual acuity, measured by the so-called Visus.

Interested students will be provided access to a database of patients from which diagnostic factors can be extracted. The majority of work will be carried out at LMU's ophthalmology department.

### Your tasks:

- Extract relevant diagnostic information from a database.
- Perform basic quality and sanity check on data.
- Develop a model predictive of a patient's survival time or time to eye removal (due nonresponse to radiotherapy therapy).
- Develop a predictive model of a patient's visual acuity (Visus) after radiotherapy.
- Create a nomogram based on the most important factors, identified previously, to easily predict a patient's survival and Visus after radiotherapy.

### Requirements:

- Good understanding of statistics and machine learning methods.
- Very good programming skills in Python and/or Matlab.
- Willingness to closely collaborate with physicians and experts in machine learning.
- Knowledge of methods for survival analysis is recommended.

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