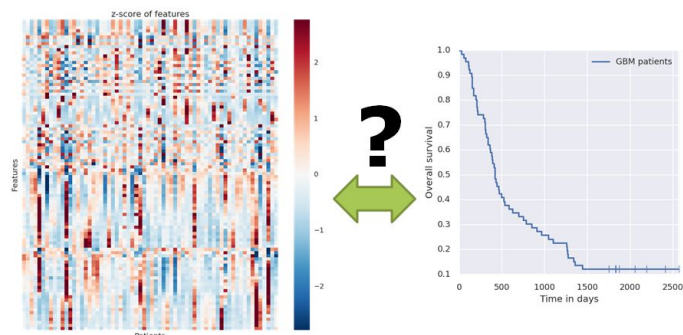# Predicting survival of lung tumor patients based on computed tomography images

The combination of conventional radiology with machine learning, termed *radiomics*, has recently gained tremendous attention, due to the promise to extract the maximal amount of information from standard-of-care images such as computed tomography (CT) or magnetic resonance imaging (MRI).

Radiomics relies on machine learning as a means to link a potentially high-dimensional space of quantitative image features to a clinical outcome parameter. This outcome may be categorical, continuous, or right-censored survival information, as in the present project.



**Preliminary work** For this thesis, publicly available data from [1] will be used. This data comprises 317 CT scans of patients with non-small cell lung cancer, along with survival data. Tumor contours have been outlined manually by experts. As a starting point, 208 quantitative image features have been extracted as in [2], including shape features, first-order statistics of intensity and texture features.

The **objective** of the proposed thesis is to use state-of-the art machine learning approaches to predict survival of patients with lung tumors based on image features derived from CT scans.

## Roadmap

1. Classical statistics: Identify most predictive features, Cox regression analysis
2. Machine learning: survival prediction in mlr
   a. Preprocessing: feature selection, normalization, ...
   b. Out-of-the box techniques
   c. Tuned models: hyperparameter optimization
3. Optional: black-box-optimization, finetuning of feature extraction pipeline

## Client

We are a research group at the Institute for Clinical Radiology of the University Hospital Munich, situated at Campus Großhadern. Our group is comprised of physicists (Dr. rer. nat. Michael Ingrisch, Moritz Schneider) and radiologists (Prof. Dr. Birgit Ertl-Wagner, Dr. med.

Dominik Nörenberg, Dr. med. Giovanna Negrao de Figueiredo). We are working in close cooperation with clinical partners e.g. from the departments of neurosurgery and nuclear medicine. Recently, we have focussed on the topic of radiomics and have published an initial study [2].

# References

1. https://wiki.cancerimagingarchive.net/display/Public/NSCLC-Radiomics#528d198408514c57920a55935a6fa781
2. http://journals.lww.com/investigativeradiology/Abstract/publishahead/Radiomic_Analysis_Reveals_Prognostic_Information.99136.aspx