Human cancers and other lesions exhibit strong differences in appearance that can be visualized noninvasively by medical imaging. Historically, experts looking at X-Ray and CT images have done this qualitatively. With the advent of new imaging modalities and the combination of multiple modalities (e.g. PET-CT), the amount of information the radiologist needs to integrate has outgrown the human cognitive capacity to hold no more than 5 concepts in working memory. In contrast to the current paradigm, quantitative image analysis refers to the comprehensive quantification of medical images by extracting a large number of quantitative features - most of which are not perceptible to the human eye - via computers using mathematical methods. Quantitative image analysis (QIA) turns medical images into mineable data and has developed to have significant and substantial implications for the medical community. The core hypothesis is that QIA features provide added relevant tissue-biology related genomic, cellular and metabolic information. This field has since gained substantiation and many publications appear every month showing new applications of radiomics, especially in aiding theranostics - combining therapeutics with diagnostics. Recently, deep learning methods have been applied to generate artificial images such as the now infamous Deep Fake images using generative adversarial networks. This same technology is being used in medical imaging to e.g. “normalize” CT scans to the same reconstruction kernel, or to combine and analyze images from different modalities.

**Lernziele:** After this talk you will have learnt about the latest methods to extract and select QIA features from multimodal medical images, how to combine these features into effective diagnostic, predictive, and prognostic models, and how to use deep learning networks to fuse and analyze medical images.