Principal Investigator

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Summary of research:

Statistical models, quality control, abnormality detection

Application Lay Summary:

1a: The aim is to develop software for detection of abnormalities in images with an application to quality control and identification of correlations with non-image data. The core builds an abnormality detection system using advanced statistical machine learning. Abnormalities caused by data corruption and pathological processes such as cancer are detected by comparing test data to statistics of a normative model. Variations outside the norm are highlighted automatically. The software has potential to significantly improve the cost-effectiveness in imaging studies, ensure high data quality, support image-based diagnosis, and to find correlations with demographics, lifestyle, and Cancer Registry data.

1b: Automated QC is essential to guarantee high quality data in large-scale studies such as the Biobank Imaging Enhancement. The derived statistical models will further reveal clinically useful information about the population, can assist automated detection of pathologies such as cancer, and will allow to correlate image derived measurements with non-image data. This has the potential to facilitate further research in understanding demographic, genetic and lifestyle factors on pathological processes such as cancer, and the role of imaging biomarkers for early detection and risk prediction.

1c: We will develop software that allows to automatically process medical images and extract clinically useful information. We apply existing algorithms for the extraction of major organs and other regions of interest for the construction of statistical population models using advanced machine learning. The statistical models will be used to detect abnormalities in test images. Abnormalities,

whether caused by poor data quality, corrupted data, or by pathological processes, will be detected as statistical outliers and can be reported to the human expert for further visual inspection. Further, we will perform statistical analyses to correlate image derived measurements with non-image data.

1d: Initially, 5,000 subjects.