**Application number/Title:** 14237 - Application of Imiomics to whole-body MRI data for creation and application of a human imaging atlas

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**Keywords provided by the Applicant PI to describe the research project:**
aging, body-composition, cardiovascular-disease, genetics, imiomics, mendelian-randomization

**Application Lay Summary:**

We are facing a global epidemic of obesity and related cardiovascular complications. This calls for novel intervention strategies where improved understanding of the underlying mechanisms is key. Both total fat mass and its distribution throughout the body have been linked to development of cardiovascular disease.

Whole-body medical imaging using magnetic resonance (MRI) can sample anatomical information such as tissue volume and fat content, i.e. parameters relevant for cardiovascular studies, at the millimetre scale using millions of small 3D-elements (voxels). We have developed and validated a novel technology, Imiomics, which enables whole body voxel-wise correlations with non-imaging data, e.g. genotypes and disease phenotypes. Imiomics thereby allows innovative types of whole body composition studies. During the Imiomics analysis, whole-body images are registered/deformed to a common coordinate system/geometry. This allows statistical analysis, in the whole-body region, such as creation of a `mean person` (atlas) and studies of deviations from that mean person. This also allows integration of imaging and non-imaging data as whole-body `correlation- images` to for example blood parameters can be made.

The aim of this project is to determine causes and consequences of variation in human body composition. This goal will be achieved by

1) applying Imiomics to build a Human Imaging Atlas using whole-body imaging data from large-scale cohort studies
2) genome-wide body-wide studies of body composition
3) assessment of the association of body composition with cardiovascular disease, including ischemic stroke and myocardial infarction and cardiovascular risk factors, including type 2 diabetes, hypertension, and dyslipidemia
4) Mendelian Randomization studies of causal effects. This interdisciplinary project addresses several fundamental questions related to causes and consequences of variation in body composition. This will improve our understanding of the underlying mechanisms of cardiovascular disorders and accelerate development of prevention, diagnosis and treatments for cardiovascular complications. Furthermore, the resources created by this project are anticipated to open up new avenues for research within the obesity-field.