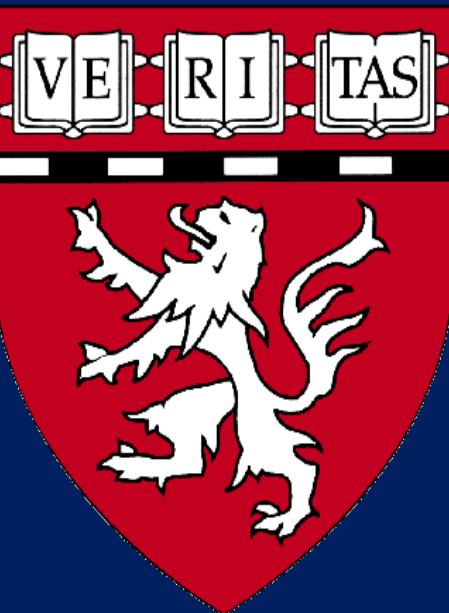




MRI-derived body composition to assess biological age and frailty



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Background

- Body composition (sarcopenia, adiposity, loss of bone density) is strongly associated with frailty indices and biological aging processes
- Anthropometric measures of body composition (BMI, waist circumference, etc.) have substantial limitations as proxies for these body compositional features related to aging
- An imaging-based biological aging clock may better capture the frailty phenotype than existing indices
- We previously found that deep learning can accurately assess volumetric body composition from whole-body MR imaging

Purpose

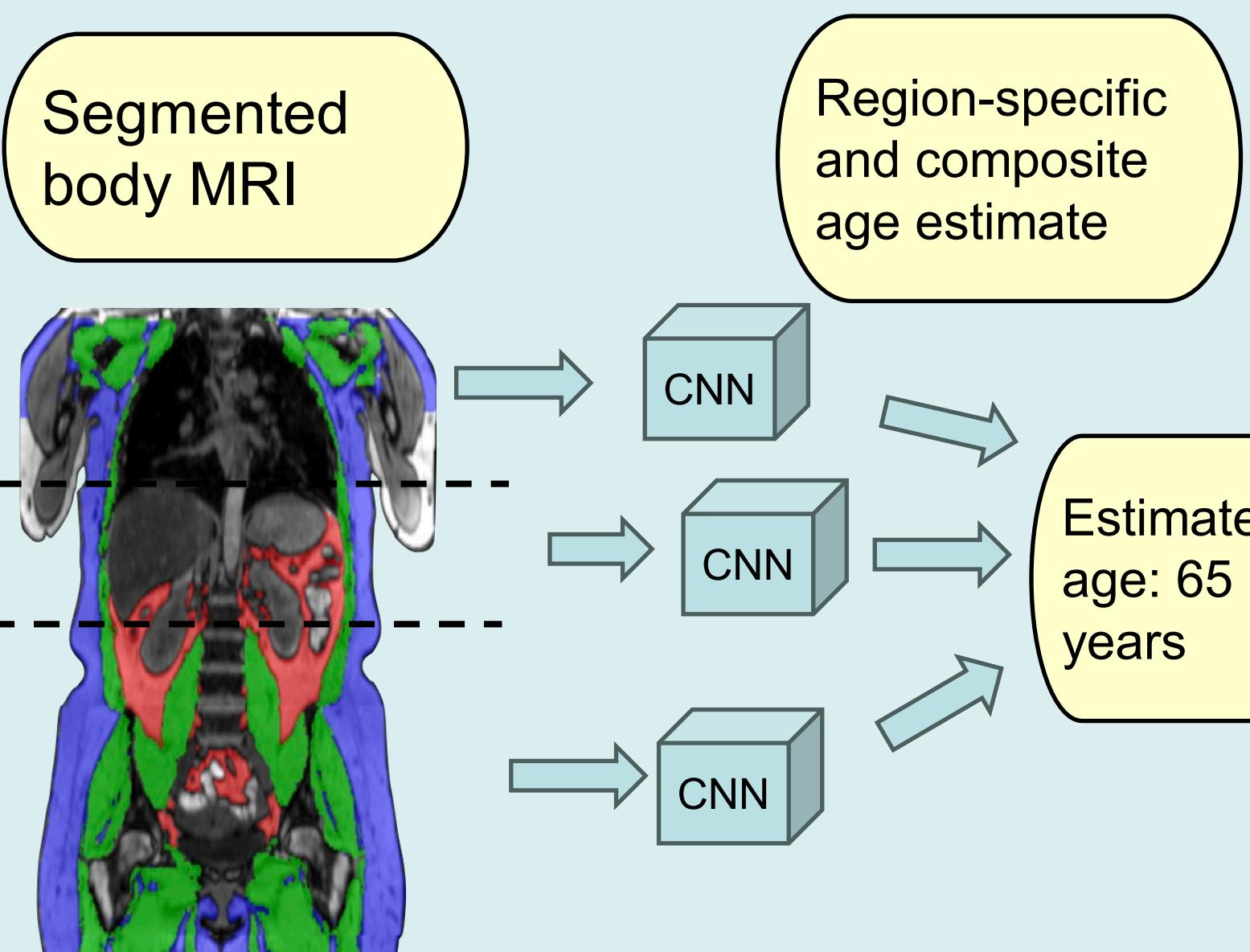
Here, we aimed to

- 1) Develop a biological aging clock using MR imaging-derived body composition
- 2) Assess the association between this clock and chronologic age in Biobank cohorts
- 3) Assess whether age-deviations predicted clinical outcomes beyond established risk factors

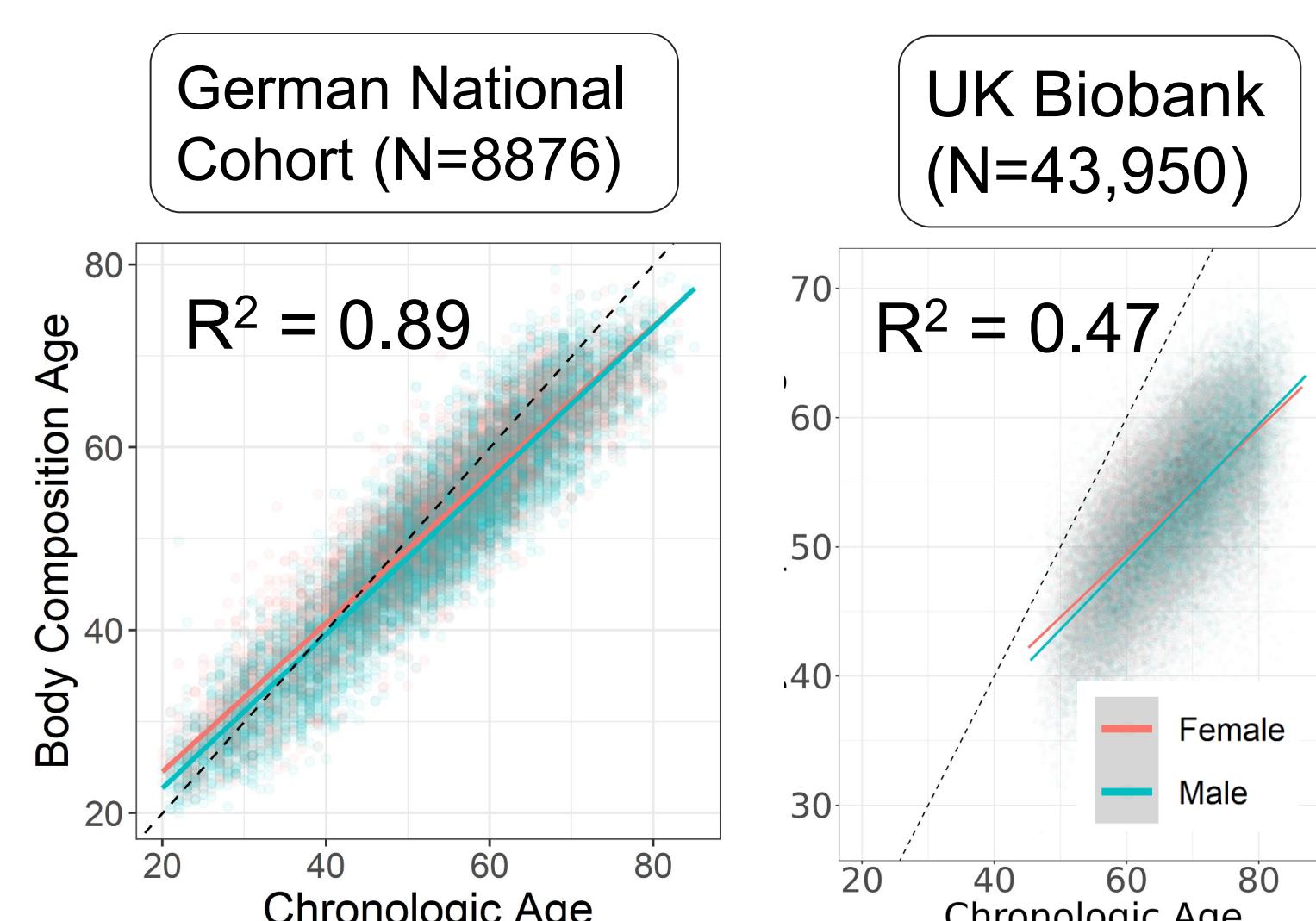
Study Cohorts

	German National Cohort (N=30,022)	UK Biobank (N=43,950)
Age Range	20 to 85	45 to 84
Female Sex (%)	44.1%	51.7%
Purpose	Model training and internal testing	External testing, outcome association
Imaging	3T Dixon MRI	1.5T Dixon MRI
Follow-up	Unavailable	Median 4.3 years

A biological aging clock based on imaging-derived body composition predicted all-cause mortality and incident disease beyond conventional risk factors



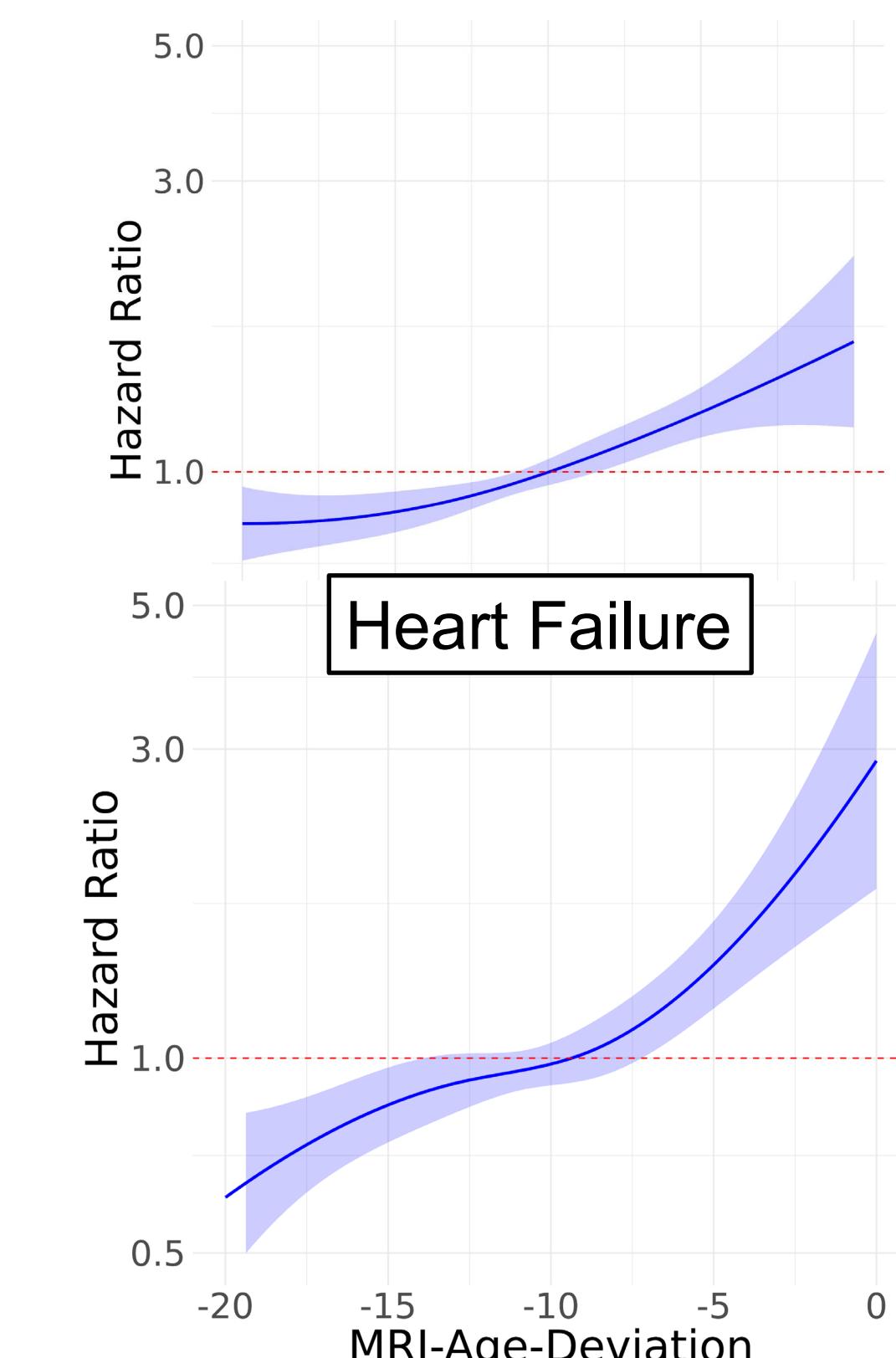
Body composition clock is associated with chronologic age



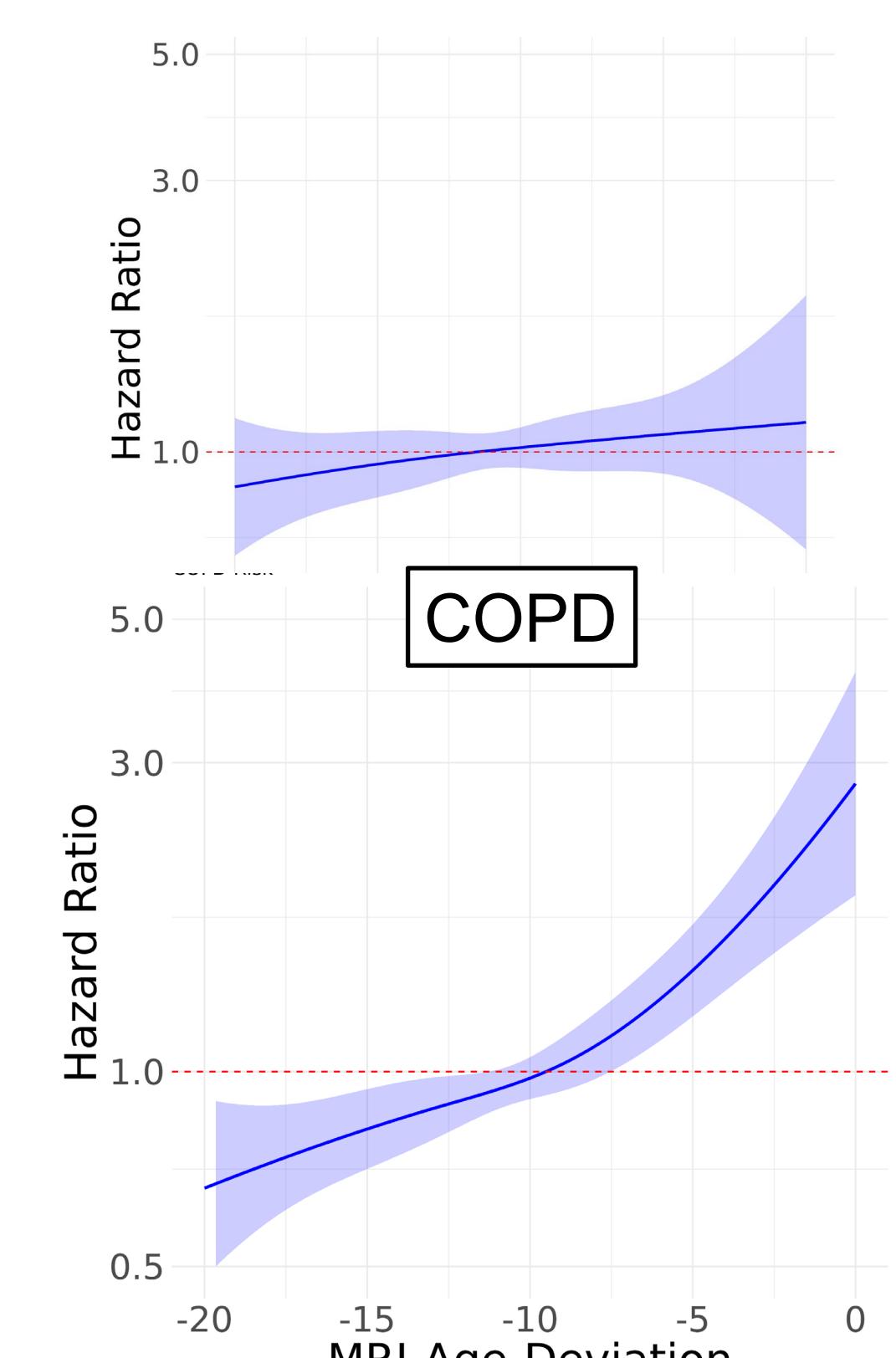
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Body composition clock predicts incident outcomes beyond risk factors

All-cause mortality



Major osteoporotic fracture



Hazard ratios adjusted for age, sex, daily alcohol use, bone mineral density, BMI, waist circumference, history of diabetes, current smoking, and genetic ancestry

Conclusions and Next Steps

- Biological aging clock based on body composition was associated with chronologic age and predicts morbidity and mortality beyond risk factors
- Next steps:** association with frailty indices, application to images obtained in clinical routine, molecular analysis of the phenotype captured by this model

References

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3. Jung, M., Raghu, V.K., Reisert, M., et al. Deep learning-based body composition analysis from whole-body magnetic resonance imaging to predict all-cause mortality in a large western population. *EBioMedicine*, 2024