

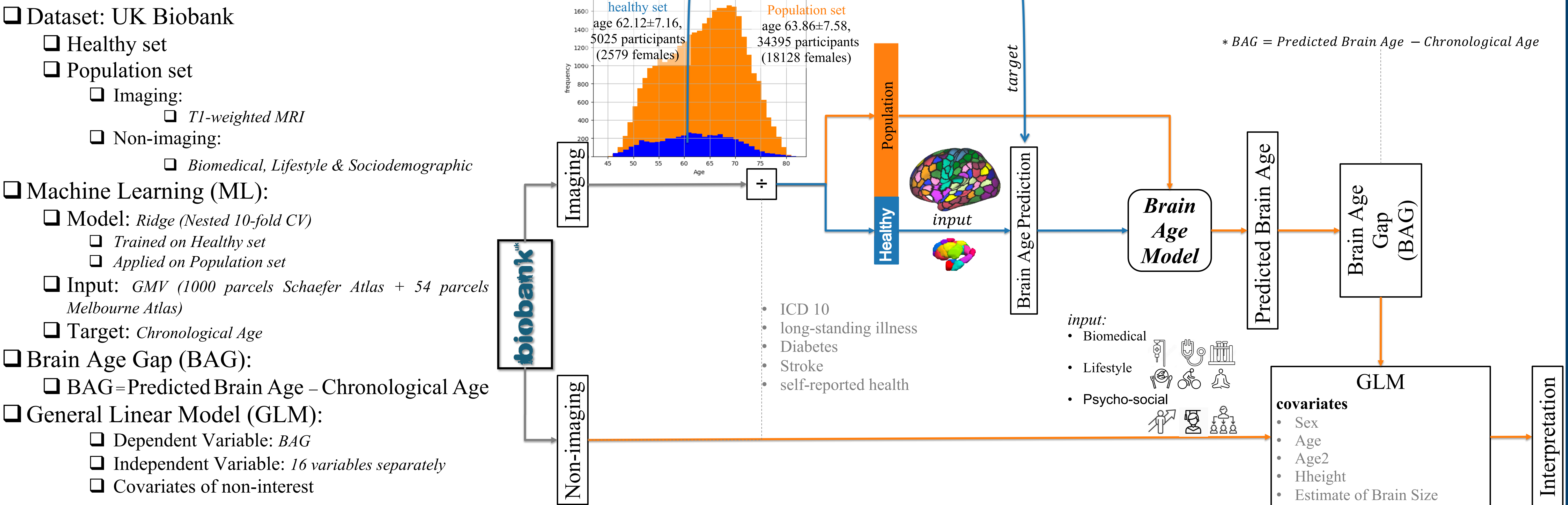
Mostafa Mahdipour^{1,2}, Shammi More^{1,2}, Somayeh Maleki Balajoo^{1,2}, Felix Hoffstaedter^{1,2}, Federico Raimondo^{1,2}, Simon B. Eickhoff^{1,2}, Sarah Genon^{1,2}

¹Institute of Systems Neuroscience, Heinrich Heine University Düsseldorf, Düsseldorf, Germany;
²Institute of Neuroscience and Medicine (INM-7: Brain and Behaviour), Research Centre Jülich, Jülich, Germany
m.mahdipour@fz-juelich.de

Introduction

The Brain Age Gap, also known as the BAG, is the difference between an individual's estimated brain age based on a Machine Learning (ML) model and their chronological age. This difference can be used as a general measure of the individual's brain health. In turn, it can be applied to research on the relationship between the health of older people's brains and the external and internal factors that affect them. Thus far, a number of different investigations have demonstrated that BAG can be associated with particular non-neuroimaging variables; nevertheless, a wide variety of biological and life factors have only rarely been taken into consideration within the context of a single research endeavour. In this study, we made use of the many different metrics that are contained within the UK Biobank in order to investigate the structural BAG's relationship to biological, lifestyle, and satisfaction characteristics.

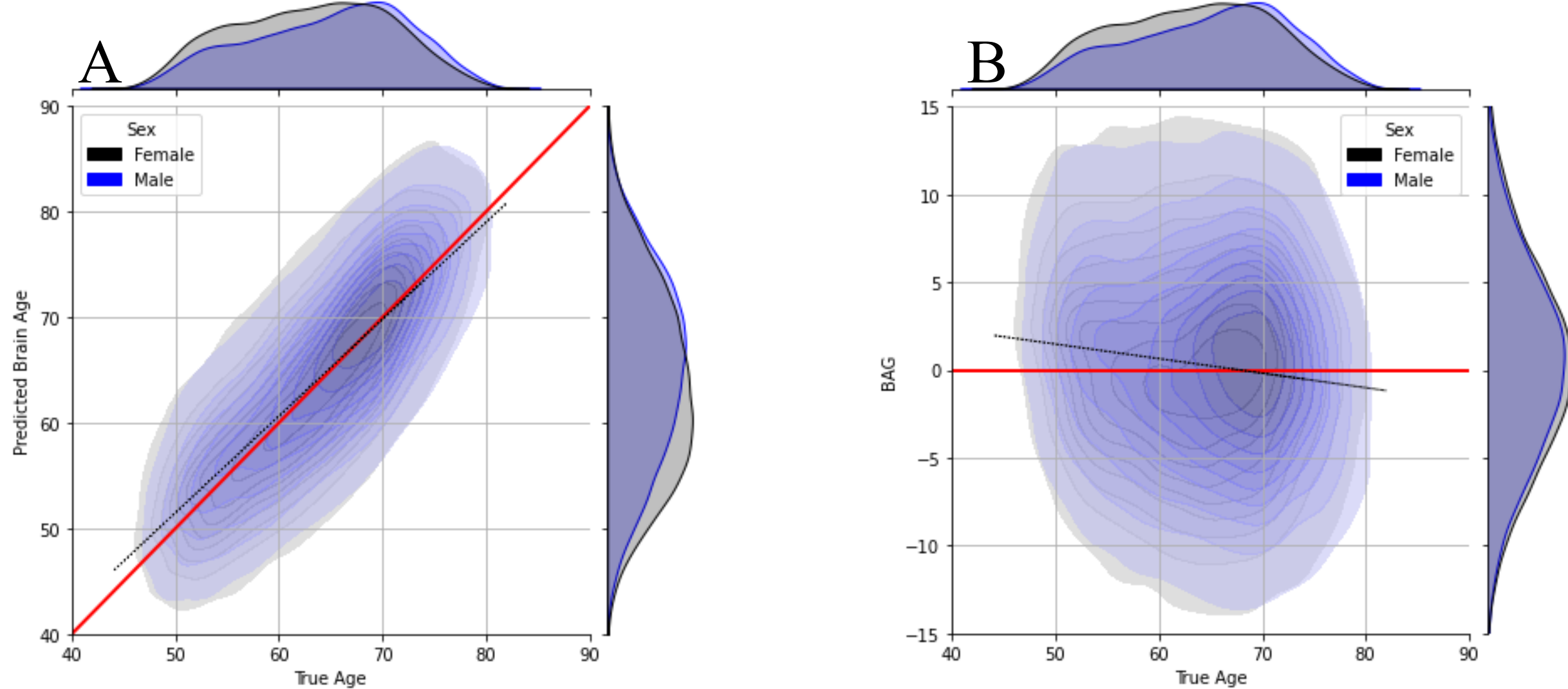
Methods



Results

- ☐ **Healthy Set Performance:**
- ☐ Correlation between Predicted and Chronological Age: $r=0.75$
 - ☐ Mean Absolute Error (MAE): 3.75 years
 - ☐ Age Bias (Correlation between BAG and Chronological Age): $r=-0.65$
- ☐ **Population Set Performance (Figure 1):**
- ☐ Correlation between Predicted and Chronological Age: $r=0.76$
 - ☐ Mean Absolute Error (MAE): 3.93 years
 - ☐ Age Bias (Correlation between BAG and Chronological Age): $r=-0.66$
- ☐ **Significant Univariate Associations with Corrected BAG (Tables):**
- ☐ Biomedical Factors:
 - ☐ Blood Pressure
 - ☐ Diabetes
 - ☐ Obesity
 - ☐ Lifestyle Factors:
 - ☐ Smoking
 - ☐ Alcohol Intake
 - ☐ Moderate Activity
 - ☐ Satisfaction Factors:
 - ☐ Family
 - ☐ Job
 - ☐ Financial Satisfaction

Figure1 A) Predicted Brain Age Vs Chronological Age (or True Age) in the population set, B) BAG Vs Chronological Age (or True Age) in the population set



Variable's Name	# of participants	standardized Coef (β)	corrected p val
Biomedical			
Diastolic blood pressure	31931	0.4741	<0.001
Systolic blood pressure	31931	0.3678	<0.001
Body mass index (BMI)	34236	0.3298	<0.001
Weight	34242	0.4347	<0.001
Hip circumference	34258	0.2475	<0.001
Diabetes	34276	0.5405	<0.001
Age stroke diagnosed	501	-0.0247	0.9377
Facial ageing	34062	-0.0025	0.9377

Variable's Name	# of participants	standardized Coef (β)	corrected p val
Psycho-social			
Family relationship satisfaction	34062	0.1011	0.0029
Work/job satisfaction	34062	0.1813	<0.001
Friendships satisfaction	34062	0.0222	0.4833
Financial situation satisfaction	34062	0.188	<0.001
Lifestyle			
Smoking status	34276	0.4917	<0.001
Alcohol intake frequency	34276	-0.3952	<0.001
Duration of moderate activity	30742	-0.0712	0.0435
Duration of vigorous activity	23050	0.0161	0.8094

Discussion

By using regression-based ML approaches applied to atlas-based GVM in a cohort of strictly healthy people, we could here develop a sensitive BAG-based structural brain health estimator. Using this estimator in a broader population revealed associations with both biomedical and life factors in line with previous studies. Nevertheless, our exploratory study further reveals association with psycho-social factors, namely satisfaction with family relationship, work/life and financial situation. Future work should further characterize these associations by using multivariate, including non-linear, models accounting for possible interactions between multiple factors from different domains

References: Jönsson, B.A., et al., *Brain age prediction using deep learning uncovers associated sequence variants*. Nature communications, 2019. **10**(1): p. 1-10.
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