

# Federated learning for brain image decoding in MS

Stijn Denissen, Matthias Grothe, Manuela Vaneckova, Tomáš Uher, Jorne Laton, Matěj Kudrna, Dana Horáková, Johan Baijot, Iris-Katharina Penner, Michael Kirsch, Jiří Motýl, Maarten De Vos, Oliver Y. Chén, Jeroen Van Schependom, Diana Maria Sima and Guy Nagels

## Background

- Clinico-radiological paradox: Weak link radiological and clinical findings in MS
- Deep learning (DL) could yield new insights, but requires large data sets

Two potential solutions:

1. Data accessibility  $\uparrow$ : Federated learning = machine learning without sharing data
2. Need for data  $\downarrow$ : Transfer learning = update trained model to perform different task

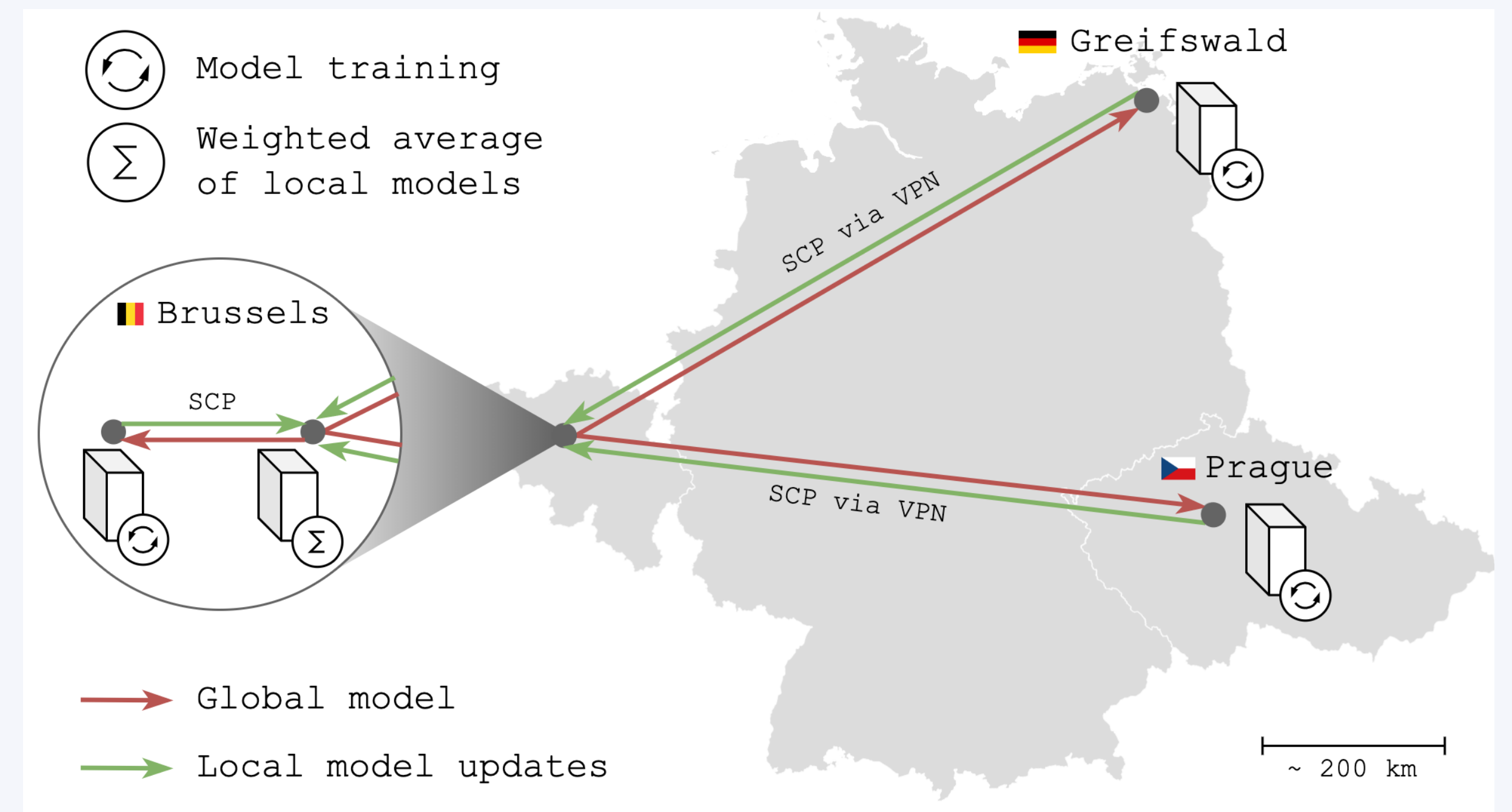
## Aim

Train brain age model\* to decode SDMT from T1w MRI using federated learning

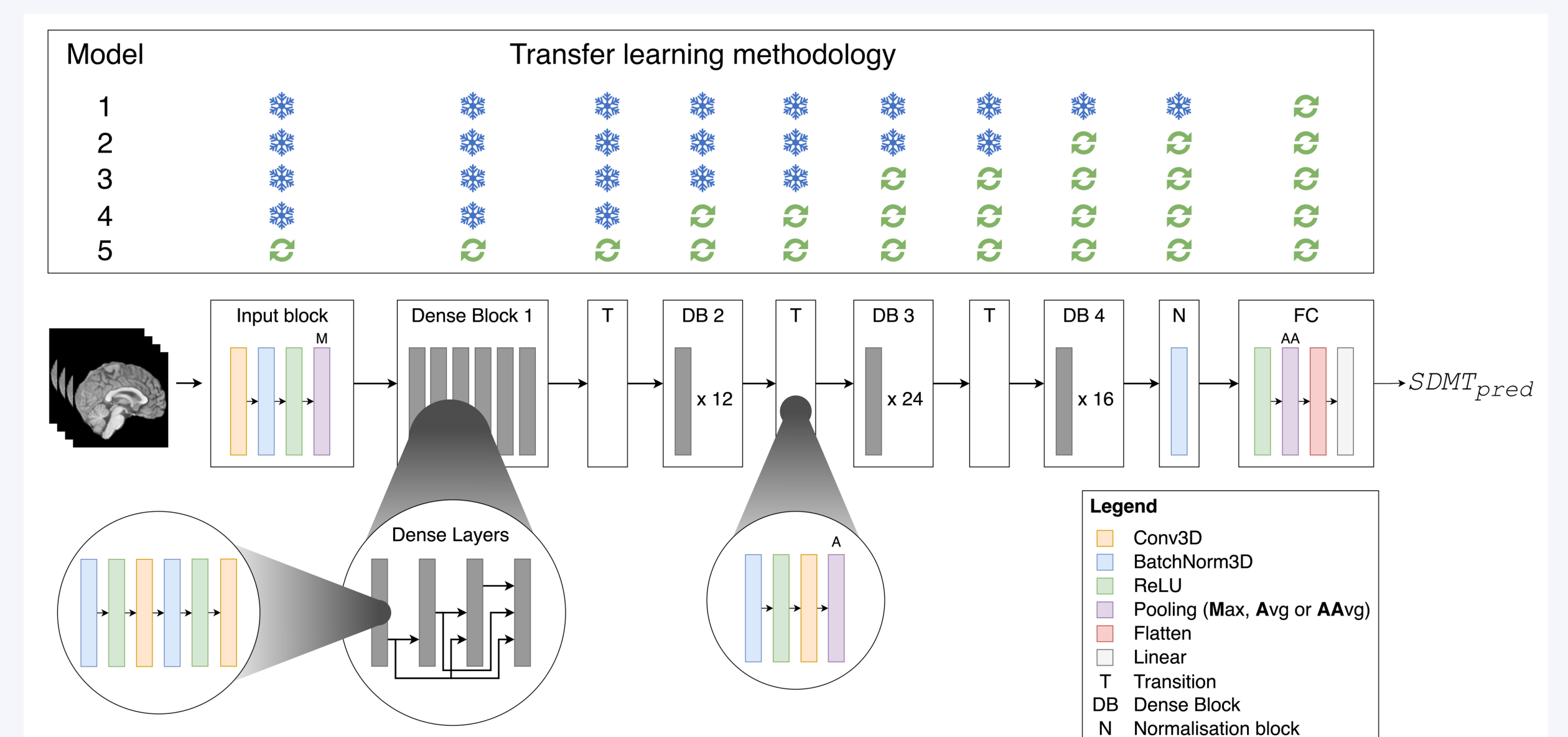
\*Brain age model (DenseNet): Wood, D. A. et al. *NeuroImage* 249, (2022)

## Methods

### Federated learning



### Transfer learning



Federated learning is feasible for decentralised machine learning research in MS



Join our network!



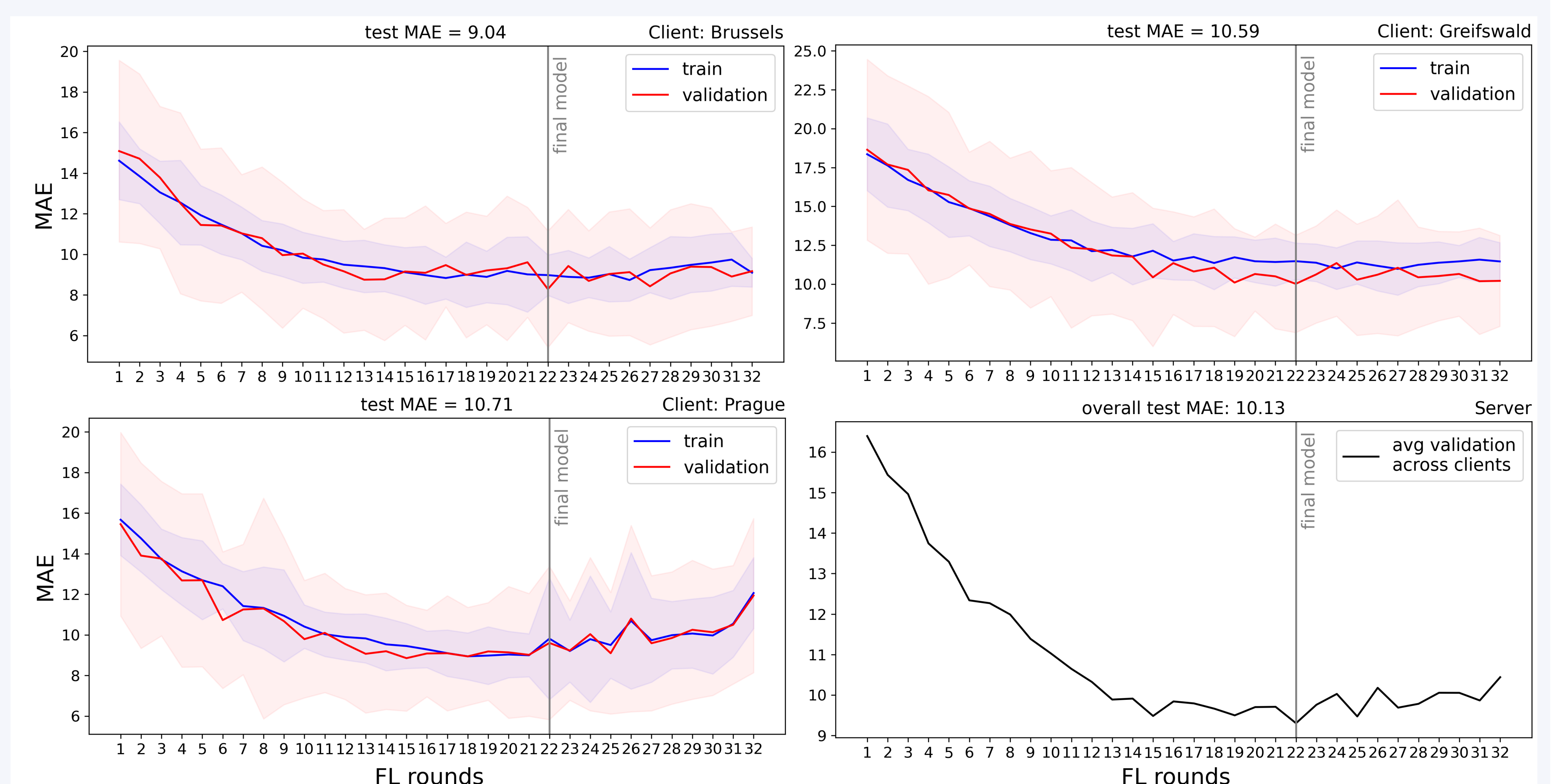
medRxiv preprint

## Results:

Error decrease in each center for all models. Results for model 1:

- Visual results:  $\rightarrow$
- Average misprediction: 10.13 SDMT points
- Poor predictions: close to the mean

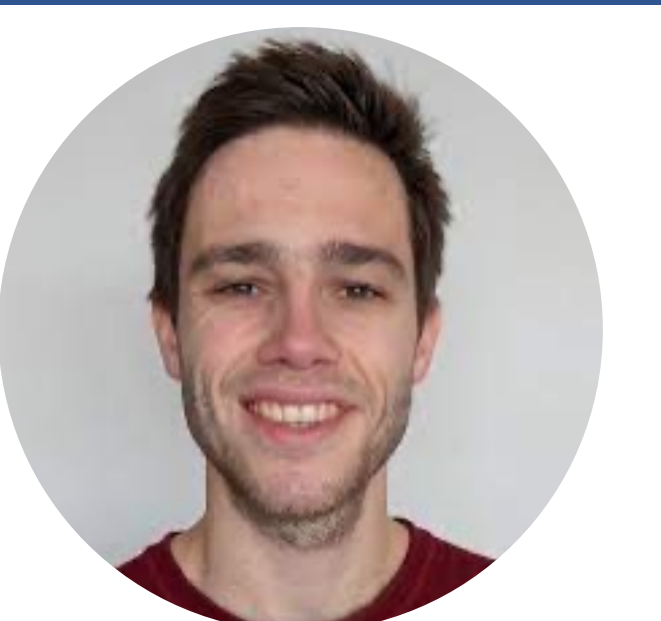
	Brussels		Greifswald		Prague	
	True	Pred	True	Pred	True	Pred
Mean	45.6	51.2	49.4	51.4	58.4	51.7
SD	10.3	2.0	13.7	2.0	11.6	2.2



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stijn.denissen@vub.be