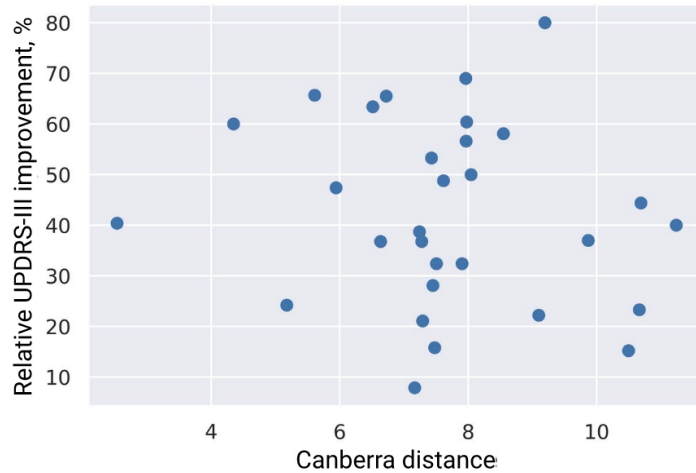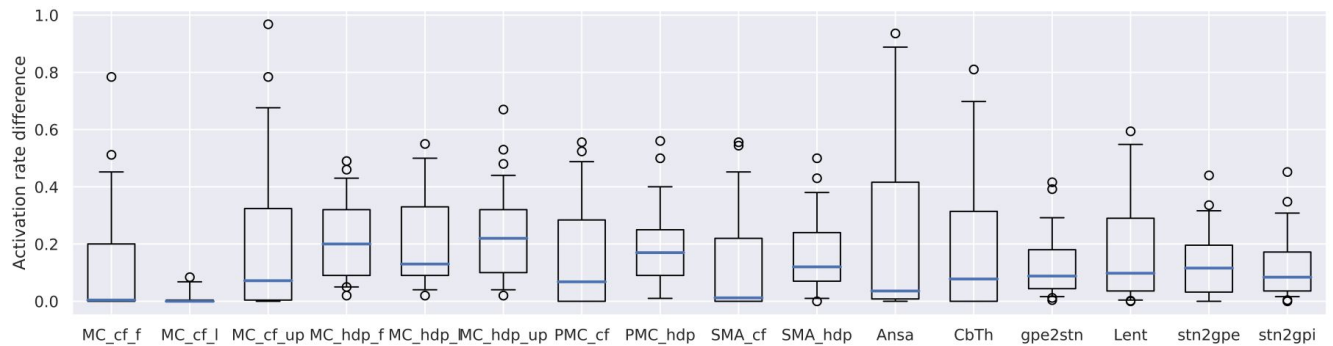# Supplementary Material: Appendix B

Suppl. 1

Absence of correlation of UPDRS-III improvement with the Canberra distance to the target profile defined in the pathway activation space based on all patients of the training cohort.

Suppl. 2: Difference in activation rates across hemispheres

Box plot of absolute difference of activation rates computed separately for both hemispheres across both cohorts. MC and PMC refer to the primary and premotor cortical regions, SMA – supplementary motor area; cf and hdp are the corticofugal and the hyperdirect pathways, respectively; Ansa – ansa lenticularis, Lent – lenticular fasciculus, CbTh – cerebellothalamic pathway; l, f, up – lower extremity, face-neck region, and upper extremity in the primary motor cortex.

Suppl. 3: Sensitivity analysis for the optimal activation profile

Using UncertainPy[1], a sensitivity analysis was conducted for the activation rates defined in $A_{optimal}$. A Monte Carlo sampling was applied to truncated (0-100% rate) normal distributions centered at the derived rates with the standard deviation set to 5%. In-sample correlation analysis using weighted Canberra distances revealed a minor effect of the uncertainty (see the figure), and the null hypothesis was rejected for all samples with the significance level equal to 0.025. It could be concluded that the performance of the correlation model is robust against minor perturbations that might occur due to computational inaccuracies and modeling assumptions. Notably, the deviation of the activation rate in the corticofugal branch descending from the supplementary motor area had by far the highest first order Sobol' index. This result is, however, not surprising since Canberra distance is a normalized metric and it inherently emphasizes matching low activation rates.

1. S. Tennøe, G. Halnes, and G. T. Einevoll. "UncertainPy: A Python Toolbox for Uncertainty Quantification and Sensitivity Analysis in Computational Neuroscience". In: Frontiers in Neuroinformatics 12 (2018), p. 49. issn: 1662-5196. doi: 10.3389/fninf.2018.00049.

Abbreviations: STD - standard deviation, P_5 and P_{95} are the 5th and 95th percentiles, respectively. M1 and PMC refer to the primary and premotor cortical regions, SMA — supplementary motor area; cf and hdp are the corticofugal and the hyperdirect pathways, respectively; Ansa — ansa lenticularis, Lent — lenticular fasciculus, CbTh — cerebellothalamic pathway; l, f, up — lower extremity, face-neck region, and upper extremity in the primary motor cortex.