

1 Appendix

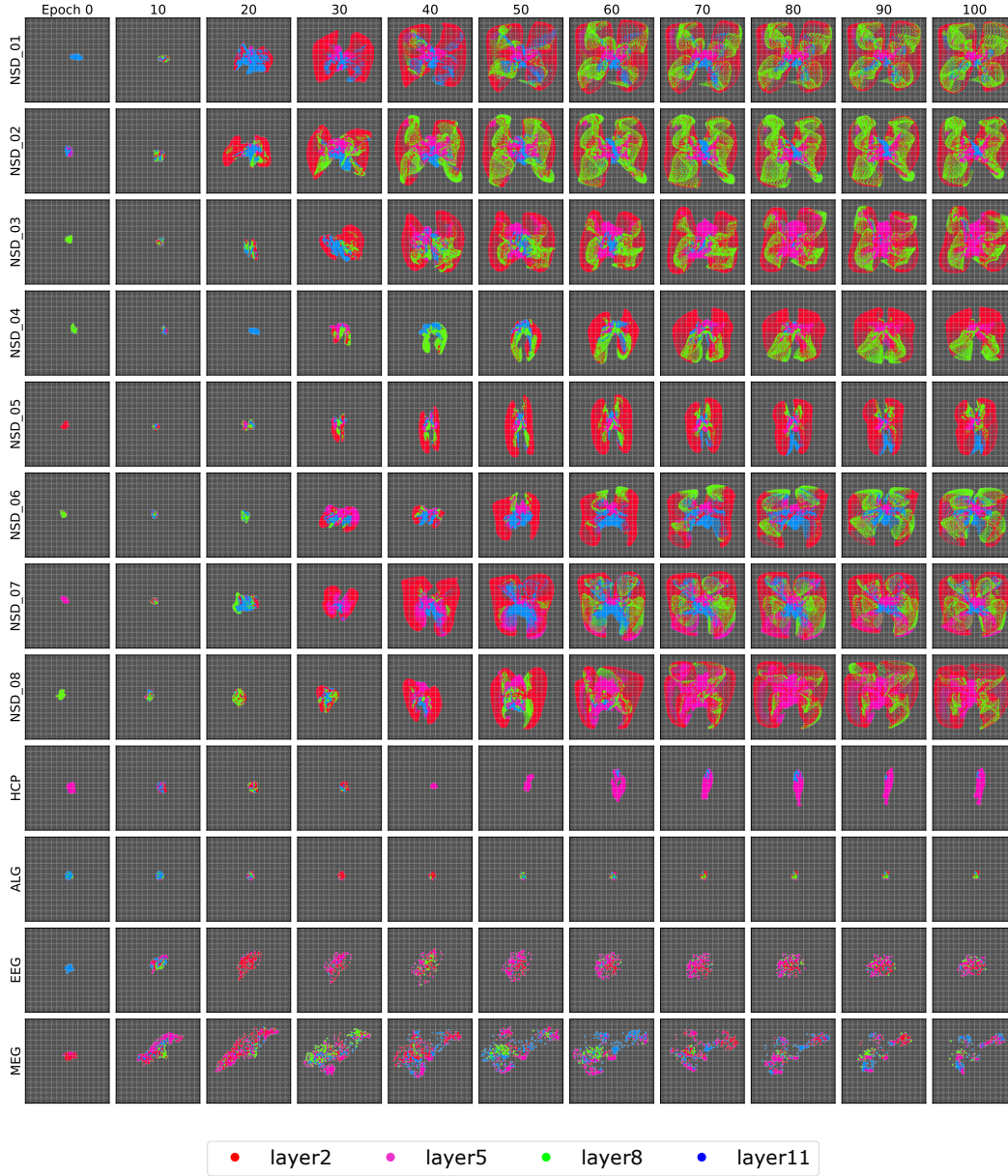
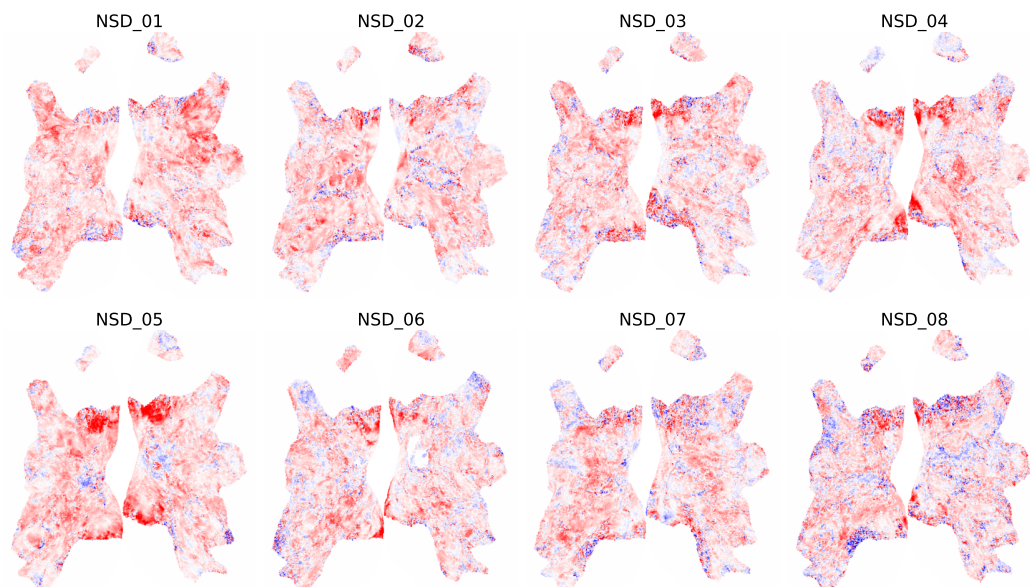
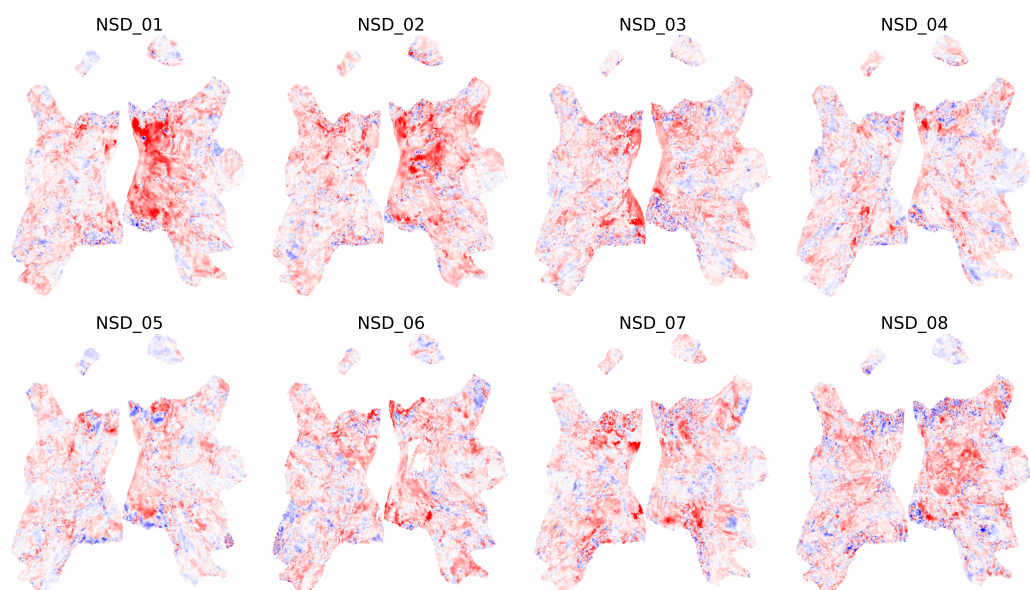


Figure 1: Retinotopic behavior emerges during training. 2D Grid (*RetinaGrid*) is latent image space. Each dot on *RetinaGrid* is a voxel of neurons, mapped from 3D physical space to 2D by *RetinaMapper*. Color is made by argmax of the *LayerSelector*, colors indicate selection of layers. Models are trained separately with all voxels of each subject.



(a) AFO - NaiveMix



(b) AFO - ROI



Figure 2: Per-voxel score difference of (a) All-for-One v.s. Naive Mix, (b) All-for-One v.s. ROI models (AFO stage one). Score is Pearson's correlation coefficient across test-set datas.

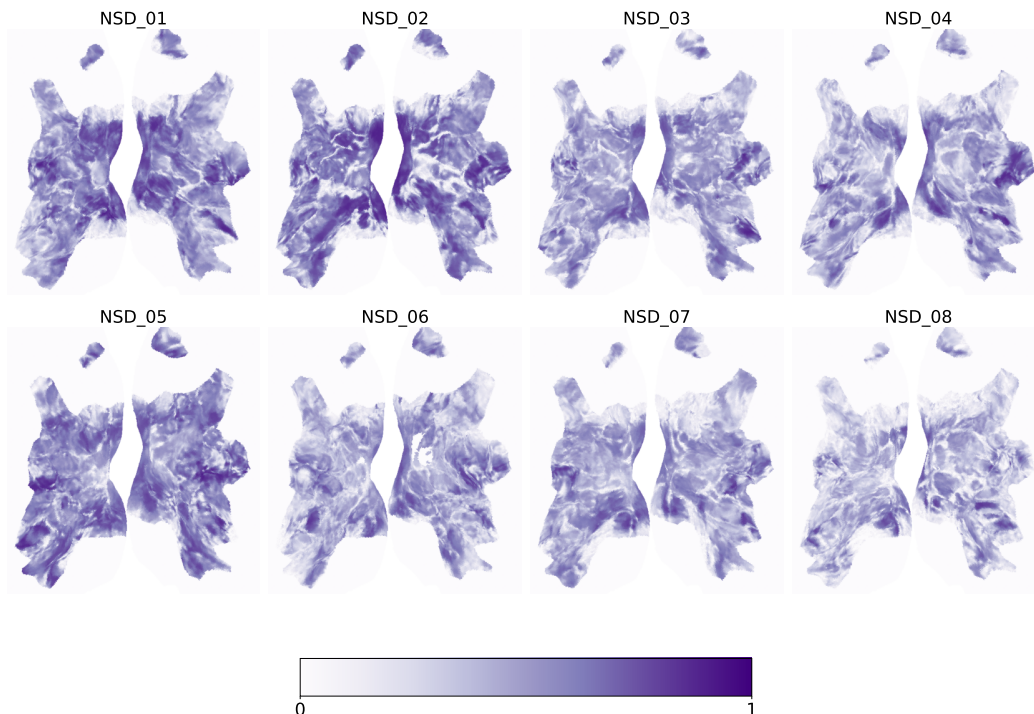


Figure 3: Per-voxel score of the best All-for-One model. Score is Pearson’s correlation coefficient across test-set datas.

Table 1: *TopyNeck* with frozen image backbone. Image backbone is trained on training subjects and kept frozen, *TopyNeck* is trained on the transfer subject with frozen backbone and trainable *RetinaMapper*, *LayerSelector*, and per-voxel linear regression. The 5 training datasets includes NSD, EEG, MEG, ALG, and HCP, holdout sets are fMRI and BOLD5K. The reported numbers are the average Pearson correlation coefficient across all voxels. Results are averaged over three runs.

Recipe	Training Dataset	Training Subject	Transfer Subject					
			NSD 01	NSD 08	EEG 01	MEG 01	fMRI 01	BOLD5K 01
AFO	5	ALL	0.475	0.310	0.206	0.181	0.268	0.240
	5	ALL	0.471	0.314	0.199	0.171	0.257	0.234
	NSD	01	0.443	-	-	-	-	-
	NSD	08	-	0.269	-	-	-	-
	NSD	ALL	0.471	0.311	-	-	-	-
Naive Mix	EEG	01	-	-	0.170	-	-	-
	EEG	ALL	-	-	0.209	-	-	-
	MEG	01	-	-	-	0.101	-	-
	MEG	ALL	-	-	-	0.153	-	-
	fMRI	01	-	-	-	-	0.157	-
	fMRI	ALL	-	-	-	-	0.218	-
	BOLD5K	01	-	-	-	-	-	0.204
	BOLD5K	ALL	-	-	-	-	-	0.223