

N2 脳情報科学

Geometric Deep Learning to Generalize EEG Decoders Across Days/Subjects

概要

Current electroencephalography (EEG) decoders typically require labeled calibration data for a new day or subject, limiting their utility and scalability. Geometric deep learning offers a remedy via combining invariances of Riemannian manifolds with neural nets to improve EEG decoder generalization across days and subjects with seamless adaptation in the background.

特徴

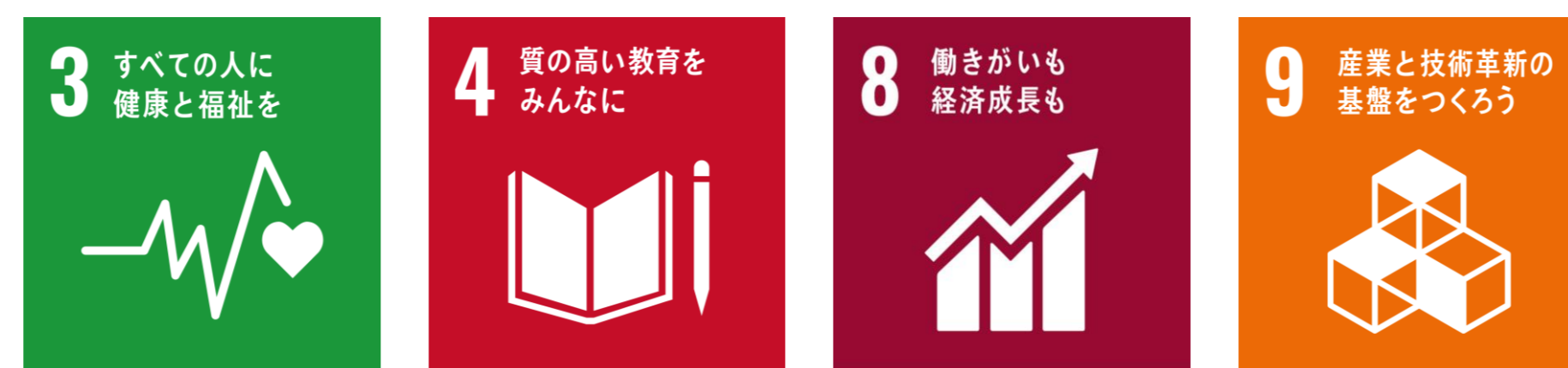
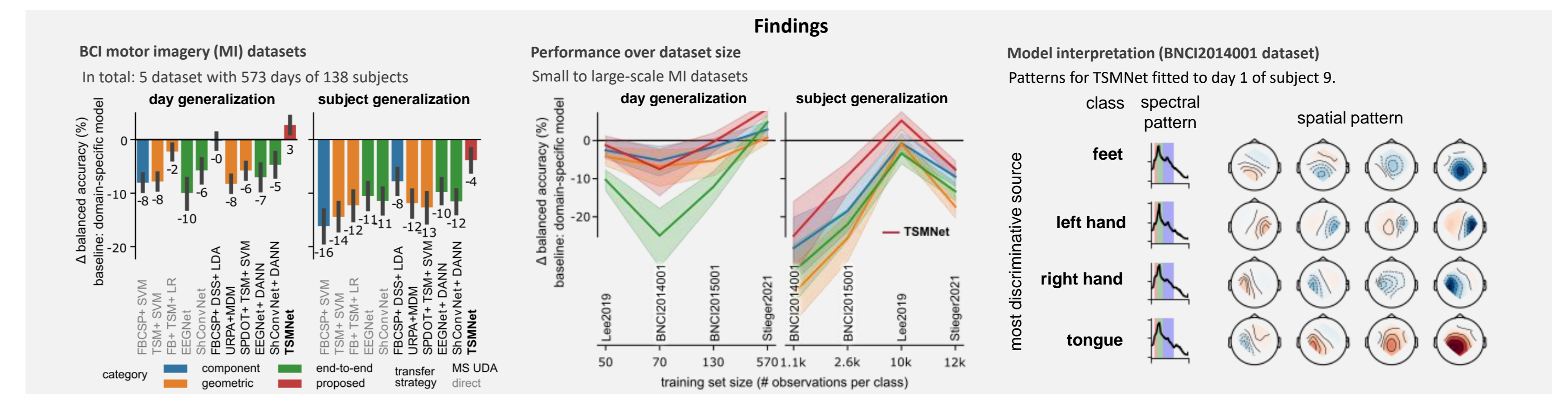
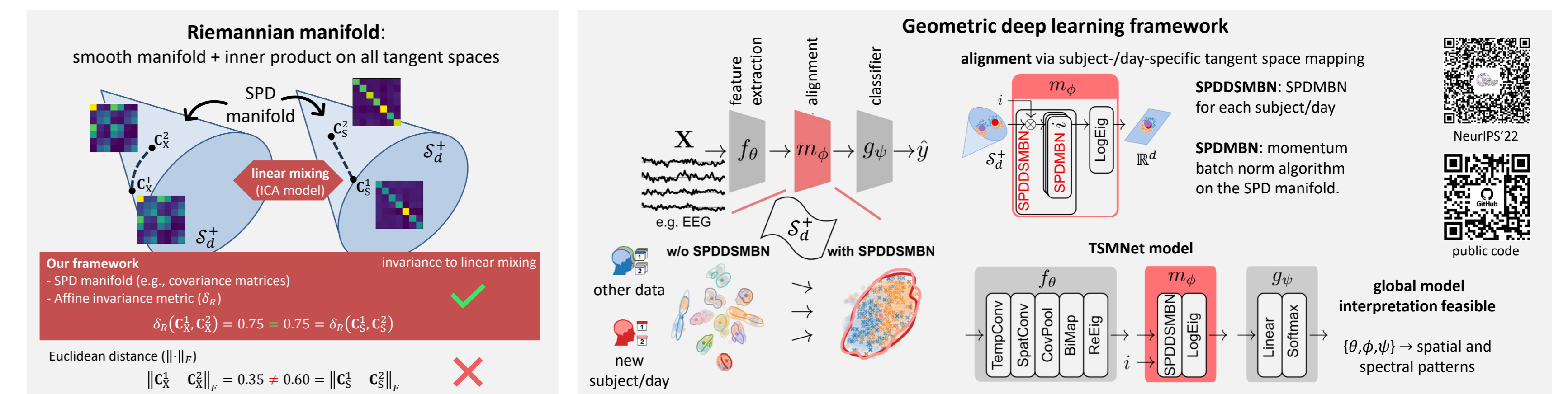
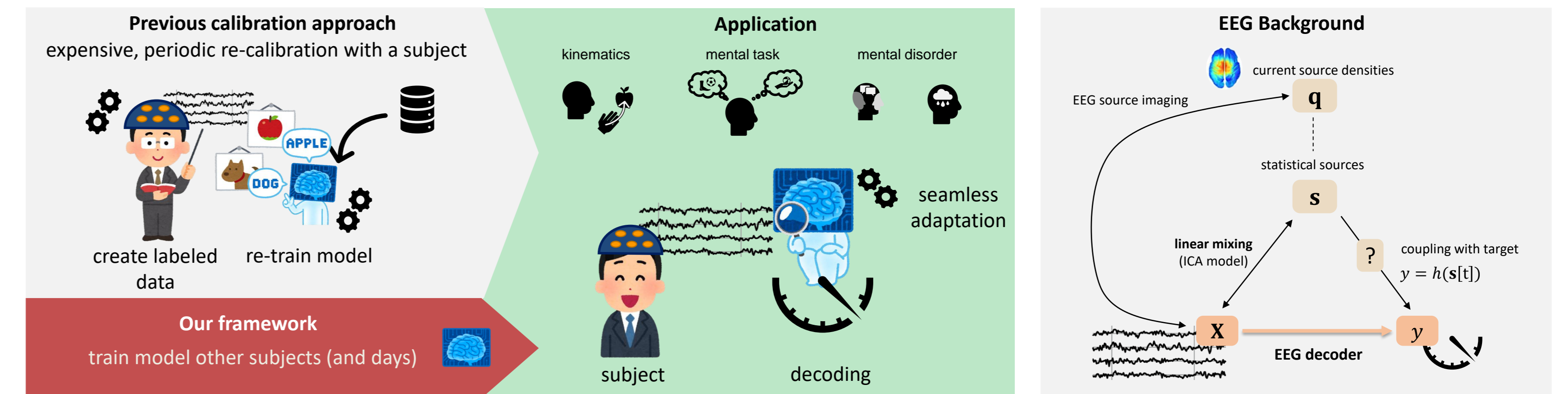
- We developed a geometric deep learning framework that combines feature learning capabilities of neural nets (e.g., temporal filters) with invariances (e.g., ICA mixing) of Riemannian manifolds.
- Using seamless (=unsupervised) adaptation on the manifold of covariance matrices, we proposed a lightweight network (=TSMNet) and obtained state-of-the-art performance in EEG decoder transfer across days and subjects.
- Unlike general deep learning models, the architecture of TSMNet is globally interpretable, enabling potential applications in healthcare, where model interpretation and data-efficiency are key characteristics.

今後の展開

- Based on the success of our framework with brain-computer interface (BCI) EEG data, we extend our framework to other types of brain data (e.g., fMRI connectivity) as well as multimodal brain data (e.g., EEG-fMRI).

テーマ「ともに究め、明日の社会を拓く」との関連

- Improving generalization of neurotechnology across days and subjects **without** supervised re-calibration will tremendously improve its utility and, thereby, facilitate adoption of neurotechnology in tomorrow's society.



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