

The Case for Cleaner Biosignals: High-fidelity Neural Compressor Enables Transfer from Cleaner iEEG to Noisier EEG

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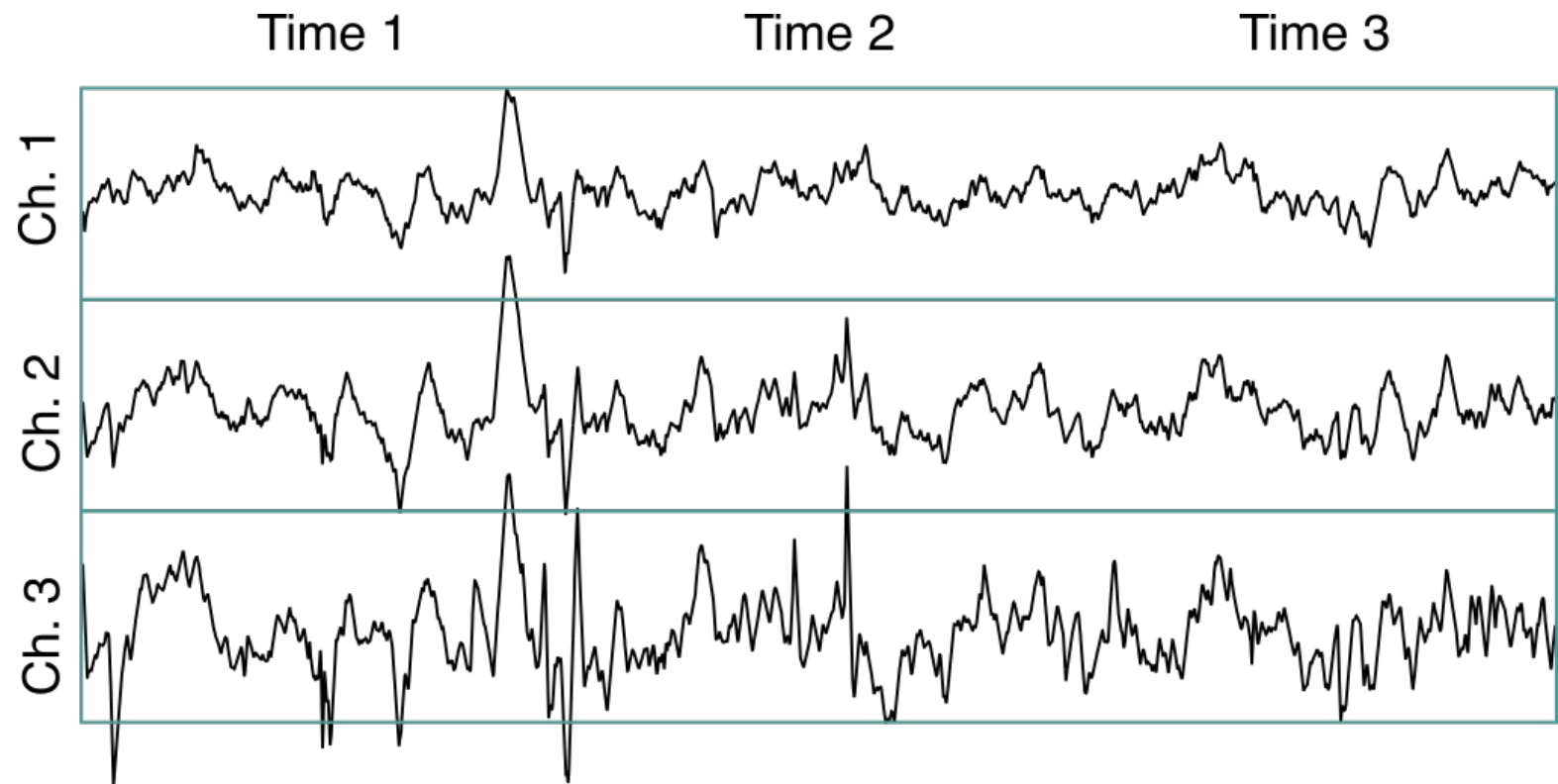
³ **IBM Research**

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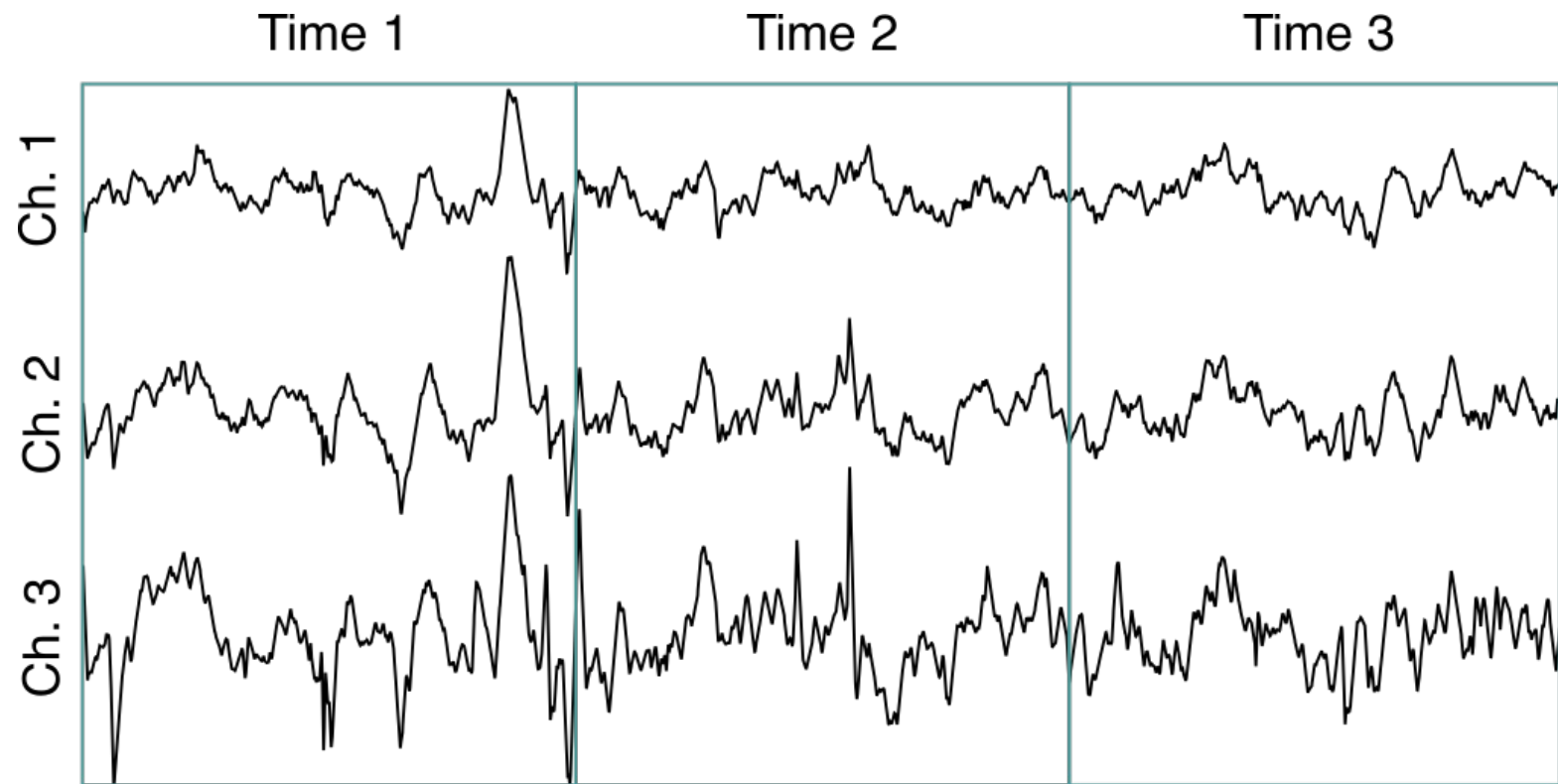
We explore human electrophysiological signals...

Channels
Time



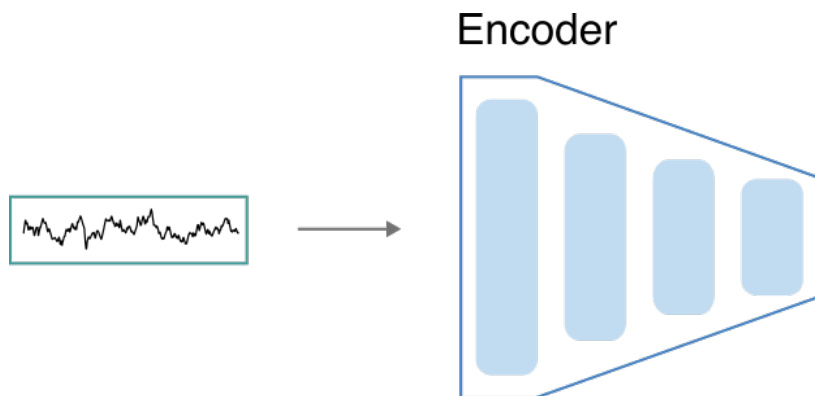
We explore human electrophysiological signals...

Channels
Time



...and how well we can compress^{1,2} them

Encode
Quantize
Decode

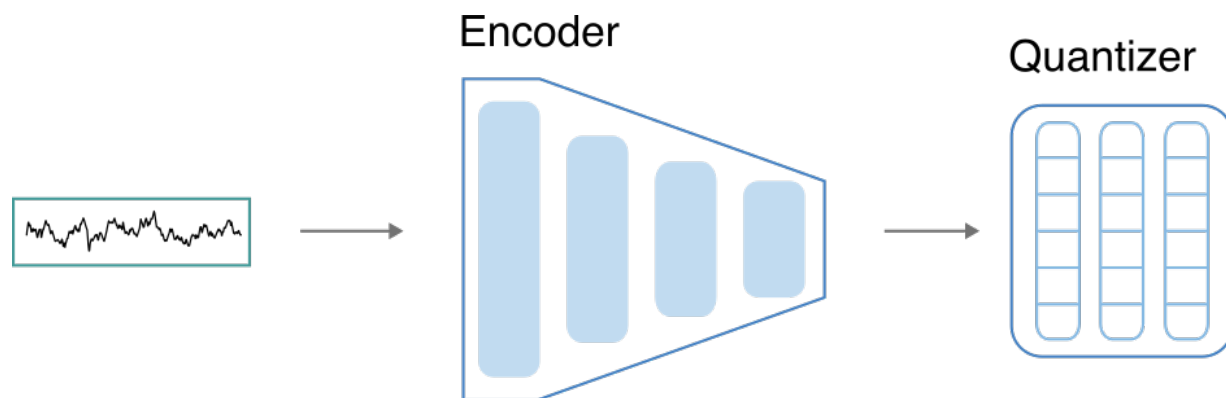


¹Zeghidour, Neil, et al. "Soundstream: An end-to-end neural audio codec." *IEEE/ACM Transactions on Audio, Speech, and Language Processing* 30 (2021)

²Défossez, Alexandre, et al. "High Fidelity Neural Audio Compression." *Transactions on Machine Learning Research* (2023)

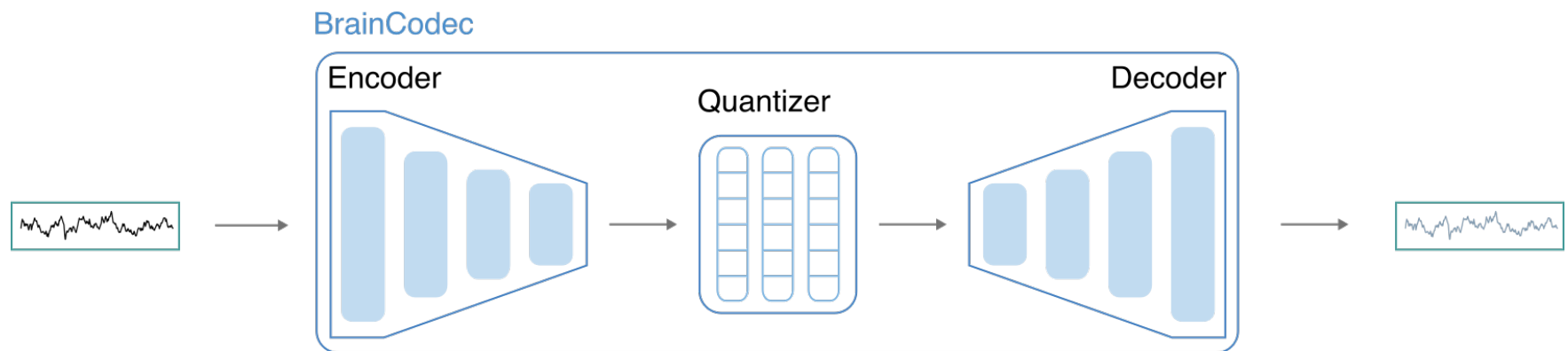
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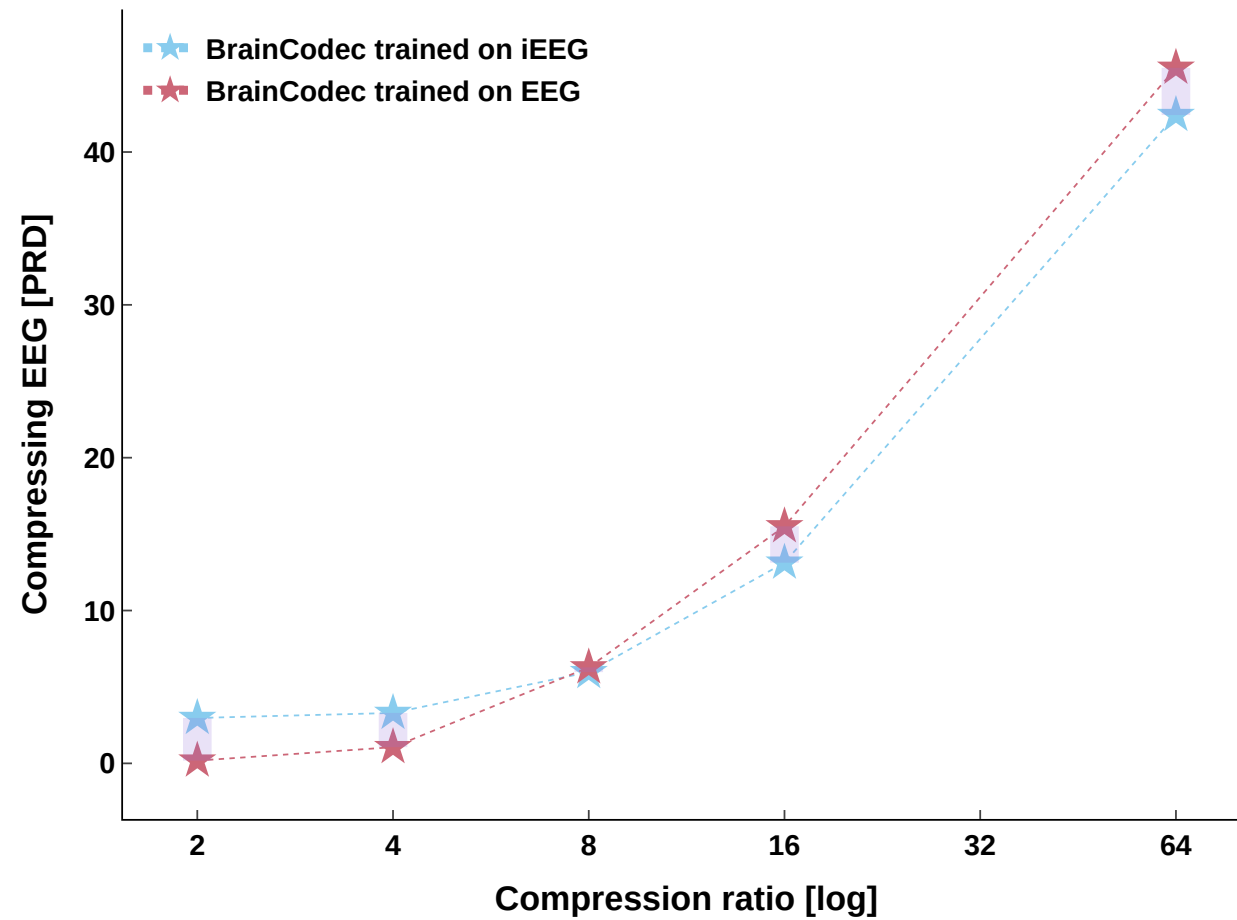


We investigate six different scenarios for reconstruction fidelity

		Testing modality	
		iEEG	EEG
Training modality	iEEG	✓	✓
	EEG	✗	✓
	iEEG + EEG	✓	✓

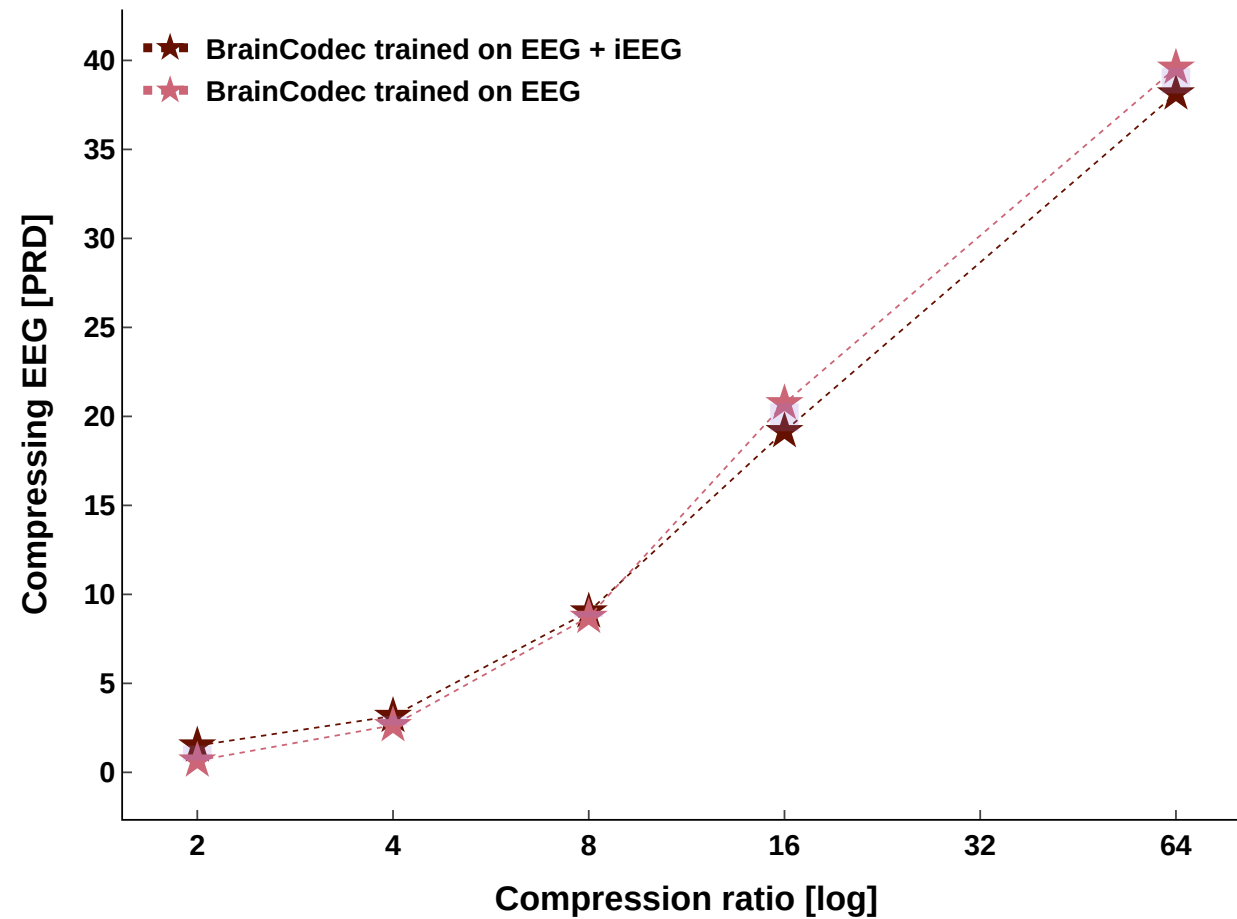
We show that high-SNR iEEG improves
compression of low-SNR EEG

Cross-modal
Mixed-modal



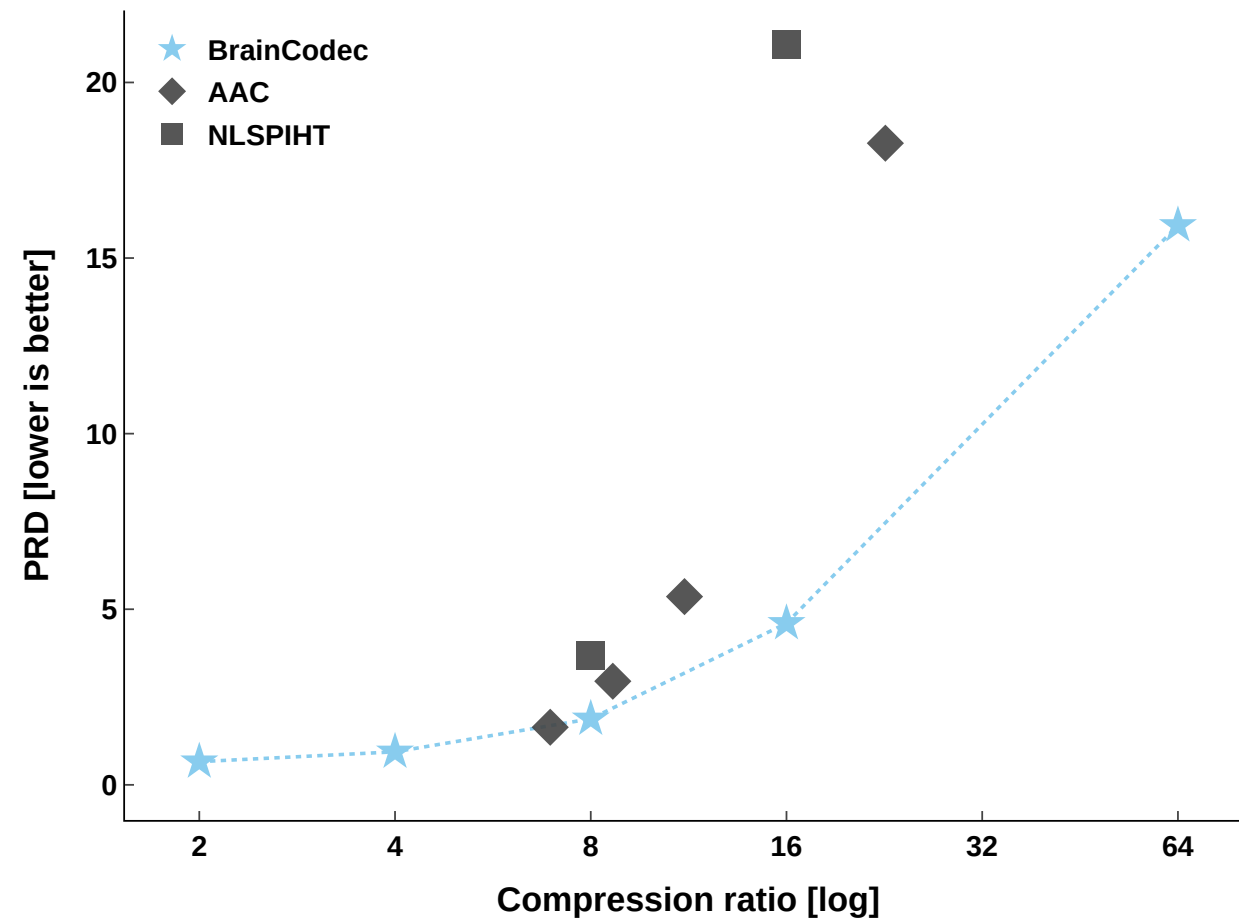
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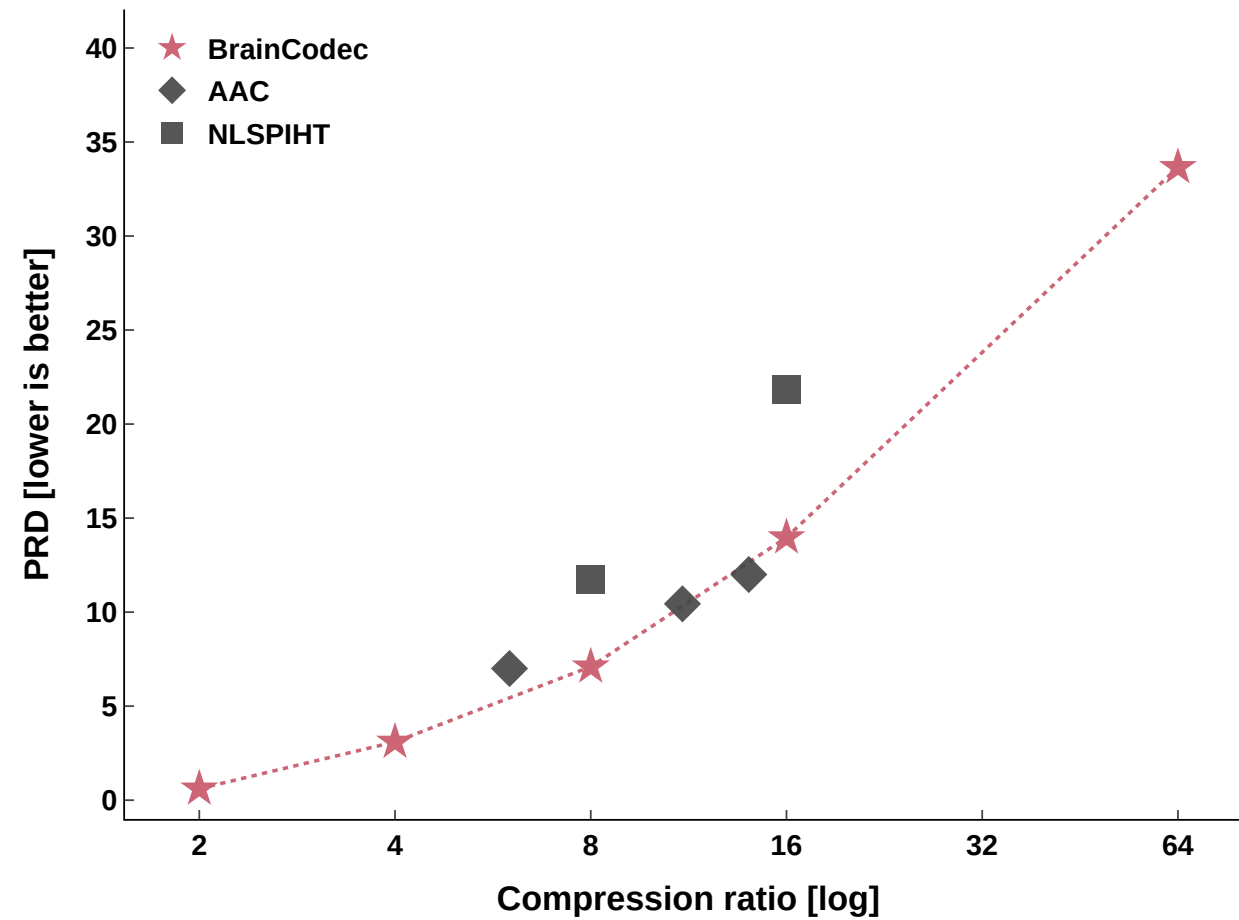
We surpass existing compressors on all tested modalities

iEEG
EEG

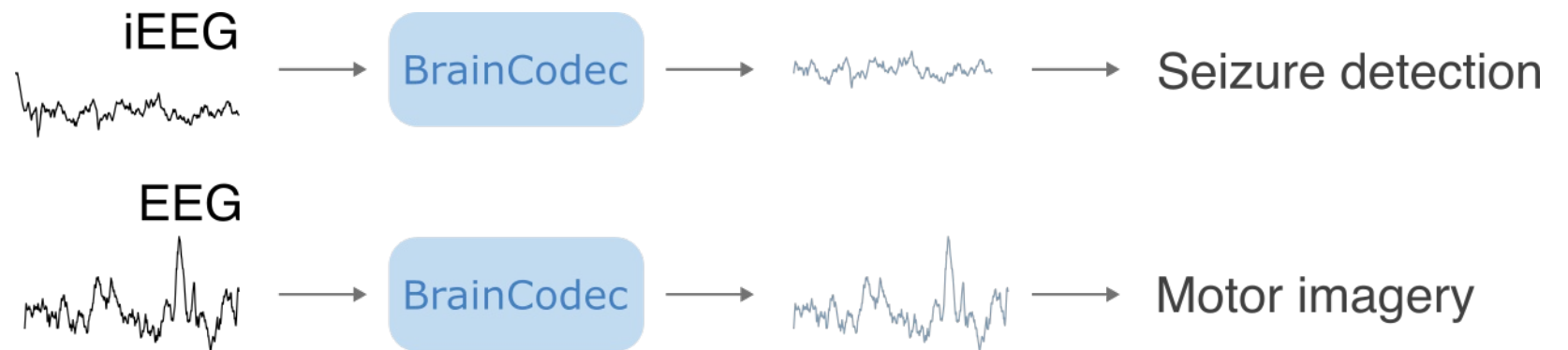


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iEEG
EEG

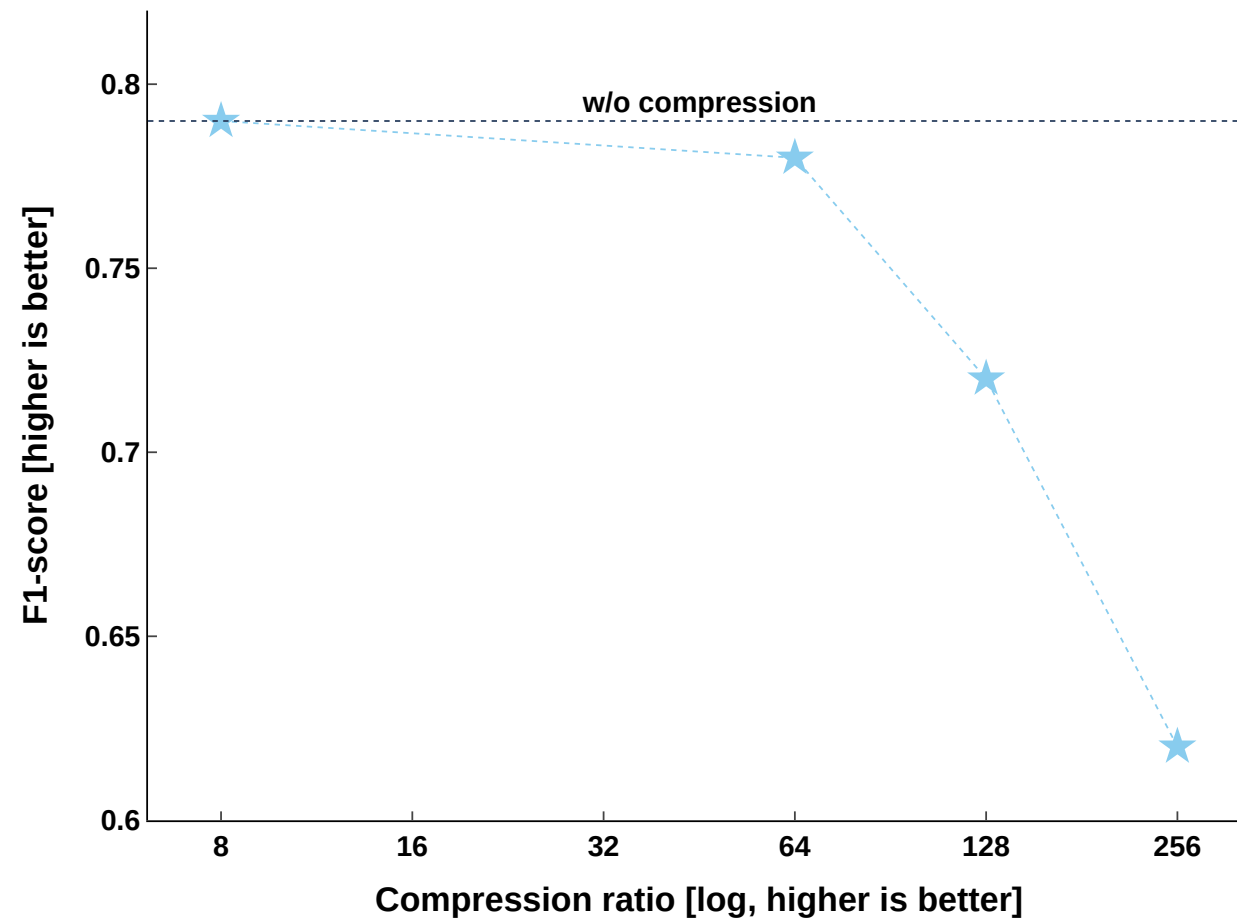


We also investigate two different scenarios for downstream task performance



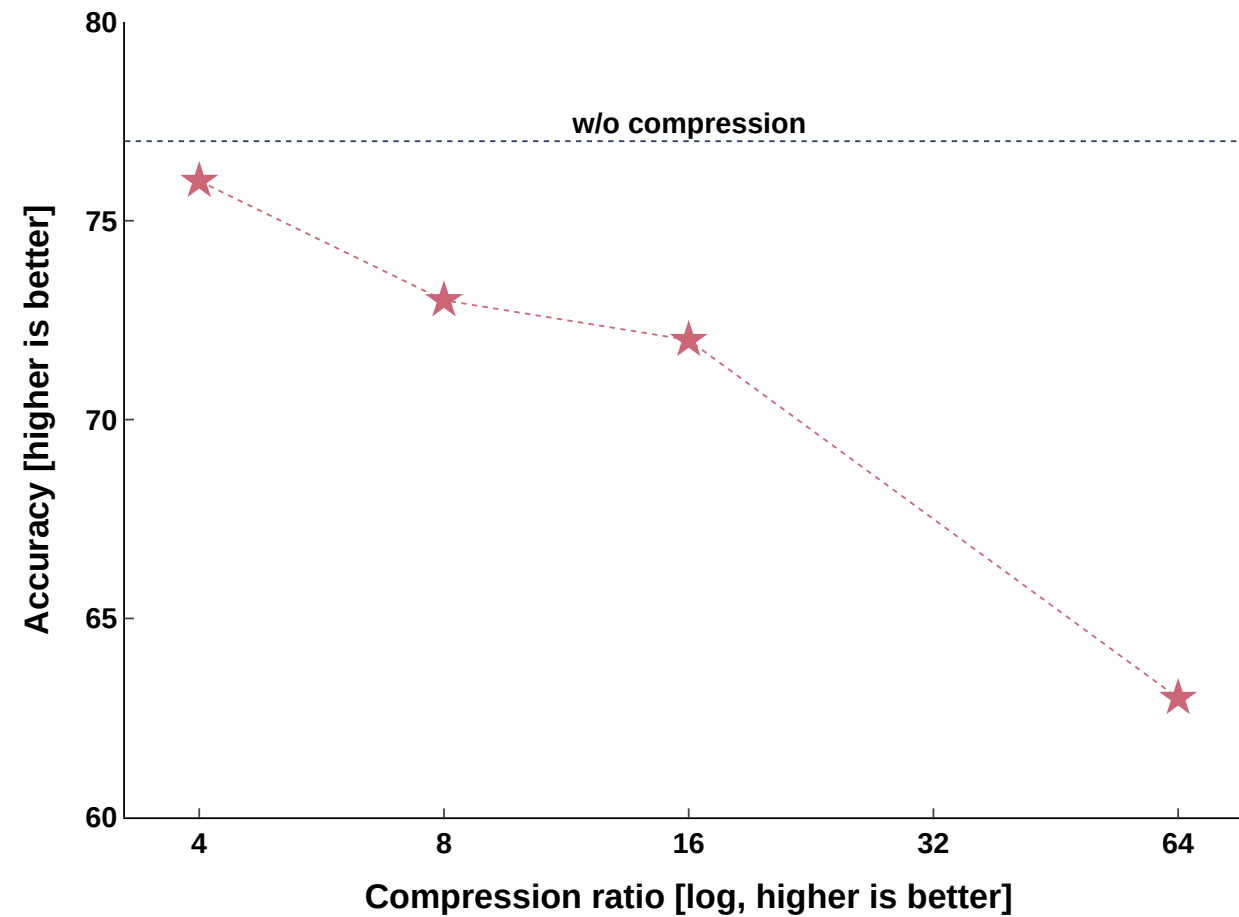
We even maintain downstream task performance using reconstructed signals

Up to 64x for iEEG
Up to 4x for EEG



We even maintain downstream task performance using reconstructed signals

Up to 64x for iEEG
Up to 4x for EEG



Neural compressors showcase remarkable performance on electrophysiological data, enabling superior cross-modal reconstruction using higher quality signals to compress lower quality ones.

Paper.

<https://openreview.net/forum?id=b57IG6N20B>



Code.

<https://github.com/IBM/eeg-ieeg-brain-compressor>

