

## **A deep learning approach for training attention with a neuromorphic brain-computer interface (BCI)**

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**Abstract:** Can we train people to improve their ability to pay attention using signals measured from their own brain? To answer this question, we will develop a brain computer interface (BCI) by recording brain signals with high-resolution functional magnetic resonance imaging (fMRI) and electroencephalography (EEG) when human participants perform attention tasks. We will develop and refine state-of-the-art deep learning models, including transformers and state-space models, to decode where and to what object the person is attending to, using a gamified Android interface. Based on this decoding analysis, we will provide neurofeedback to subjects to make them aware of their level of attention, and potential lapses of attention to help them improve their performance. The entire system including recording, analysis and neurofeedback will be implemented on a BCI neuromorphic chip, which allows efficient, lowpower decoding and real-time feedback. The project lies at the intersection of neuroscience, computer science, electronic systems and deep learning, and is part of the Brain Co-processors Neural Implants project at IISc.

**Reference:** <https://brain-computation.iisc.ac.in/moonshot-project/>