

Mining the mind: machine learning in brain research

Matthias Treder, University of Birmingham, UK

In human brain research, machine learning has found wide application in the context of brain-computer interfaces (BCIs). At the heart of a BCI is a machine learning algorithm for classifying mental states based on brain data acquired in real-time. In clinical applications, the aim of a BCI is to restore key abilities of patients that might be lost due to motor deficiencies, such as communication with the environment and the operation of a wheelchair. Furthermore, in cognitive neuroscience research, machine learning is being increasingly harnessed for decoding the mental states of participants under different experimental manipulations. To illustrate this, I will discuss several applications of machine learning in basic brain research such as the classification of error potentials and the reoccurrence of mental representations in memory research. Cognitive neuroscience faces a wealth of ethical questions addressed in a field called neuroethics. Among others, this involves questions related to neuromarketing and the privacy of our thoughts. Moreover, BCI researchers are confronted with a specific set of questions involving informed consent in clinical groups, conflicts of interest, military research, and the future potential of BCIs in enhancing the mind.