『清华信息大讲堂』
第86讲

报告题目： Mining Event-Related Brain Dynamics

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摘 要:

Electroencephalography (EEG) is the recording of electric potentials produced by the local collective partial synchrony of electrical field activity in cortical neuropile, today most commonly measured by an array of electrodes attached to the scalp using water-based gel. EEG is today the most widely known and studied portable non-invasive brain imaging modality. The first report of signals originating in the human brain and recorded non-invasively from the scalp was that of Berger in 1924. While today neurologists still typically review EEG 'squiggles' by visual inspection, half a century later (and over 35 years ago) both engineers and artists begin to seriously consider the possible use of EEG for active and automated information exchange between humans and machines. It is now generally accepted that the spatiotemporal EEG activity patterns correlate with changes in cognitive arousal, attention, intention, evaluation, and the like, thereby providing a potential “window on the mind.” However, the biological mechanisms that link EEG patterns to these or other aspects of cognition are not understood in much detail. We believe that in the coming decades adequate and more near real-time signal processing for feature extraction and state prediction or recognition, combined with new, non-invasive and even wearable electrophysiological sensing technologies can produce meaningful 3-D functional brain imaging and brain-computer interface (BCI) applications in a wide range of directions. Here, we will begin with a brief primer on the neuroscientific basis of cognitive state assessment, i.e. on the nature of the EEG itself, followed by a review of the history and current state of the use of signal processing in the relatively young 3-D EEG functional brain imaging and BCI design fields, and then will consider avenues for its short-term and medium-term technical advancement using the EEGLAB environment (Delorme & Makeig, 2004) and its ever-evolving range of plug-in toolboxes.

简 介:

Scott Makeig completed a bachelor's degree, "Self in Experience", at the University of California Berkeley in 1972 and a Ph.D. in "Music Psychobiology" from the University of California San Diego (UCSD) in 1985. After a year in Ahmednagar, India as an American India Foundation research fellow, he became a Psychobiologist at UCSD, and then a Research Psychologist at the Naval Health Research Center, San Diego. In 1999, he move to the Salk Institute, La Jolla to be a Staff Scientist in the laboratory of Terry Sejnowski, then to UCSD as a Research Scientist in 2002 to develop the Swartz Center for Computational Neuroscience, which he now directs. His primary research interest is in analysis and modeling of human cognitive event-related brain dynamics as captured by high-dimensional EEG, MEG and other imaging modalities now including body motion capture. He directs the Swartz Center for Computational Neuroscience of the Institute for Neural Computation, UCSD, now housed in a suite of new offices and laboratories in the Supercomputer Center building on the UCSD campus, and is the Chief Scientist for the Cognition and Neuroergonomics alliance sponsored by the US Army Research Laboratories. He also holds the position of Adjunct Professor of Neurosciences in the UCSD Medical School. In this capacity, he has begun research with clinical researchers to apply the advances in functional EEG-based imaging to medical research and clinical practice. At SCCN, he is looking to continue to build collaborations with researchers wanting to apply new analytic methods to EEG and multimodality cognitive neuroscience imaging data, as well as with physicists, engineers, and mathematicians modeling the distributed human brain dynamics underlying brain cognitive capacities including attention, memory, decision-making, emotion, social interaction and creativity including musical expression.

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