



Recent Advances in Predicting and Preventing Epileptic Seizures

Ronald Et Al Tetzlaff

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This book is to improve our understanding of mechanisms leading to seizures in humans and in developing new therapeutic options. The book covers topics such as recent approaches to seizure control, recent developments in signal processing of interest for seizure prediction, ictogenesis in complex epileptic brain networks, active probing of the pre-seizure state, non-EEG based approaches to the transition to seizures, microseizures and their role in the generation of clinical seizures, the impact of sleep and long-biological cycles on seizure prediction, as well as animal and computational models of seizures and epilepsy. Furthermore the book covers recent developments of international databases and of parallel computing structures based on Cellular Nonlinear Networks that can play an important role in the realization of a portable seizure warning device.

Contents:

- ***Epileptic Networks and Their Role for Seizure Prediction and Seizure Control:***
 - Transition Into and Out of a Focal Seizure (*M de Curtis*)
 - Neuronal and Network Dynamics Preceding Experimental Seizures (*P Jiruska, F Mormann and J G R Jefferys*)
 - Interictal EEG and Its Relevance for Seizure Prediction (*A Schulze-Bonhage*)
 - Invasive Brain Stimulation in the Treatment of Epilepsy (*M Sprengers, R Raedt, A Meurs, E Carrette, D van Roost, P Boon and K Vonck*)
- ***Computational Models of Seizures and Epilepsy:***
 - Patient-Specific Neural Mass Modeling — Stochastic and Deterministic Methods (*D R Freestone, L Kuhlmann, M S Chong, D Netic and D B Grayden*)
 - Computational Modelling of Microseizures and Focal Seizure Onset (*Y Wang, M Goodfellow, P N Taylor, D J Garry and G Baier*)
 - Predictability of Seizure-Like Events in a Complex Network Model of Integrate-and-Fire Neurons (*A Rothkegel and K Lehnertz*)
 - Bursting and Synchrony in Networks of Model Neurons (*C Geier, A Rothkegel and K Lehnertz*)
- ***Advances in Analysis and Measurement Techniques:***
 - Signal Processing of the EEG: Approaches Tailored to Epilepsy (*B Schelter, M Thiel, M Mader and W Mader*)
 - From Time Series to Complex Networks: An Overview (*S Bialonski and K Lehnertz*)
 - Visualizing and Quantifying EEG Complexity on the Base of Ordinal Pattern Distributions (*K Keller*)
 - Dynamics of Linear and Nonlinear Interrelation Networks in Peri-Ictal Intracranial EEG: Seizure Onset and Termination (*C Rummel, M Müller, M Hauf, R Wiest and K Schindler*)
 - On the Centrality of the Focus in Human Epileptic Brain Networks (*C Geier, M-T Kuhnert, C E Elger and K Lehnertz*)
 - Pre-Seizure States in Epileptic Brain Networks: A Surrogate-Assisted, Weighted Network Analysis (*G Ansmann, M-T Kuhnert, C E Elger and K Lehnertz*)
 - Network Analysis of Generalized Epileptic Discharges (*P Ossenblok, P van Houdt, A Lüttjohann and G van Luijtelaar*)
 - Signal Processing Platform Based on Cellular Nonlinear Networks (*J Müller, J Müller, R Becker and R*

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- Seizure Prediction by Cellular Nonlinear Networks? (*V Senger and R Tetzlaff*)
- Measuring Directed Interactions Using Cellular Neural Networks with Complex Connection Topologies (*H Dickten, C E Elger and K Lehnertz*)
- Seizure Prediction Using Optical Measurements of Blood Flow and Oxygenation (*M Zhao, H Ma and T H Schwartz*)
- Observing the Sleep-Wake Regulatory System to Improve Prediction of Seizures (*M Sedigh-Sarvestani and B J Gluckman*)
- The World's Largest Epilepsy Database: Content and Structure (*M Ihle, B Schelter, J Timmer and A Schulze-Bonhage*)

Readership: Graduate students and professionals in the field of epileptology, neurosurgery and neuroscience.

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