Summary

This doctoral dissertation examines the intricate realm of connectivity analysis, utilizing electroencephalography (EEG) to investigate the connectivity patterns in pediatric encephalitis.
Objective. To elucidate the theoretical foundations and practical applications of connectivity analysis in the context of EEG data, in particular of the pediatric encephalitis.
Methods. The study starts with a comprehensive exploration of neuroanatomy, electrophysiology, and the generation of EEG data. Theoretical underpinnings of connectivity analysis are presented, including techniques, challenges, and procedural guidelines. Special attention is given to topological network analysis, accompanied by an overview of statistical tools employed in the literature.
Application. A practical demonstration of connectivity analysis is showcased in a real-world scenario, specifically within the EEG data of pediatric encephalitis patients. The analysis focuses on detecting connectivity deviations in proximity to and distant from Slow Biphasic Complexes (SBCs), known encephalitis markers.
Results. The findings reveal significant connectivity divergence in pediatric encephalitis patients with varying severity scores. The study contributes to our understanding of the dynamic interactions in the brain during encephalitis, providing valuable insights into the potential implications for patient prognosis and treatment.

Perspectives. This thesis serves as a foundational resource for researchers entering the field of connectivity analysis. Beyond its immediate contributions, this research opens avenues for future investigations. The identified connectivity patterns may serve as potential biomarkers for early diagnosis and personalized treatment strategies. Additionally, the methodology established in this study can be adapted for similar neurologic disorders, expanding its applicability and relevance in broader medical contexts.

Limitations. While this study provides crucial insights, certain limitations should be acknowledged. The sample size and heterogeneity of pediatric encephalitis cases may impact the generalizability of the findings.