EEG-GRAF: A Factor-Graph-Based Model for Capturing Spatial, Temporal, and Observational Relationships in Electroencephalograms

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Introduction

Graph Inference

Motivation and Goals of the Project

Dependencies - Graphical Representation

Definitions of Factor Functions

Notation

\[ X_k(t) \in \{0,1\} \text{- abnormal event at the } n^{th} \text{epoch of channel } k \]

\[ Y_k(t) \in \{0,1\} \text{- the SOZ likely state of the } n^{th} \text{epoch of channel } k \]

Abnormal events

\[ f(Y_k(t),X_k(\cdot)) = e^{-c(X_k(t)-Y_k(t))^2} \]

Spatial correlation

\[ g(Y_k(t),Y_{\cdot}(\cdot)) = e^{-c(Y_k(t)-Y_{\cdot}(\cdot))^2} \]

Temporal correlation

\[ h(Y_k(t),Y_{\cdot}(\cdot)) = e^{-c(Y_k(t)-Y_{\cdot}(\cdot))^2} \]

where \( \Delta_i\) was

Results

<table>
<thead>
<tr>
<th>Method</th>
<th>AUC</th>
<th>Sensitivity</th>
<th>Specificity</th>
<th>Precision</th>
<th>Recall</th>
<th>F-measure</th>
</tr>
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1. Study of neurophysiological processes is important for understanding the brain.
2. Electroencephalography (EEG) is an exceptional tool for this type of studies.
3. EEG contains rhythms and discrete neurophysiological events.
4. Neural activities in different brain regions have spatial and temporal associations.

Graph Inference

Exact Inference using Graph Cut

Abnormal Brain Tissue Classification

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