SNS COLLEGE OF TECHNOLOGY

Coimbatore-35
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DEPARTMENT OF BIOMEDICAL ENGINEERING

19BMB302 - BIOMEDICAL SIGNAL PROCESSING

III YEAR/ V SEMESTER

Unit V : DATA REDUCTION TECHNIQUES

- Turning point algorithm
- AZTEC algorithm
- CORTES algorithm
- Fan algorithm
- Huffman algorithm

CORTES algorithm

- The CORTES (Coordinate Reduction Time Encoding System) algorithm is a hybrid of the TP and AZTEC algorithms
- It attempts to exploit the strengths of each while sidestepping the weaknesses.
- CORTES uses AZTEC to discard clinically insignificant data in the isoelectric region with a high reduction ratio and applies the TP algorithm to the clinically significant high-frequency regions (QRS complexes).
- It executes the AZTEC and TP algorithms in parallel on the incoming ECG data.
- Whenever an AZTEC line is produced, the CORTES algorithm decides, based on the length of the line, whether the AZTEC data or the TP data are to be saved.

CORTES algorithm

- If the line is longer than an empirically determined threshold, it saves the AZTEC line. Otherwise it saves the TP data points.
- Since TP is used to encode the QRS complexes, only AZTEC plateaus, not slopes, are implemented.
- The CORTES algorithm reconstructs the signal by expanding the AZTEC plateaus and interpolating between each pair of the TP data points.
- It then applies parabolic smoothing to the AZTEC portions to reduce discontinuities

Key Concepts of CORTES

1. **Coordinate Reduction**: CORTES applies dimensionality reduction techniques to simplify the structure of high-dimensional time-series data without sacrificing critical information. By reducing redundant or less informative features, it helps streamline data for more efficient analysis.
2. **Time Encoding**: CORTES encodes temporal information to retain time-related patterns in the data. This time encoding preserves the dynamic characteristics of the signal, which is crucial for identifying patterns across time, such as recurrent anomalies in biosignals.
3. **Handling Non-Stationarity**: Biosignals are often non-stationary, meaning their statistical properties can change over time. CORTES is designed to accommodate such variations by adjusting its encoding and feature reduction dynamically, ensuring more accurate analysis even when the signal characteristics vary.
4. **Cost-Sensitive Optimization**: Similar to other cost-sensitive methods, CORTES incorporates a mechanism to handle imbalanced classes, such as detecting rare but significant events (e.g., epileptic seizures in EEG or arrhythmias in ECG), which are usually outnumbered by normal events in a dataset.

Thank You!