Sensor encoding Discussion workgroup Session 3: Temporal signals

INRC Workgroup

2021

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Agenda

- Brief Intro
  - Yulia
- INRC members presentations:
  - Daniel Gutierrez Galan (Alejandro Linares Barranco,)
    - Project “Real-Time Loihi interface for Neuromorphic Auditory Sensor and ED-Scorbot (RELIAR)”
  - Lyes Khacef (Elisabetta Chicca)
    - Project “Spiking Time Difference Encoder”
  - Dezhe Jin
    - Project “Noise-robust speech recognition with Loihi”
  - Zhe Chen (Jason Cong)
    - Project “EEG Signal Processing on Neuromorphic Hardware for Closed-Loop Neurofeedback”
- Discussion
- Outlook: Topics to cover in the next session

Temporal signals

- “Spatially” low-dimensional signals
  - In contrast to imaging
- Signal is determined by temporal patterns
  - Typically, some periodicity is present (sound, vibrations, EEGs)
  - Fourier transform brings signal in frequency space, where features are formulated
    - Efficient coverage or large range of frequencies
    - Feature design or learning
- Possible tasks:
  - Classification (e.g., anomalies, words)
  - Compression / representation (for efficient communication)
  - Composition-analysis
- Application domains:
  - Stock; Robot control (RL); seismic activity; vibrations of motors, engines; anomaly detection; network traffic, malware detection

Approaches

- Time delay networks
- Weavelets
- Filter banks
- MFCCs filters
- Spectral envelope
- Temporal masking
- RNNs
- LSTM
- Hidden Markov Models
- GMMs (Gaussian mixture models)
- Cochlea models