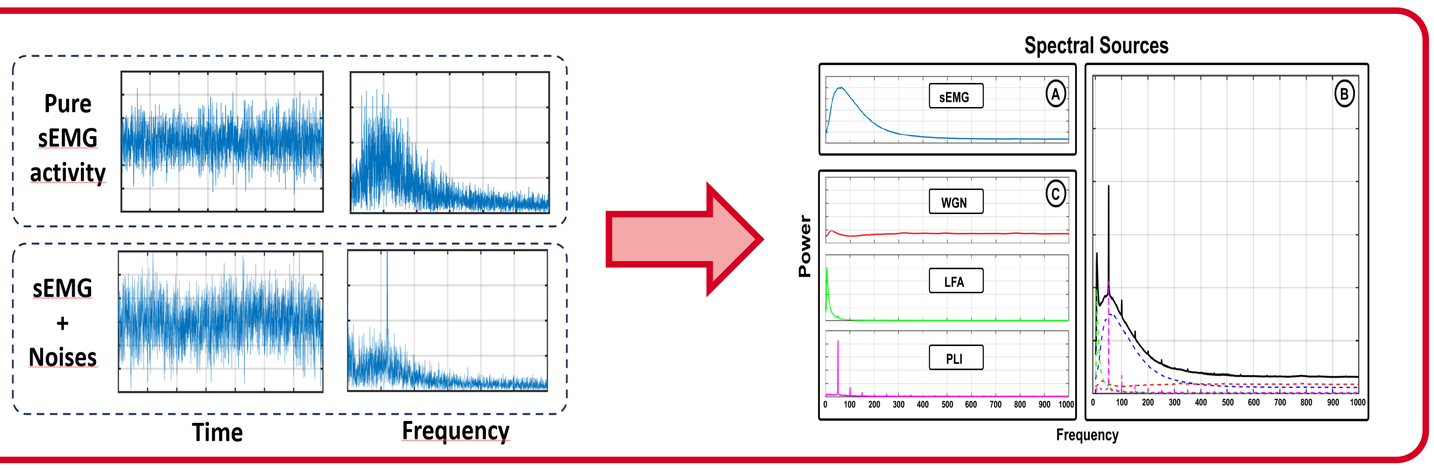
Artifact removal from sEMG signals recorded during fully unsupervised daily activities

Steps towards the daily monitorization of muscle activity

- **Method to remove artifacts from sEMG signals recorded during unsupervised daily activities**
- **Outperforms traditional filtering and other decomposition techniques**
- **sEMG for daily health monitoring and early diagnosis of muscle conditions**

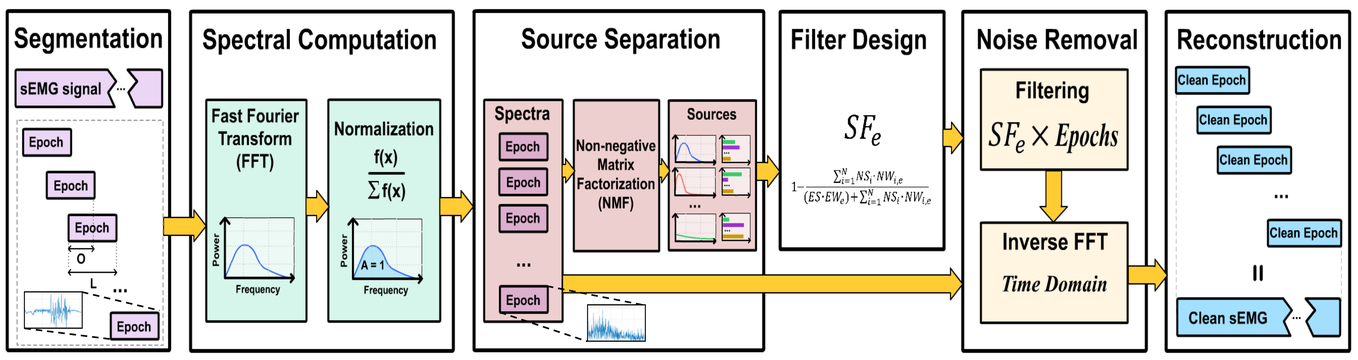
Introduction

- Understanding the Spectral Features of **sEMG** and **Noise Sources**
- **Common Noise Sources**:
  - White Gaussian Noise (WGN)
  - Power Line Interference (PLI)
  - Low Frequency Artifacts (LFA)
- Easier to differentiate in the spectral domain

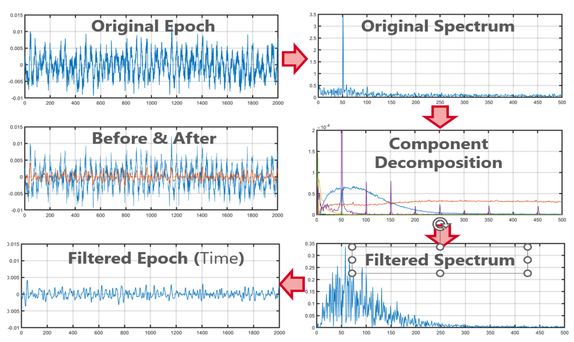


Algorithm Workflow

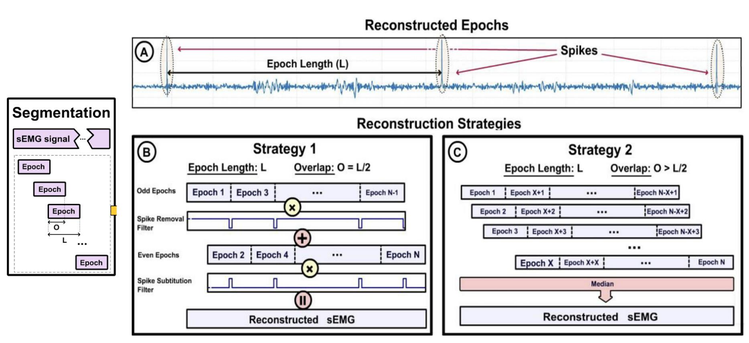
- Spectral Component Extraction for Epoch/Time Specific Filter definition



Noise Removal

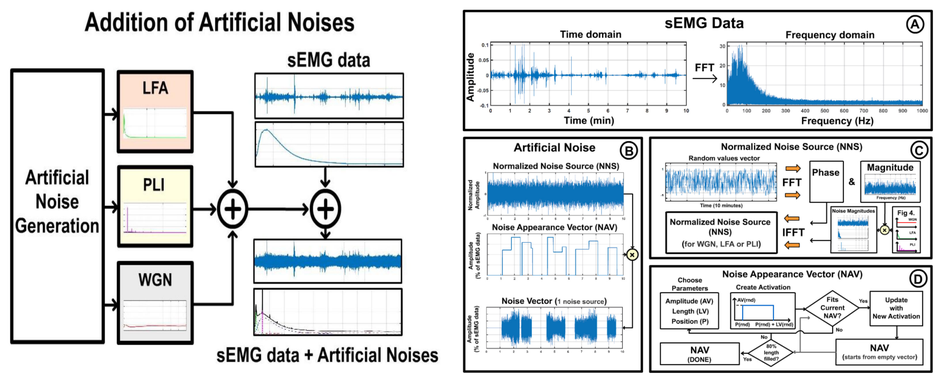


Signal Reconstruction

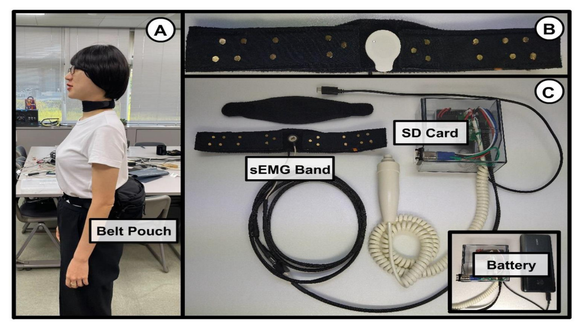


Validation

- From Artificial Noise Generation
- Compare with regular filtering and state-of-the-art methods



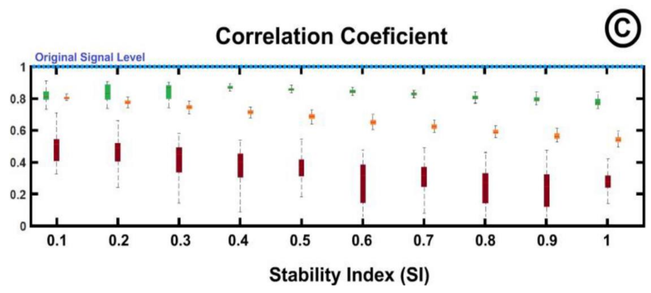
- From unsupervised recording during daily activities
  - 5 participants
  - sEMG neck band
  - 10 hours autonomy
  - Few days recording
  - On participant decision

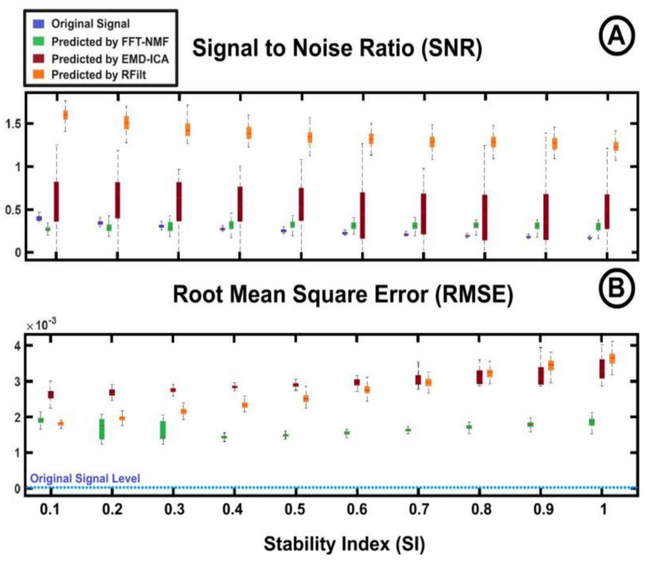


Results

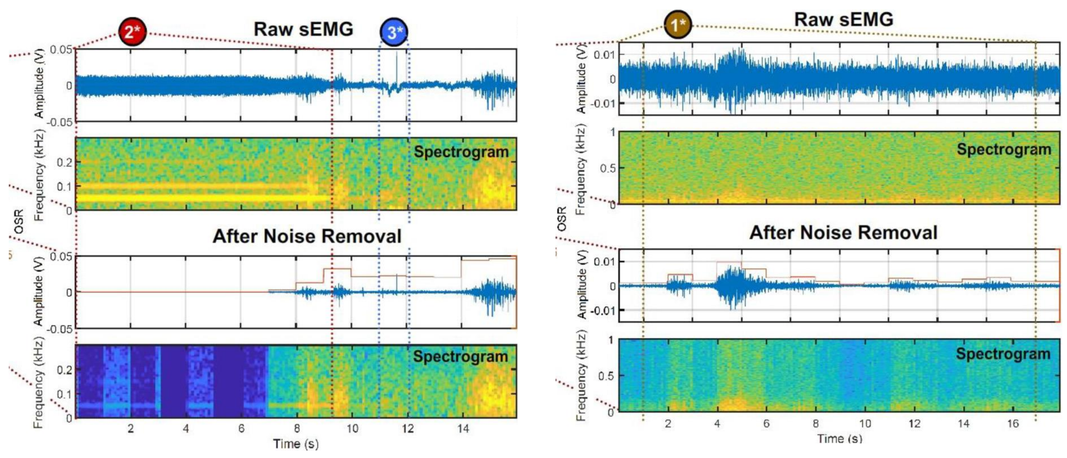
Artificial Noise Detection

FFT-NMF **vs** EMD-ICA **vs** Regular Filtering





Application on real recordings



[1] Costa-Garcia A et al. Artifact removal from sEMG signals recorded during fully unsupervised daily activities. Digit Health. 2023; doi:10.1177/20552076231164239

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