

Classifying EEG Spectrograms by Phalangeal Articulations utilizing Long Recurrent Convolutional Neural Networks

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# 1. Introduction

## 1.1. Background

## 1.2. Proposition

# 2. Theory of Operation

## 2.1. Data

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# 3. System Architecture

## 3.1. Overview

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## 4.1. ESPA Module

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# 5. Training

## 5.1. Setup

The raw data comprises of 9, 8-channel EEG data, saved in text format, 3 for each of the following classes:

1. left index finger flexion
2. left middle finger flexion
3. left ring finger flexion

The data is then converted from text files into CSV files. Then, the data is filtered and trimmed to remove DC offset, mains interference, and setup/teardown artifacts. Next, spectrograms are calculated for each channel, each of which split into samples with 250 discrete frequency points and 50 discrete time points, and replicated 3 times to match the CNN’s input dimensions, which expects 3-colour channel RGB inputs, generating a 30 x 8 x 3 x250 x 50 training dataset. Finally, the data is saved into an HDF5 file, which is vital for on-demand loading of data as a workaround for memory resource limitations.

The following training setups were implemented, with 3 trials for each:

1. Replication, 10x sample count
2. 1% augmentation, 10x sample count
3. 5% augmentation, 10x sample count

For each setup, the data was split into the following components:

1. 60% training data
2. 20% validation data
3. 20% testing data

## 5.2. Results

# 6. Recommendations

# 7. References

# 8. Appendix