Final Report: Brain Dataset

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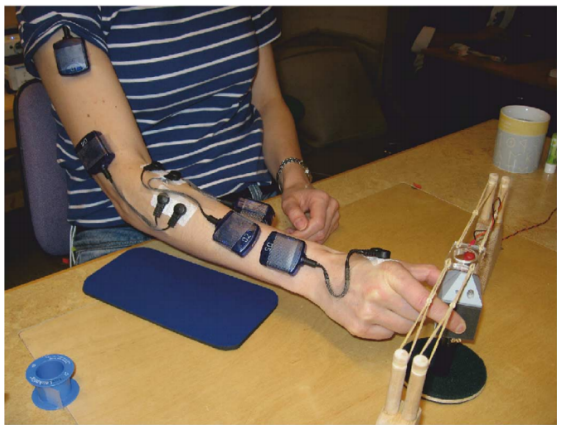
Overview

Dataset

Experiment recording human grasp and lift tasks[1]

- 12 participants, 5 different types of series recorded each
- EEG: 32 electrodes recorded at 5kHz
- EMG: 5 signals at 4kHz
- kinetic: 36 signals at 500Hz
- objects to grasp with different surface friction/weights (165g - 660g)
- preprocessing: trials provided in windowed format



[1] Data source: Luciw, M. D., Jarocka, E. & Edin, B. B. FigShare http://dx.doi.org/10.6084/m9.figshare.988376 (2014).

Dataset

Single trial procedure:

- event/commands signaled visually by LED to participant
- participant starts moving hand to grasp position
- grasp object
- move to target position
- hold position
- move back to initial position
- release object
- move hand back to resting position

Methodology

- Data preparation
  - Normalization
  - Subsampling of EMG data
- t-SNE
- RNN
  - Network shape
  - Data input shape
  - Weight initialization
  - Important weights

Results (1): t-SNE

- Figure of t-SNE of EEG data $\rightarrow$ Seperability of trials
- Possible to separate with standard NN
- Figure of t-SNE of EMG data $\rightarrow$ As expected

Results (2): RNN

- Overview of the targets
- Hand move to target works good.
- Touch phase target also quite ok.
- hand move back target also (partially) sucessful
- Comparison: Training with data of one person vs. data of more participants
- etc.

Pitfalls

- Prediction do not fit to the target borders exactly
- No working early stopping criterion (so far)
- Targets within the lift phase cannot be predicted properly
- etc.

Blocks of Highlighted Text

Block 1

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Multiple Columns

Heading

1. Statement
2. Explanation
3. Example

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Table

Treatments	Response 1	Response 2
Treatment 1	0.0003262	0.562
Treatment 2	0.0015681	0.910
Treatment 3	0.0009271	0.296

Table : Table caption

Theorem

Theorem (Mass–energy equivalence)

$E = mc^2$

Verbatim

Example (Theorem Slide Code)

```
\begin{frame}
\frametitle{Theorem}
\begin{theorem}[Mass--energy equivalence]
$E = mc^2$
\end{theorem}
\end{frame}
```

Figure

Uncomment the code on this slide to include your own image from the same directory as the template .TeX file.

Citation

An example of the `\cite` command to cite within the presentation:

This statement requires citation [Smith, 2012].

References

John Smith (2012)

Title of the publication

Journal Name 12(3), 45 – 678.

The End