

An Analysis and Recipe of SWLDA for Brain Computer Interfaces

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Abstract

Brain Computer Interfaces is a broad discipline. It uses many tools from signal processing and statistics. One of the most used algorithms is SWLDA. This algorithm is the default implementation in BCI2000 and it is implemented in many other toolboxes. However their implementation details are hidden and neglected when it should not be. This work presents an analysis of the variants versions of the algorithms, their implementation details, and an analysis on the statistical assumptions which is based upon. We tested on a public dataset of P300 for ALS patients. We also tested on a Dataset of MI. BLABLABLA

Keywords: `elsarticle.cls`, L^AT_EX, Elsevier, template

2010 MSC: 00-01, 99-00

1. Stepwise Discriminant Analysis

There are five different alternatives of this algorithm

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- document style
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2. Statistical Assumptions

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35 3. Statistical Tests on Real Dataset

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40 generate your bibliography and include DOIs whenever available.

Here are two sample references: [1, 2].

References

References

- [1] C. M. Michel, M. M. Murray, Towards the utilization of EEG as a brain
45 imaging tool, NeuroImage 61 (2) (2012) 371–385. arXiv:NIHMS150003,
doi:10.1016/j.neuroimage.2011.12.039.
URL [https://www.sciencedirect.com/science/article/pii/
S1053811911014418](https://www.sciencedirect.com/science/article/pii/S1053811911014418)
- [2] B. Scholkopf, A. J. Smola, Learning with kernels: support vector machines,
50 regularization, optimization, and beyond, MIT press, 2001.