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## Abstract

Identifying artifacts in EEG data produced by the neurons in brain is an important task in EEG signal processing research. These artifacts are corrected before further analyzing. In this work, fast fixed point algorithm for Independent Component Analysis (ICA) is used for removing artifacts in EEG signals and principal component analysis (PCA) tool is used for reducing high dimensional data and spatial redundancy. Support vector machine (SVM) tool is used for pattern recognition of EEG signals and the extracted parameters are used to impart cognitive interpretation ability towards autonomous system design.

## References

### ences

- E. Tamil, "Electroencephalogram (EEG) Brain Wave Feature Extraction Using Short Time Fourier Transform", Faculty of Computer Science and Information Technology, University of Malaya, 2007.
- J. Lee, D. Tan, "Using a Low-Cost Electroencephalograph for Task Classification in HCI Research", UIST'06, Montreux, Switzerland, October 15–18, 2006.
- G. Molina, "Joint Time-Frequency-Space Classification of EEG in a

Brain-Computer Interface Application", EURASIP Journal on Applied Signal Processing, Vol. 7, pp. 713–729, 2003.

- A. Akrami, "EEG-Based Mental Task Classification: Linear and Nonlinear classification of Movement Imagery", in proceedings of the IEEE Engineering in Medicine and Biology 27th Annual Conference Shanghai, China, September 1-4, 2005.
- H. Behnam A., A. Sheikhan B., M. Mohammadi C., M. Noroozian D., P. Golabie, "Analyses of EEG background activity in Autism disorder with fast Fourier transform and short time Fourier transform", International Conference on Intelligent and Advanced Systems, 2007.
- Abdulhamit Subasi, M. Ismail Gursoy, "EEG signal classification using PCA, ICA, LDA and support vector machines", Expert Systems with Applications, Vol. 37, pp. 8659–8666, 2010.
- Cao, L. J. , Chua, K. S. , Chong, W. K. , Lee, H. P. , & Gu, Q. M. , "A comparison of PCA, KPCA and ICA for dimensionality reduction in support vector machine", Neurocomputing, 55, pp. 321–336, 2003.
- Subasi, A. , "EEG signal classification using wavelet feature extraction and a mixture of expert model", Expert Systems with Applications, 32, pp. 1084–1093, 2007.
- Ubeyli, E. D. , "Analysis of EEG signals by combining eigenvector methods and multiclass support vector machines", Computers in Biology and Medicine, 38, pp. 14–22, 2008.
- Wang, X. , Paliwal, K. K. , "Feature extraction and dimensionality reduction algorithms and their applications in vowel recognition", Pattern Recognition, 36, pp. 2429–2439, 2003.
- Widodo. A. , Yang. B. , "Application of nonlinear feature extraction and support vector machines for fault diagnosis of induction motors", Expert Systems with Applications, 33, pp. 241–250, 2007.
- Carlos Guerrero-Mosquera, Michel Verleysen and Angel Navia Vazquez, "EEG feature selection using mutual information and support vector machine: A comparative analysis", 32nd Annual International Conference of the IEEE EMBS Buenos Aires, Argentina, August 31st- September 4th, 2010.
- Gomez V. Vanessa, Verleysen Michel and Jerome Fleury, "Information theoretic feature selection for functional data classification", Neurocomputing, Vol. 72, pp. 3580–3589, 2009.
- Guerrero-Mosquera C. , Malanda Trigueros A. , Iriarte Franco J. and Navia Vazquez Angel, "New feature extraction approach for epileptic EEG signal detection using time-frequency distributions", Med Biol Eng Computer, Vol. 48, pp. 321–330, 2009.
- Ocak Hasan, "Optimal classification of epileptic seizures in EEG using wavelet analysis and genetic algorithm", Signal processing, Vol. 88, pp. 1858–1867, 2008.
- Marcin Ko Odziej, Andrzej Majkowski, Remigiusz J. Rak, "A new method of feature extraction from EEG signal for brain computer interface design", Przegl D Elektrotechniczny, ISSN 0033-2097, R. 86 NR 9/2010.
- MiHye Song, Jeon Lee, Sung Pil Cho, KyoungJoung Lee, and Sun Kook Yoo, "Support Vector Machine Based Arrhythmia Classification Using Reduced Features", International Journal of Control, Automation and Systems, Vol. 3, No. 4, pp. 571-579, December 2005.

- V. V. Shete, SachinElgandelwar, Sapna Sonar, AshwiniCharantimath, Dr. V. D. Mytri, &quot;Detection of K-Complex in Sleep EEG Signal using Support Vector Machine&quot;; International Journal of Scientific & Engineering Research, Vol. 3, Issue 6, No. 1, ISSN 2229-5518, June-2012.
- Sarah M. Hosni, Mahmoud E. Gadallah, Sayed F. Bahgat, Mohamed S. AbdelWahab, &quot;Classification of EEG Signals Using DifferentFeature Extraction Techniques for Mental-Task BCI&quot;; IEEE Transactions, 2007.
- Mohammad H. Alomari, AyaSamaha, and KhaledAlKamha, &quot;Automated Classification of L/R Hand Movement EEG Signals using Advanced Feature Extraction and Machine Learning&quot;; International Journal of Advanced Computer Science and Applications(IJACSA), Vol. 4, No. 6, 2013.
- KavitaMahajan, M. R. Vargantwar, Sangita M. Rajput, &quot;Classification of EEG using PCA, ICA and Neural Network&quot;; International Journal of Engineering and Advanced Technology (IJEAT), Volume-1, Issue-1, October 2011.

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### **Index Terms**

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### **Keywords**

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