

## REFERENCE

- [1] D. H. Krishna, I. A. Pasha, and T. S. Savithri, "Classification of EEG Motor Imagery Multi Class Signals Based on Cross Correlation," *Procedia Comput. Sci.*, vol. 85, pp. 490–495, 2016, doi: 10.1016/j.procs.2016.05.198.
- [2] J. Minguillon, M. A. Lopez-Gordo, and F. Pelayo, "Trends in EEG-BCI for daily-life: Requirements for artifact removal," *Biomed. Signal Process. Control*, vol. 31, pp. 407–418, 2017, doi: 10.1016/j.bspc.2016.09.005.
- [3] H. Mirvaziri and Z. S. Mobarakeh, "Improvement of EEG-based motor imagery classification using ring topology-based particle swarm optimization," *Biomed. Signal Process. Control*, vol. 32, pp. 69–75, 2017, doi: 10.1016/j.bspc.2016.10.015.
- [4] T. Uehara, M. Sartori, T. Tanaka, and S. Fiori, "Robust Averaging of Covariances for EEG Recordings Classification in Motor Imagery Brain-Computer Interfaces," *Neural Comput.*, vol. 29, no. 6, pp. 1631–1666, Jun. 2017, doi: 10.1162/NECO\_a\_00963.
- [5] S. Liang, K.-S. Choi, J. Qin, W.-M. Pang, Q. Wang, and P.-A. Heng, "Improving the discrimination of hand motor imagery via virtual reality based visual guidance," *Comput. Methods Programs Biomed.*, vol. 132, pp. 63–74, 2016, doi: 10.1016/j.cmpb.2016.04.023.
- [6] Y. Yu *et al.*, "Toward brain-actuated car applications: Self-paced control with a motor imagery-based brain-computer interface," *Comput. Biol. Med.*, vol. 77, pp. 148–155, Oct. 2016, doi: 10.1016/j.combiomed.2016.08.010.
- [7] M. Z. Baig, N. Aslam, H. P. H. Shum, and L. Zhang, "Differential Evolution Algorithm as a Tool for Optimal Feature Subset Selection in Motor Imagery EEG," *Expert Syst. Appl.*, vol. 90, pp. 184–195, 2017, doi: 10.1016/j.eswa.2017.07.033.
- [8] J. Kevric and A. Subasi, "Comparison of signal decomposition methods in classification of EEG signals for motor-imagery BCI system," *Biomed. Signal Process. Control*, vol. 31, pp. 398–406, 2017, doi: 10.1016/j.bspc.2016.09.007.
- [9] L. Sun, Z. Feng, B. Chen, and N. Lu, "A contralateral channel guided model for EEG-based motor imagery classification," *Biomed. Signal Process. Control*, vol. 41, pp. 1–9, 2018, doi: 10.1016/j.bspc.2017.10.012.
- [10] S. Soman and Jayadeva, "High performance EEG signal classification using classifiability and the Twin SVM," *Appl. Soft Comput. J.*, vol. 30, pp. 305–318, 2015, doi: 10.1016/j.asoc.2015.01.018.
- [11] T. Yu *et al.*, "Enhanced motor imagery training using a hybrid BCI with feedback," *IEEE Trans. Biomed. Eng.*, vol. 9294, no. c, pp. 1–13, 2015, doi: 10.1109/TBME.2015.2402283.
- [12] D. Rathee, H. Raza, G. Prasad, and S. Member, "Current Source Density Estimation Enhances the Performance of Motor-Imagery-Related Brain – Computer Interface," *IEEE Trans. Neural Syst. Rehabil. Eng.*, vol. 25, no. 12, pp. 2461–2471, 2017.
- [13] Y. Yang, S. Chevallier, J. Wiart, and I. Bloch, "Subject-specific time-frequency selection for multi-class motor imagery-based BCIs using few Laplacian EEG channels," *Biomed. Signal Process. Control*, vol. 38, pp. 302–311, 2017, doi: 10.1016/j.bspc.2017.06.016.
- [14] P. J. García-Laencina, G. Rodríguez-Bermudez, and J. Roca-Dorda, "Exploring dimensionality reduction of EEG features in motor imagery task classification," *Expert Syst. Appl.*, vol. 41, no. 11, pp. 5285–5295, 2014, doi:

- 10.1016/j.eswa.2014.02.043.
- [15] Siuly, H. Wang, and Y. Zhang, "Detection of motor imagery EEG signals employing Naïve Bayes based learning process," *Meas. J. Int. Meas. Confed.*, vol. 86, pp. 148–158, 2016, doi: 10.1016/j.measurement.2016.02.059.
  - [16] H. Burianová *et al.*, "Multimodal functional imaging of motor imagery using a novel paradigm," *Neuroimage*, vol. 71, pp. 50–58, 2013, doi: 10.1016/j.neuroimage.2013.01.001.
  - [17] D. Li, H. Zhang, M. S. Khan, and F. Mi, "A self-adaptive frequency selection common spatial pattern and least squares twin support vector machine for motor imagery electroencephalography recognition," *Biomed. Signal Process. Control*, vol. 41, pp. 222–232, 2018, doi: 10.1016/j.bspc.2017.11.014.
  - [18] A. S. Aghaei, M. S. Mahanta, and K. N. Plataniotis, "Separable Common Spatio-Spectral Patterns for Motor Imagery BCI Systems," *IEEE Trans. Biomed. Eng.*, vol. 63, no. 1, pp. 15–29, 2016, doi: 10.1109/TBME.2015.2487738.
  - [19] X. Xie, Z. L. Yu, H. Lu, Z. Gu, and Y. Li, "Motor Imagery Classification Based on Bilinear Sub-Manifold Learning of Symmetric Positive-Definite Matrices," *IEEE Trans. Neural Syst. Rehabil. Eng.*, vol. 25, no. 6, pp. 504–516, 2017, doi: 10.1109/TNSRE.2016.2587939.
  - [20] L. He, B. Liu, D. Hu, Y. Wen, M. Wan, and J. Long, "Motor imagery EEG signals analysis based on Bayesian network with Gaussian distribution," *Neurocomputing*, vol. 188, pp. 217–224, 2016, doi: 10.1016/j.neucom.2015.05.133.
  - [21] T. Kaykicioglu and O. Aydemir, "A polynomial fitting and k-NN based approach for improving classification of motor imagery BCI data," *Pattern Recognit. Lett.*, vol. 31, no. 11, pp. 1207–1215, Aug. 2010, doi: 10.1016/j.patrec.2010.04.009.
  - [22] S. Chatterjee, N. Ray Choudhury, and R. Bose, "Detection of epileptic seizure and seizure-free EEG signals employing generalised S -transform," *IET Sci. Meas. Technol.*, vol. 11, no. 7, pp. 847–855, 2017, doi: 10.1049/iet-smt.2016.0443.
  - [23] J. Meng, L. Yao, X. Sheng, D. Zhang, and X. Zhu, "Simultaneously Optimizing Spatial Spectral Features Based on Mutual Information for EEG Classification," *IEEE Trans. Biomed. Eng.*, vol. 62, no. 1, pp. 227–240, 2015.
  - [24] L. Duan, M. Bao, J. Miao, Y. Xu, and J. Chen, "Classification Based on Multilayer Extreme Learning Machine for Motor Imagery Task from EEG Signals," *Procedia Comput. Sci.*, vol. 88, pp. 176–184, 2016, doi: 10.1016/j.procs.2016.07.422.
  - [25] J. S. Suri, A. Kumar, G. K. Singh, and M. K. Ahirwal, "Sub-band classification of decomposed single event-related potential co-variants for multi-class brain-computer interface: a qualitative and quantitative approach," *IET Sci. Meas. Technol.*, vol. 10, no. 4, pp. 355–363, 2016, doi: 10.1049/iet-smt.2015.0200.
  - [26] S. Saha, K. Ahmed, R. Mostafa, L. Hadjileontiadis, and A. Khandoker, "Evidence of Variabilities in EEG Dynamics during Motor Imagery-Based Multiclass Brain Computer Interface," *IEEE Trans. Neural Syst. Rehabil. Eng.*, vol. XX, no. XX, pp. 1–13, 2017, doi: 10.1109/TNSRE.2017.2778178.
  - [27] W. Samek, M. Kawanabe, and K. R. Muller, "Divergence-based framework for common spatial patterns algorithms," *IEEE Rev. Biomed. Eng.*, vol. 7, pp. 50–72, 2014, doi: 10.1109/RBME.2013.2290621.
  - [28] X. Song and S. C. Yoon, "Improving brain-computer interface classification using adaptive common spatial patterns," *Comput. Biol. Med.*, vol. 61, pp. 150–160, 2015, doi: 10.1016/j.combiomed.2015.03.023.
  - [29] C. A. Stefano Filho, R. Attux, and G. Castellano, "Can graph metrics be used for EEG-BCIs based on hand motor imagery?," *Biomed. Signal Process. Control*, vol. 40, pp. 359–365, 2018, doi: 10.1016/j.bspc.2017.09.026.

- [30] M. Miao, H. Zeng, A. Wang, C. Zhao, and F. Liu, "Discriminative spatial-frequency-temporal feature extraction and classification of motor imagery EEG: An sparse regression and Weighted Naïve Bayesian Classifier-based approach," *J. Neurosci. Methods*, vol. 278, pp. 13–24, 2017, doi: 10.1016/j.jneumeth.2016.12.010.
- [31] L. F. Nicolas-Alonso, R. Corralejo, J. Gomez-Pilar, D. Alvarez, and R. Hornero, "Adaptive Stacked Generalization for Multiclass Motor Imagery-Based Brain Computer Interfaces," *IEEE Trans. Neural Syst. Rehabil. Eng.*, vol. 23, no. 4, pp. 702–712, Jul. 2015, doi: 10.1109/TNSRE.2015.2398573.
- [32] M. Almonacid, J. Ibarrola, and J.-M. Cano-Izquierdo, "Voting Strategy to Enhance Multimodel EEG-Based Classifier Systems for Motor Imagery BCI," *IEEE Syst. J.*, vol. 10, no. 3, pp. 1082–1088, Sep. 2016, doi: 10.1109/JSYST.2014.2360433.
- [33] H. Dong, T. Li, R. Ding, and J. Sun, "A novel hybrid genetic algorithm with granular information for feature selection and optimization," *Appl. Soft Comput.*, vol. 65, pp. 33–46, Apr. 2018, doi: 10.1016/j.asoc.2017.12.048.
- [34] B. Kitchenham and S. Charters, "Guidelines for performing Systematic Literature Reviews in Software Engineering," *EBSE Tech. Rep.*, 2007.
- [35] M. Miao, H. Zeng, A. Wang, C. Zhao, and F. Liu, "Discriminative spatial-frequency-temporal feature extraction and classification of motor imagery EEG: An sparse regression and Weighted Naïve Bayesian Classifier-based approach," *J. Neurosci. Methods*, vol. 278, pp. 13–24, Feb. 2017, doi: 10.1016/j.jneumeth.2016.12.010.
- [36] S.-H. Park, D. Lee, and S.-G. Lee, "Filter Bank Regularized Common Spatial Pattern Ensemble for Small Sample Motor Imagery Classification," *IEEE Trans. Neural Syst. Rehabil. Eng.*, vol. 26, no. 2, pp. 498–505, Feb. 2018, doi: 10.1109/TNSRE.2017.2757519.
- [37] S. M. Park, X. Yu, P. Chum, W. Y. Lee, and K. B. Sim, "Symmetrical feature for interpreting motor imagery EEG signals in the brain-computer interface," *Optik (Stuttg.)*, vol. 129, pp. 163–171, 2017, doi: 10.1016/j.ijleo.2016.10.047.
- [38] A. Jafarifarmand, M. A. Badamchizadeh, S. Khanmohammadi, M. A. Nazari, and B. M. Tazehkand, "A new self-regulated neuro-fuzzy framework for classification of EEG signals in motor imagery BCI," *IEEE Trans. Fuzzy Syst.*, vol. 6706, no. c, 2017, doi: 10.1109/TFUZZ.2017.2728521.
- [39] T. Nguyen, A. Khosravi, D. Creighton, and S. Nahavandi, "Fuzzy system with tabu search learning for classification of motor imagery data," *Biomed. Signal Process. Control*, vol. 20, pp. 61–70, Jul. 2015, doi: 10.1016/j.bspc.2015.04.007.
- [40] Siuly, Y. Li, and P. (Paul) Wen, "Modified CC-LR algorithm with three diverse feature sets for motor imagery tasks classification in EEG-based brain-computer interface," *Comput. Methods Programs Biomed.*, vol. 113, no. 3, pp. 767–780, Mar. 2014, doi: 10.1016/j.cmpb.2013.12.020.
- [41] J. Luo, Z. Feng, J. Zhang, and N. Lu, "Dynamic frequency feature selection based approach for classification of motor imageries," *Comput. Biol. Med.*, vol. 75, pp. 45–53, 2016, doi: 10.1016/j.compbimed.2016.03.004.
- [42] L. Mingai, G. Shuoda, Y. Jinfu, and S. Yanjun, "A novel EEG feature extraction method based on OEMD and CSP algorithm," *J. Intell. Fuzzy Syst.*, vol. 30, no. 5, pp. 2971–2983, Apr. 2016, doi: 10.3233/IFS-151896.
- [43] M. Arvaneh, C. Guan, K. K. Ang, and C. Quek, "Optimizing the Channel Selection and Classification Accuracy in EEG-Based BCI," *IEEE Trans. Biomed. Eng.*, vol. 58, no. 6, pp. 1865–1873, Jun. 2011, doi: 10.1109/TBME.2011.2131142.
- [44] A. Ghaemi, E. Rashedi, A. M. Pourrahimi, M. Kamandar, and F. Rahdari,

- “Automatic channel selection in EEG signals for classification of left or right hand movement in Brain Computer Interfaces using improved binary gravitation search algorithm,” *Biomed. Signal Process. Control*, vol. 33, pp. 109–118, 2017, doi: 10.1016/j.bspc.2016.11.018.
- [45] L. He, Y. Hu, Y. Li, and D. Li, “Channel selection by Rayleigh coefficient maximization based genetic algorithm for classifying single-trial motor imagery EEG,” *Neurocomputing*, vol. 121, pp. 423–433, 2013, doi: 10.1016/j.neucom.2013.05.005.
- [46] C.-Y. Kee, S. G. Ponnambalam, and C.-K. Loo, “Multi-objective genetic algorithm as channel selection method for P300 and motor imagery data set,” *Neurocomputing*, vol. 161, no. Mi, pp. 120–131, 2015, doi: 10.1016/j.neucom.2015.02.057.
- [47] X. Yu, P. Chum, and K.-B. Sim, “Analysis the effect of PCA for feature reduction in non-stationary EEG-based motor imagery of BCI system,” *Optik (Stuttg.)*, vol. 125, no. 3, pp. 1498–1502, Feb. 2014, doi: 10.1016/j.ijleo.2013.09.013.
- [48] A. M. Alvarez-Meza, L. F. Velasquez-Martinez, and G. Castellanos-Dominguez, “Time-series discrimination using feature relevance analysis in motor imagery classification,” *Neurocomputing*, vol. 151, no. P1, pp. 122–129, 2015, doi: 10.1016/j.neucom.2014.07.077.
- [49] S. Venate and T. D. Sunny, “Multiclass Classification of EEG Signal Using a Probabilistic Approach,” *Procedia Technol.*, vol. 24, pp. 1002–1007, 2016, doi: 10.1016/j.protcy.2016.05.219.
- [50] C. Liu, Y. Fu, J. Yang, X. Xiong, H. Sun, and Z. Yu, “Discrimination of motor imagery patterns by electroencephalogram phase synchronization combined with frequency band energy,” *IEEE/CAA J. Autom. Sin.*, vol. 4, no. 3, pp. 551–557, 2017, doi: 10.1109/JAS.2016.7510121.
- [51] L. He, D. Hu, M. Wan, Y. Wen, K. M. von Deneen, and M. Zhou, “Common Bayesian Network for Classification of EEG-Based Multiclass Motor Imagery BCI,” *IEEE Trans. Syst. Man, Cybern. Syst.*, vol. 46, no. 6, pp. 843–854, Jun. 2016, doi: 10.1109/TSMC.2015.2450680.
- [52] S. Taran, V. Bajaj, D. Sharma, S. Siuly, and A. Sengur, “Features based on analytic IMF for classifying motor imagery EEG signals in BCI applications,” *Measurement*, vol. 116, pp. 68–76, 2018, doi: 10.1016/j.measurement.2017.10.067.
- [53] A. Khorshidtalab, M. J. E. Salami, and R. Akmeliawati, “Motor imagery task classification using transformation based features,” *Biomed. Signal Process. Control*, vol. 33, pp. 213–219, Mar. 2017, doi: 10.1016/j.bspc.2016.12.006.
- [54] J. P. Kamdem *et al.*, “Research trends in food chemistry: A bibliometric review of its 40 years anniversary (1976–2016),” *Food Chem.*, vol. 294, no. May, pp. 448–457, 2019, doi: 10.1016/j.foodchem.2019.05.021.
- [55] C. Yang, X. Wang, X. Tang, X. Bao, and R. Wang, “Research trends of stem cells in ischemic stroke from 1999 to 2018: A bibliometric analysis,” *Clin. Neurol. Neurosurg.*, vol. 192, no. December 2019, p. 105740, 2020, doi: 10.1016/j.clineuro.2020.105740.
- [56] K. Okaiyeto and O. O. Oguntibeju, “Trends in diabetes research outputs in South Africa over 30 years from 2010 to 2019: A bibliometric analysis,” *Saudi J. Biol. Sci.*, no. xxxx, Feb. 2021, doi: 10.1016/j.sjbs.2021.02.025.
- [57] N. Niknejad, W. Ismail, M. Bahari, R. Hendradi, and A. Z. Salleh, “Mapping the research trends on blockchain technology in food and agriculture industry: A bibliometric analysis,” *Environ. Technol. Innov.*, vol. 21, p. 101272, Feb. 2021,



doi: 10.1016/j.eti.2020.101272.

- [58] I. Bautista-Bernal, C. Quintana-García, and M. Marchante-Lara, “Research trends in occupational health and social responsibility: A bibliometric analysis,” *Saf. Sci.*, vol. 137, no. January, p. 105167, 2021, doi: 10.1016/j.ssci.2021.105167.
- [59] N. J. van Eck and L. Waltman, “Software survey: VOSviewer, a computer program for bibliometric mapping,” *Scientometrics*, vol. 84, no. 2, pp. 523–538, 2010, doi: 10.1007/s11192-009-0146-3.
- [60] M. Aria and C. Cuccurullo, “bibliometrix: An R-tool for comprehensive science mapping analysis,” *J. Informetr.*, vol. 11, no. 4, pp. 959–975, 2017, doi: 10.1016/j.joi.2017.08.007.
- [61] N. J. van Eck and L. Waltman, “CitNetExplorer: A new software tool for analyzing and visualizing citation networks,” *J. Informetr.*, vol. 8, no. 4, pp. 802–823, 2014, doi: 10.1016/j.joi.2014.07.006.
- [62] E. Garfield, A. I. Pudovkin, and V. S. Istomin, “Why do we need algorithmic historiography?,” *J. Am. Soc. Inf. Sci. Technol.*, vol. 54, no. 5, pp. 400–412, 2003, doi: 10.1002/asi.10226.
- [63] C. Chen, “CiteSpace II: Detecting and visualizing emerging trends and transient patterns in scientific literature,” *J. Am. Soc. Inf. Sci. Technol.*, vol. 57, no. 3, pp. 359–377, Feb. 2006, doi: 10.1002/asi.20317.
- [64] C. Catal and B. Diri, “A systematic review of software fault prediction studies,” *Expert Syst. Appl.*, vol. 36, no. 4, pp. 7346–7354, May 2009, doi: 10.1016/j.eswa.2008.10.027.
- [65] B. Blankertz *et al.*, “The BCI competition III: Validating alternative approaches to actual BCI problems,” *IEEE Trans. Neural Syst. Rehabil. Eng.*, vol. 14, no. 2, pp. 153–159, 2006, doi: 10.1109/TNSRE.2006.875642.
- [66] C. Brunner, R. Leeb, G. R. Muller-Putz, A. Schlogl, and G. Pfurtscheller, “BCI Competition 2008 – Graz data set A,” 2008.
- [67] I. Majidov and T. Whangbo, “Efficient classification of motor imagery electroencephalography signals using deep learning methods,” *Sensors (Switzerland)*, vol. 19, no. 7, pp. 1–13, 2019, doi: 10.3390/s19071736.
- [68] L. Li, G. Xu, J. Xie, and M. Li, “Classification of single-trial motor imagery EEG by complexity regularization,” *Neural Comput. Appl.*, vol. 31, no. 6, pp. 1959–1965, 2019, doi: 10.1007/s00521-017-3174-6.
- [69] J. Luo, J. Wang, R. Xu, and K. Xu, “Class discrepancy-guided sub-band filter-based common spatial pattern for motor imagery classification,” *J. Neurosci. Methods*, vol. 323, no. May, pp. 98–107, 2019, doi: 10.1016/j.jneumeth.2019.05.011.
- [70] K. Belwafi, S. Gannouni, H. Aboalsamh, H. Mathkour, and A. Belghith, “A dynamic and self-adaptive classification algorithm for motor imagery EEG signals,” *J. Neurosci. Methods*, vol. 327, p. 108346, Nov. 2019, doi: 10.1016/j.jneumeth.2019.108346.
- [71] P. Gaur, R. B. Pachori, H. Wang, and G. Prasad, “An Automatic Subject Specific Intrinsic Mode Function Selection for Enhancing Two-Class EEG-Based Motor Imagery-Brain Computer Interface,” *IEEE Sens. J.*, vol. 19, no. 16, pp. 6938–6947, 2019, doi: 10.1109/JSEN.2019.2912790.
- [72] J. K. Feng *et al.*, “An Optimized Channel Selection Method Based on Multifrequency CSP-Rank for Motor Imagery-Based BCI System,” *Comput. Intell. Neurosci.*, vol. 2019, pp. 1–10, May 2019, doi: 10.1155/2019/8068357.
- [73] C. Kim, J. Sun, D. Liu, Q. Wang, and S. Paek, “An effective feature extraction method by power spectral density of EEG signal for 2-class motor imagery-based

- BCI,” *Med. Biol. Eng. Comput.*, vol. 56, no. 9, pp. 1645–1658, 2018, doi: 10.1007/s11517-017-1761-4.
- [74] W. Y. Hsu, “EEG-based motor imagery classification using neuro-fuzzy prediction and wavelet fractal features,” *J. Neurosci. Methods*, vol. 189, no. 2, pp. 295–302, 2010, doi: 10.1016/j.jneumeth.2010.03.030.
- [75] A. A. Alshehri, “Non-Stationary Signal Segmentation and Separation from Joint Time-Frequency Plane,” *J. Signal Inf. Process.*, vol. 03, no. 03, pp. 339–343, 2012, doi: 10.4236/jsip.2012.33043.
- [76] Y. Zhang, C. S. Nam, G. Zhou, J. Jin, X. Wang, and A. Cichocki, “Temporally constrained sparse group spatial patterns for motor imagery BCI,” *IEEE Trans. Cybern.*, vol. 49, no. 9, pp. 3322–3332, 2019, doi: 10.1109/TCYB.2018.2841847.
- [77] M. Z. Baig, N. Aslam, H. P. H. Shum, and L. Zhang, “Differential evolution algorithm as a tool for optimal feature subset selection in motor imagery EEG,” *Expert Syst. Appl.*, vol. 90, pp. 184–195, 2017, doi: 10.1016/j.eswa.2017.07.033.
- [78] S. Razi, M. R. Karami Mollaei, and J. Ghasemi, “A novel method for classification of BCI multi-class motor imagery task based on Dempster–Shafer theory,” *Inf. Sci. (Ny.)*, vol. 484, pp. 14–26, 2019, doi: 10.1016/j.ins.2019.01.053.
- [79] Y. Jiao *et al.*, “Sparse Group Representation Model for Motor Imagery EEG Classification,” *IEEE J. Biomed. Heal. Informatics*, vol. 23, no. 2, pp. 631–641, 2019, doi: 10.1109/JBHI.2018.2832538.
- [80] S. H. Park, D. Lee, and S. G. Lee, “Filter Bank Regularized Common Spatial Pattern Ensemble for Small Sample Motor Imagery Classification,” *IEEE Trans. Neural Syst. Rehabil. Eng.*, vol. 26, no. 2, pp. 498–505, 2018, doi: 10.1109/TNSRE.2017.2757519.
- [81] B. E. Olivas-Padilla and M. I. Chacon-Murguia, “Classification of multiple motor imagery using deep convolutional neural networks and spatial filters,” *Appl. Soft Comput. J.*, vol. 75, pp. 461–472, 2019, doi: 10.1016/j.asoc.2018.11.031.
- [82] Y. Park and W. Chung, “Frequency-Optimized Local Region Common Spatial Pattern Approach for Motor Imagery Classification,” *IEEE Trans. Neural Syst. Rehabil. Eng.*, vol. 27, no. 7, pp. 1378–1388, 2019, doi: 10.1109/TNSRE.2019.2922713.
- [83] R. Salazar-Varas and R. A. Vazquez, “Evaluating the effect of the cutoff frequencies during the pre-processing stage of motor imagery EEG signals classification,” *Biomed. Signal Process. Control*, vol. 54, no. xxxx, p. 101592, Sep. 2020, doi: 10.1016/j.bspc.2019.101592.
- [84] S. Guan, K. Zhao, and S. Yang, “Motor Imagery EEG Classification Based on Decision Tree Framework and Riemannian Geometry,” *Comput. Intell. Neurosci.*, vol. 2019, 2019, doi: 10.1155/2019/5627156.
- [85] K. Sadatnejad and S. Shiry Ghidary, “Kernel learning over the manifold of symmetric positive definite matrices for dimensionality reduction in a BCI application,” *Neurocomputing*, vol. 179, pp. 152–160, Feb. 2016, doi: 10.1016/j.neucom.2015.11.065.
- [86] R. Salazar-Varas and R. A. Vazquez, “Evaluating the effect of the cutoff frequencies during the pre-processing stage of motor imagery EEG signals classification,” *Biomed. Signal Process. Control*, vol. 54, p. 101592, 2019, doi: 10.1016/j.bspc.2019.101592.
- [87] P. G. Rodrigues, C. A. S. Filho, R. Attux, G. Castellano, and D. C. Soriano, “Space-time recurrences for functional connectivity evaluation and feature extraction in motor imagery brain-computer interfaces,” *Med. Biol. Eng. Comput.*, vol. 57, no. 8, pp. 1709–1725, Aug. 2019, doi: 10.1007/s11517-019-01989-w.

- [88] K. C. Chua, V. Chandran, U. R. Acharya, and C. M. Lim, "Application of Higher Order Spectra to Identify Epileptic EEG," *J. Med. Syst.*, vol. 35, no. 6, pp. 1563–1571, Dec. 2011, doi: 10.1007/s10916-010-9433-z.
- [89] R. Liu, Z. Zhang, F. Duan, X. Zhou, and Z. Meng, "Identification of Anisomeric Motor Imagery EEG Signals Based on Complex Algorithms," *Comput. Intell. Neurosci.*, vol. 2017, pp. 1–12, 2017, doi: 10.1155/2017/2727856.
- [90] S. U. Amin, M. Alsulaiman, G. Muhammad, M. A. Mekhtiche, and M. Shamim Hossain, "Deep Learning for EEG motor imagery classification based on multi-layer CNNs feature fusion," *Futur. Gener. Comput. Syst.*, vol. 101, pp. 542–554, Dec. 2019, doi: 10.1016/j.future.2019.06.027.
- [91] H. Raza, D. Rathee, S. M. Zhou, H. Cecotti, and G. Prasad, "Covariate shift estimation based adaptive ensemble learning for handling non-stationarity in motor imagery related EEG-based brain-computer interface," *Neurocomputing*, vol. 343, pp. 154–166, 2019, doi: 10.1016/j.neucom.2018.04.087.
- [92] C. C. J. M. De Klerk, M. H. Johnson, and V. Southgate, "An EEG study on the somatotopic organisation of sensorimotor cortex activation during action execution and observation in infancy," *Dev. Cogn. Neurosci.*, vol. 15, pp. 1–10, 2015, doi: 10.1016/j.dcn.2015.08.004.
- [93] BNCI Horizon 2020 Consortium, *Roadmap: The Future in Brain/Neural-Computer Interaction: Horizon 2020*. 2015.
- [94] M. X. Cohen, *Analyzing Neural Time Series Data: Theory and Practice*. London, England: The MIT Press, 2014.
- [95] T. Zhang *et al.*, "Structural and functional correlates of motor imagery BCI performance: Insights from the patterns of Fronto-Parietal Attention Network," *Neuroimage*, 2016, doi: 10.1016/j.neuroimage.2016.04.030.
- [96] K. McInnes, C. Friesen, and S. Boe, "Specific Brain Lesions Impair Explicit Motor Imagery Ability: A Systematic Review of the Evidence," *Arch. Phys. Med. Rehabil.*, vol. 97, no. 3, pp. 478–489.e1, Mar. 2016, doi: 10.1016/j.apmr.2015.07.012.
- [97] S. Salehi, A. Selamat, and H. Fujita, "Systematic mapping study on granular computing," *Knowledge-Based Syst.*, vol. 80, pp. 78–97, 2015, doi: 10.1016/j.knosys.2015.02.018.
- [98] X. Yang, W. Xu, and Y. She, "Theory and Application on Rough Set, Fuzzy Logic, and Granular Computing Fuzzy Systems," vol. 2015, 2015.
- [99] V. Loia, F. Orciuoli, and W. Pedrycz, "Towards a granular computing approach based on Formal Concept Analysis for discovering periodicities in data," *Knowledge-Based Syst.*, vol. 146, pp. 1–11, 2018, doi: 10.1016/j.knosys.2018.01.032.
- [100] O. Hryniewicz and K. Kaczmarek, "Bayesian analysis of time series using granular computing approach," *Appl. Soft Comput. J.*, 2014, doi: 10.1016/j.asoc.2014.11.024.
- [101] P. Singh and G. Dhiman, "A hybrid fuzzy time series forecasting model based on granular computing and bio-inspired optimization approaches," *J. Comput. Sci.*, 2018, doi: 10.1016/j.jocs.2018.05.008.
- [102] H. Zhao, P. Wang, and Q. Hu, "Cost-sensitive feature selection based on adaptive neighborhood granularity with multi-level confidence," *Inf. Sci. (Ny)*, vol. 366, pp. 134–149, 2016, doi: 10.1016/j.ins.2016.05.025.
- [103] M. M. Eissa, M. Elmogy, and M. Hashem, "Rough – Granular Computing knowledge discovery models for medical classification," *Egypt. Informatics J.*, vol. 17, no. 3, pp. 265–272, 2016.

- [104] J. Leng, Q. Chen, N. Mao, and P. Jiang, "Combining granular computing technique with deep learning for service planning under social manufacturing contexts," *Knowledge-Based Syst.*, vol. 143, pp. 295–306, 2018, doi: 10.1016/j.knosys.2017.07.023.
- [105] W. Pedrycz, *Granular computing: Analysis and design of intelligent systems*. CRC press, 2016.
- [106] W. Wieclawek, "Information granules in image histogram analysis," *Comput. Med. Imaging Graph.*, vol. 65, pp. 129–141, 2018, doi: 10.1016/j.compmedimag.2017.05.003.
- [107] Y. Yao, "Three-way decision and granular computing," *Int. J. Approx. Reason.*, vol. 103, pp. 107–123, 2018, doi: 10.1016/j.ijar.2018.09.005.
- [108] G. James, D. Witten, T. Hastie, and R. Tibshirani, *An Introduction to Statistical Learning with Applications in R*. Springer New York, 2014.
- [109] H. A. Abu Alfeilat *et al.*, "Effects of Distance Measure Choice on K-Nearest Neighbor Classifier Performance: A Review," *Big Data*, vol. 7, no. 4, pp. 221–248, 2019, doi: 10.1089/big.2018.0175.
- [110] A. S. Shirkhorshidi, S. Aghabozorgi, and T. Ying Wah, "A Comparison study on similarity and dissimilarity measures in clustering continuous data," *PLoS One*, vol. 10, no. 12, pp. 1–20, 2015, doi: 10.1371/journal.pone.0144059.
- [111] T. Yang, W. Chen, and G. Cao, "Automated classification of neonatal amplitude-integrated EEG-based on gradient boosting method," *Biomed. Signal Process. Control*, vol. 28, pp. 50–57, 2016, doi: 10.1016/j.bspc.2016.04.004.
- [112] B. Harangi, "Skin lesion classification with ensembles of deep convolutional neural networks," *J. Biomed. Inform.*, vol. 86, no. January, pp. 25–32, 2018, doi: 10.1016/j.jbi.2018.08.006.
- [113] J. S. Kirar and R. K. Agrawal, "A combination of spectral graph theory and quantum genetic algorithm to find relevant set of electrodes for motor imagery classification," *Appl. Soft Comput.*, vol. 97, p. 105519, Dec. 2020, doi: 10.1016/j.asoc.2019.105519.
- [114] S. U. Amin, M. Alsulaiman, G. Muhammad, M. A. Mekhtiche, and M. Shamim Hossain, "Deep Learning for EEG motor imagery classification based on multi-layer CNNs feature fusion," *Futur. Gener. Comput. Syst.*, vol. 101, pp. 542–554, 2019, doi: 10.1016/j.future.2019.06.027.
- [115] K. Belwafi, S. Gannouni, H. Aboalsamh, H. Mathkour, and A. Belghith, "A dynamic and self-adaptive classification algorithm for motor imagery EEG signals," *J. Neurosci. Methods*, vol. 327, 2019, doi: 10.1016/j.jneumeth.2019.108346.
- [116] M. K. Abdullah, N. R. M. Suradi, N. Jamaluddin, A. S. Mokhtar, A. R. A. Talib, and M. F. Zainuddin, "K-Chart: A Tool for Research Planning and Monitoring," vol. 2, no. 1, pp. 123–129, 2006.
- [117] L. Duan, Z. Hongxin, M. S. Khan, and M. Fang, "Recognition of motor imagery tasks for BCI using CSP and chaotic PSO twin SVM," *J. China Univ. Posts Telecommun.*, vol. 24, no. 3, pp. 83–90, 2017, doi: 10.1016/S1005-8885(17)60215-2.
- [118] C. Park, C. C. Took, and D. P. Mandic, "Augmented Complex Common Spatial Patterns for Classification of Noncircular EEG From Motor Imagery Tasks," *IEEE Trans. Neural Syst. Rehabil. Eng.*, vol. 22, no. 1, pp. 1–10, Jan. 2014, doi: 10.1109/TNSRE.2013.2294903.
- [119] X. Tang, N. Zhang, J. Zhou, and Q. Liu, "Hidden-layer visible deep stacking network optimized by PSO for motor imagery EEG recognition,"



- Neurocomputing*, vol. 234, no. December 2016, pp. 1–10, 2017, doi: 10.1016/j.neucom.2016.12.039.
- [120] P. K. Pattnaik and J. Sarraf, “Brain Computer Interface issues on hand movement,” *J. King Saud Univ. - Comput. Inf. Sci.*, vol. 30, no. 1, pp. 18–24, Jan. 2018, doi: 10.1016/j.jksuci.2016.09.006.
- [121] S. G. Kwak and J. H. Kim, “Central limit theorem: The cornerstone of modern statistics,” *Korean J. Anesthesiol.*, vol. 70, no. 2, pp. 144–156, 2017, doi: 10.4097/kjae.2017.70.2.144.
- [122] J. Uttley, “Power Analysis, Sample Size, and Assessment of Statistical Assumptions—Improving the Evidential Value of Lighting Research,” *LEUKOS - J. Illum. Eng. Soc. North Am.*, vol. 15, no. 2–3, pp. 143–162, 2019, doi: 10.1080/15502724.2018.1533851.
- [123] S. M. Ross, “Distributions of sampling statistics,” in *Introduction to Probability and Statistics for Engineers and Scientists*, Elsevier, 2021, pp. i–iii.
- [124] B. J. Edelman, B. Baxter, and B. He, “EEG Source Imaging Enhances the Decoding of Complex Right-Hand Motor Imagery Tasks,” *IEEE Trans. Biomed. Eng.*, vol. 63, no. 1, pp. 4–14, 2016.
- [125] D. Liang, C.-F. Tsai, and H.-T. Wu, “The effect of feature selection on financial distress prediction,” *Knowledge-Based Syst.*, vol. 73, pp. 289–297, 2015, doi: 10.1016/j.knosys.2014.10.010.
- [126] S. Selim, M. M. Tantawi, H. A. Shedeed, and A. Badr, “A CSP\AM-BA-SVM Approach for Motor Imagery BCI System,” *IEEE Access*, vol. 6, no. c, pp. 49192–49208, 2018, doi: 10.1109/ACCESS.2018.2868178.
- [127] J. Demšar, “Statistical comparisons of classifiers over multiple data sets,” *J. Mach. Learn. Res.*, vol. 7, pp. 1–30, 2006.
- [128] Siuly and Y. Li, “A novel statistical algorithm for multiclass EEG signal classification,” *Eng. Appl. Artif. Intell.*, vol. 34, pp. 154–167, 2014, doi: 10.1016/j.engappai.2014.05.011.
- [129] B. Xu *et al.*, “Wavelet Transform Time-Frequency Image and Convolutional Network-Based Motor Imagery EEG Classification,” *IEEE Access*, vol. 7, no. MI, pp. 6084–6093, 2019, doi: 10.1109/ACCESS.2018.2889093.
- [130] P. Gaur, R. B. Pachori, H. Wang, and G. Prasad, “An Automatic Subject Specific Intrinsic Mode Function Selection for Enhancing Two-Class EEG-Based Motor Imagery-Brain Computer Interface,” *IEEE Sens. J.*, vol. 19, no. 16, pp. 6938–6947, 2019, doi: 10.1109/jsen.2019.2912790.
- [131] Y. Zhang, C. S. Nam, G. Zhou, J. Jin, X. Wang, and A. Cichocki, “Temporally constrained sparse group spatial patterns for motor imagery BCI,” *IEEE Trans. Cybern.*, vol. 49, no. 9, pp. 3322–3332, 2019, doi: 10.1109/TCYB.2018.2841847.
- [132] R. Salazar-Varas and R. A. Vazquez, “Evaluating the effect of the cutoff frequencies during the pre-processing stage of motor imagery EEG signals classification,” *Biomed. Signal Process. Control*, vol. 54, p. 101592, 2019, doi: 10.1016/j.bspc.2019.101592.
- [133] S. Guan, K. Zhao, and S. Yang, “Motor Imagery EEG Classification Based on Decision Tree Framework and Riemannian Geometry,” *Comput. Intell. Neurosci.*, vol. 2019, pp. 1–13, 2019, doi: 10.1155/2019/5627156.
- [134] M.-A. Carbonneau, V. Cheplygina, E. Granger, and G. Gagnon, “Multiple instance learning: A survey of problem characteristics and applications,” *Pattern Recognit.*, vol. 77, pp. 329–353, May 2018, doi: 10.1016/j.patcog.2017.10.009.
- [135] T. M. Mitchell, *Machine Learning*. Burr Ridge, IL: McGraw-Hill, 1997.
- [136] J. Han, M. Kamber, and J. Pei, *Data Mining: Concepts and Techniques*, 11th ed.

Morgan Kaufman, 2011.

- [137] A. Singh, A. A. Hussain, S. Lal, and H. W. Guesgen, "A comprehensive review on critical issues and possible solutions of motor imagery based electroencephalography brain-computer interface," *Sensors*, vol. 21, no. 6, pp. 1–35, 2021, doi: 10.3390/s21062173.
- [138] A. Tharwat, T. Gaber, A. Ibrahim, and A. E. Hassanien, "Linear discriminant analysis: A detailed tutorial," *AI Commun.*, vol. 30, no. 2, pp. 169–190, 2017, doi: 10.3233/AIC-170729.
- [139] D. W. Chen *et al.*, "A feature extraction method based on differential entropy and linear discriminant analysis for emotion recognition," *Sensors (Switzerland)*, vol. 19, no. 7, 2019, doi: 10.3390/s19071631.
- [140] A. Natekin and A. Knoll, "Gradient boosting machines, a tutorial," *Front. Neurobot.*, vol. 7, pp. 1–21, 2013, doi: 10.3389/fnbot.2013.00021.
- [141] G. Einziger, M. Goldstein, Y. Sa'ar, and I. Segall, "Verifying Robustness of Gradient Boosted Models," *Proc. AAAI Conf. Artif. Intell.*, vol. 33, pp. 2446–2453, Jul. 2019, doi: 10.1609/aaai.v33i01.33012446.
- [142] Z. Wen, B. He, R. Kotagiri, S. Lu, and J. Shi, "Efficient Gradient Boosted Decision Tree Training on GPUs," in *2018 IEEE International Parallel and Distributed Processing Symposium (IPDPS)*, 2018, no. i, pp. 234–243, doi: 10.1109/IPDPS.2018.00033.