Feng WAN萬 峰
Associate Professor

Academic Qualification

- Ph.D in Electrical and Electronics Engineering, The Hong Kong University of Science and Technology, Hong Kong
- M.Eng. in Control Theory and Engineering, Institute of Industrial Process Control, Zhejiang University, China
- B.Eng. in Material Science and Engineering & B.Eng. in Electronics Engineering, Tianjin University, China

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Teaching

B.Sc. Courses

1. Quality Control (ELEC200)
2. Project on Social Awareness (HONR2004)
3. Probability and Statistics (ECEN2007)
4. Control Systems (ECEN3000)
5. Computer and Microprocessor Control Systems (ELEC409)
6. Graduation Project I (ECEN4000)
7. Graduation Project II (ECEN4001)
8. Honours Project (HONR4000)

M.Sc. and PhD Courses

1. Introduction to Research (ECEN7001)
2. Advanced Topics in Control Systems (ECEN7006)
3. Expert Systems (ECEN7008)
4. Advanced Topics in Applied Probability and Statistics (ECEN7102)
5. Advanced Signal Processing and Analysis (ELCE801)
6. Computational Intelligence and Intelligent Control (ELCE802)
7. Advanced Topics in Electrical and Computer Engineering (ECEN8001)
8. Thesis (ECEN7999)
9. Thesis (ECEN8999)

Research

Research Interests

- Biomedical Engineering: Brain-Computer Interfaces, Biomedical Signal Processing, Brain Imaging and Neurofeedback Training
- Computational Intelligence and Machine Learning: Fuzzy Systems, Neural Networks, Deep and Transfer Learning
- Control: Intelligent Control, Nonlinear and Adaptive Control

Recent Research Projects

- Research on Key Technologies of Practical Brain-Computer Interface for Clinical Applications, FDCT-MOST Joint Research Project, Principal Investigator, 2025-2027.
- Fast Brain-Computer Interfaces with Deep Learning Techniques, funded by the University of Macau Development Fund, Principal Investigator, 2025-2026.
- Mitigating Inattentional Blindness Using AR+BCI+AI, International Collaborative Research Project funded by the University of Macau, Principal Investigator, 2025-2026.
- Spatio-Temporal Connection Mode on Dynamic Brain Cognitive Activities, funded by Guangdong Basic and Applied Basic Research Foundation, Principal Investigator, 2023-2025.
- Plug-and-Play High Performance SSVEP-based BCIs, funded by the University of Macau, Principal Investigator, 2023-2024.
- Decision-Making: EEG-Based Brain Network, Prediction and Intervention, FDCT-NSFC Joint Scientific Research Project, Principal Investigator, 2019-2022.
- Steady-State Visual Evoked Potential-Based Brain Computer Interface Illiteracy: Its Assessment, Prediction and Improvement, funded by the Research Committee of University of Macau, Principal Investigator, 2018-2020.

- Prediction of Learning Effectiveness in Neurofeedback Training, funded by the University of Macau, Principal Investigator, 2017-2019.
- Neurofeedback Training Approach to the Performance Enhancement of Steady-State Visual Evoked Potential-based Brain-Computer Interfaces, funded by Macau Science and Technology Development Fund, Principal Investigator, 2016-2018.

Awards

- 2020 World Robot Conference Brain-Computer Interfaces Contest / The Fourth China Brain-Computer Interfaces Contest (advised by NSFC, organized by NSFC-DIFS, Chinese Institute of Electronics, and Tsinghua University):
  - Technical Competitions (in total 4 paradigms, for real-time performance)
    (1) Grand Champion/Grand Prize (tied with Tsinghua University – Beijing Post and Telecommunication University Joint Team)
    (2) Event-Related Potentials-Based Brain-Computer Interfaces Competition: Champion/First Prize
  - Technical Championships (in total 7 paradigms, for best performance)
    (1) SSVEP-Based Brain-Computer Interfaces (with calibration) Competition: Champion
    (2) SSVEP-Based Brain-Computer Interfaces (without calibration) Competition: Champion
    (3) Event-Related Potentials-Based Brain-Computer Interfaces (with calibration) Competition: Champion
    (4) Event-Related Potentials-Based Brain-Computer Interfaces (without calibration) Competition: Champion

  2020世界機器人大會腦控機器人大賽暨第四屆中國腦機接口比賽（國家自然科學基金委員會指導、
  國家自然科學基金委員會信息科學部、中國電子學會及清華大學主辦），獲：

  - 技術賽（共四個單項賽，考察實時性能）
    (1) 總冠軍/特等獎（與清華大學-北京郵電大學聯隊並列）
    (2) 頂葉腦機組/基於事件相關電位的腦機接口系統賽冠軍/一等獎
  - 技術錦標賽（共七個單項賽，考察最佳信息傳輸率）
    (1) 枕葉腦機組/基於穩態視覺誘發電位的腦機接口系統賽（有訓練集）第一名/優勝獎
    (2) 枕葉腦機組/基於穩態視覺誘發電位的腦機接口系統賽（無訓練集）第一名/優勝獎
    (3) 頂葉腦機組/基於事件相關電位的腦機接口系統賽（有訓練集）第一名/優勝獎
    (4) 頂葉腦機組/基於事件相關電位的腦機接口系統賽（無訓練集）第一名/優勝獎
- 2019 World Robot Conference Brain-Computer Interfaces Contest / The Third China Brain-Computer Interfaces Contest (advised by NSFC, organized by NSFC-DIFS, Chinese Institute of Electronics, and Tsinghua University, more than 400 teams participated in 3 technical competitions):
  (1) Grand Champion/Grand Prize, (2) Brain-Computer Interfaces Tying Record, (3) SSVEP-Based Brain-Computer Interfaces Competition: Champion/First Prize, (4) Motor Imagery-Based Brain-Computer Interfaces Competition: Champion/First Prize.
  2019世界機器人大會腦控機器人大賽暨第三屆中國腦機接口比賽（國家自然科學基金委員會指導、國家自然科學基金委員會信息科學部、中國電子學會及清華大學主辦，400余支參賽隊參加共三項單項技術賽），獲：
  技術賽總冠軍/特等獎、創腦控打字記錄、枕葉腦機組/基於穩態視覺誘發電位的腦機接口系統技術賽冠軍/一等獎、顳葉腦機組/基於運動想像的腦機接口系統技術賽冠軍/一等獎

Selected Publications

Selected Journal Papers

1. “Spectral-spatial attention alignment for multi-source domain adaptation in EEG-based emotion recognition,” *IEEE Transactions on Affective Computing*, 15(4), 2012-2024, 2024.
2. “Brain network manifold learned by cognition-inspired graph embedding model for emotion recognition,” *IEEE Transactions on Systems, Man and Cybernetics: Systems*, 54(12), 7794-7808, 2024.
3. “A least-square unified framework for spatial filtering in SSVEP-based BCIs,” *IEEE Transactions on Neural Systems and Rehabilitation Engineering*, 32, 2470-2481, 2024.
4. “Neural adaptive optimal control of inequality constrained nonlinear system with partial uncertain time delay,” *IEEE Transactions on Systems, Man and Cybernetics: Systems*, 54(7), 4066-4076, 2024.
5. “ADFCNN: Attention-based dual-scale fusion convolutional neural network for motor imagery brain-computer interface,” *IEEE Transactions on Neural Systems and Rehabilitation Engineering*, 32(1), 154-165, 2024.
6. “Activation network improves spatiotemporal modelling of human brain communication processes,” *NeuroImage*, 285, 120472, 2024.
7. “Relationship between decision-making and resting-state EEG in adolescents with different emotional stabilities,” *IEEE Transactions on Cognitive and Developmental Systems*, 16(1), 243-250, 2024.
8. “Multi-view contrastive learning for unsupervised domain adaptation in brain-computer interfaces,” *IEEE Transactions on Instrumentation and Measurement*, 73, 2509410, 2024.

9. “Compact artificial neural network based on task attention for individual SSVEP recognition with less calibration,” *IEEE Transactions on Neural Systems and Rehabilitation Engineering*, 31, 2525-2534, 2023.
10. “Driving fatigue effects on cross-frequency phase synchrony embedding in multi-layer brain network,” *IEEE Transactions on Instrumentation and Measurement*, 72, 1-14, 2023.
11. “Enhancing detection of multi-frequency-modulated SSVEP using phase difference constrained canonical correlation analysis,” *IEEE Transactions on Neural Systems and Rehabilitation Engineering*, 31, 1343-1352, 2023.
12. “E-Key: an EEG-based biometric authentication and driving fatigue detection system,” *IEEE Transactions on Affective Computing*, 14(2), 864-877, 2023.
13. “Stimulus-stimulus transfer based on time-frequency-joint representation in SSVEP-based BCIs,” *IEEE Transactions on Biomedical Engineering*, 70(2), 603-615, 2023.
14. “ST-CapsNet: Linking sspatial and temporal attention with capsule network for P300 detection improvement,” *IEEE Transactions on Neural Systems and Rehabilitation Engineering*, 31, 991-1000, 2023.
15. “On the benefits of two dimensional metric learning,” *IEEE Transactions on Knowledge and Data Engineering*, 35(2), 1909-1921, 2023.
16. “EEG-based emotion recognition via channel-wise attention and self attention,” *IEEE Transactions on Affective Computing*, 14(1), 382-393, 2023.
17. “Lifelong online learning from accumulated knowledge,” *ACM Transactions on Knowledge Discovery from Data*, 17(4), Article No.: 52, 1-23, 2023.
18. “Classification of attention deficit/hyperactivity disorder based on EEG signals using EEG-transformer model,” *Journal of Neural Engineering*, 20(5), 056013, 2023.
19. “Resting-state network predicts the decision-making behaviors of the proposer during the ultimatum game,” *Journal of Neural Engineering*, 20(5), 056003, 2023.
20. “Empirical validation of task-related component analysis reformulation for computational complexity reduction,” *Biomedical Signal Processing and Control*, 86, 105220, 2023.
21. “SSVEP-based brain computer interface controlled soft robotic glove for post-stroke hand function rehabilitation,” *IEEE Transactions on Neural Systems and Rehabilitation Engineering,* 30: 1737-1744, 2022.
22. “Adaptive Fourier decomposition for multi-channel signal analysis,” *IEEE Transactions on Signal Processing*, 70(1): 903-918, 2022.
23. “Online adaptation boosts SSVEP-based BCI performance,” *IEEE Transactions on Biomedical Engineering*, 69(6): 2018-2028, 2022.
24. “Fusing frequency-domain features and brain connectivity features for cross-subject emotion recognition,” *IEEE Transactions on Instrumentation and Measurement,* 71, 2508215, 2022.
25. “The masking impact of intra-artifacts in EEG on deep learning-based sleep staging systems: A comparative study,” *IEEE Transactions on Neural Systems and Rehabilitation Engineering,* 30: 1452-1463, 2022.
26. “Learning curve and dynamic brain network based on phase locking value during short time neurofeedback training,” *IEEE Transactions on Cognitive and Developmental Systems*, 14(3): 1282-1295, 2022.
27. “Epileptic seizure detection by cascading isolation forest-based anomaly screening and EasyEnsemble,” *IEEE Transactions on Neural Systems and Rehabilitation Engineering,* 30: 915-924, 2022.
28. ” Development of a clinical risk score prediction tool for 5-, 9-, and 13-year risk of dementia: a 13-year longitudinal population-based study,” *JAMA Network Open*, 5(11): e2242596, 2022.
29. “Transferring subject-specific knowledge across stimulus frequencies in SSVEP-Based BCIs,” *IEEE Transactions on Automation Science and Engineering*, 18(2): 552-563, 2021.
30. “Common spatial pattern reformulated for regularizations in brain-computer interfaces,” *IEEE Transactions on Cybernetics*, 51(10): 5008-5020, 2021.
31. “Driving fatigue recognition with functional connectivity based on phase synchronization,” *IEEE Transactions on Cognitive and Developmental Systems*, 13(3): 668-678, 2021.
32. “Brain network excitatory/inhibitory imbalance is a biomarker for drug-naïve Rolandic epilepsy: A radiomics strategy,” *Epilepsia*, 62(10): 2426-2438, 2021.
33. “Effect of excessive use of internet games on inhibitory control and resting-state EEG,” *International Journal of Psychophysiology*, 168, S101, 2021.
34. “Decision-feedback stages revealed by hidden Markov modelling of EEG,” *International Journal of Neural Systems*, 31(7): 2150031, 2021.
35. “The decision strategies of adolescents with different emotional stabilities in the unfair situations,” *Neuroscience Bulletin*, 37: 1481-1486, 2021
36. “Effect of brain alpha oscillation on the performance in laparoscopic skills simulator training,” *Surgical Endoscopy*, 35: 584-592, 2021.
37. “Fractional delay filter based repetitive control for precision tracking: design and application to a piezoelectric nanopositioning stage,” *Mechanical Systems and Signal Processing*, 164, 108249, 2021.
38. “Spatial filtering in SSVEP-based BCIs: Unified framework and new improvements,” *IEEE Transactions on Biomedical Engineering*, 67(11): 3057-3072, 2020.
39. “Inter- and intra-subject transfer reduces calibration effort for high-speed SSVEP-based BCIs,” *IEEE Transactions on Neural Systems and Rehabilitation Engineering*, 28(10): 2123-2135, 2020.

40. “Dynamic reorganization of functional connectivity unmasks fatigue related performance declines in simulated driving,” *IEEE Transactions on Neural Systems and Rehabilitation Engineering*, 28(8): 1790-1799, 2020.
41. “Individual variation in alpha neurofeedback training efficacy predicts pain modulation,” *NeuroImage: Clinical*, 28,102454, 2020.
42. “Consensus on the reporting and experimental design of clinical and cognitive-behavioural neurofeedback studies (CRED-nf checklist),” *Brain*, DOI: 10.1093/brain/awaa009, 2020.
43. “Multi-channel EEG-based emotion recognition via a multi-level features guided capsule network,” *Computer in Biology and Medicine*, 123,103927, 2020.
44. “Changes of EEG phase synchronization and EOG signals along the use of SSVEP-based BCI,” *Journal of Neural Engineering*, 17(4): 045006, 2020.
45. “Alpha down-regulation neurofeedback training facilitates implicit motor learning and consolidation,” *Journal of Neural Engineering*, 17(2): 026014, 2020.
46. “Learning across multi-stimulus enhances target recognition methods in SSVEP-based BCIs,” *Journal of Neural Engineering*, 17(1): 016026, 2020.
47. “Predicting individual decision-making responses based on the functional connectivity of resting-state EEG,” *Journal of Neural Engineering*, 16(6): 066025, 2019.
48. “Competing with multinational enterprise’ entry: Search strategy, environmental complexity and survival of local firms,” *International Business Review*, 28(4): 727-738, 2019.
49. “Sparse EEG source localization using LAPPS: Least absolute l_p (0<p<1) penalized solution,” *IEEE Transactions on Biomedical Engineering*, 66(7): 1927-1939, 2018.
50. “Eyes-closed resting EEG predicts the learning of alpha down-regulation in neurofeedback training,” *Frontiers in Psychology*, 9, 1067, 2018.
51. “Reliable detection of implicit waveform-specific learning in continuous tracking task paradigm,” *Scientific Reports*, 7(1): 12333, Sep. 26, 2017.
52. “Adaptive Fourier decomposition based ECG denoising,” *Computers in Biology and Medicine*, 77, 195-205, 2016.
53. “Alpha neurofeedback training improves SSVEP-based BCI performance,” *Journal of Neural Engineering*, 13(3): 036019, 2016.
54. “Adaptive time-window length based on online performance measurement in SSVEP-based BCIs,” *Neurocomputing*, 149(A), 93-99, 2015.
55. “Objective evaluation of fatigue by EEG spectral analysis in steady-state visual evoked potential-based brain-computer interfaces,” *Biomedical Engineering Online*, 13(28), 2014.
56. “Resting alpha activity predicts learning ability in alpha neurofeedback,” *Frontiers in Human Neuroscience*, 8:500, 2014.
57. “15-nW biopotential LPFs in 0.35-μm CMOS using subthreshold-source-follower biquads with and without gain compensation,” *IEEE Transactions on Biomedical Circuits and Systems*, 7(5), 690-702, 2013.
58. “One-unit second order blind identification (SOBI) with reference for short transient signals,” *Information Sciences*, 227, 90-101, 2013.
59. “Individual alpha neural feedback training effect on short-term memory,” *International Journal of Psychophysiology*, 86(1): 83-87, 2012.
60. “A 0.83-μW QRS detection processor using quadratic spline wavelet transform for wireless ECG acquisition in 0.35-μm CMOS,” *IEEE Transactions on Biomedical Circuits and Systems*, 6(6): 586-595, 2012.
61. “A fast adaptive model reduction method based on Takenaka-Malmquist systems,” *Systems and Control Letters*, 61(1): 223-230, 2012.
62. “Further study on the parameter convergence of fuzzy models in nonlinear system identifications,” *Acta Automatica Sinica*, 33(1): 109-112, 2007.
63. “How to determine the minimum number of fuzzy rules to achieve given accuracy: A computational geometric approach to SISO case,” *Fuzzy Sets and Systems*, 150(2): 199-209, 2005.
64. “Nonlinear discrete-time system identifications based on fuzzy models: Algorithms and performance analyses,” *Acta Automatica Sinica*, 30(6): 844-853, 2004.
65. “Structured neural networks for constrained model predictive control,” *Automatica*, 37(8): 1235-1243, 2001.

Recent Conference Papers

1. “EEG-based emotion recognition under convolutional neural network with differential entropy feature maps,” *2019 IEEE International Conference on Computational Intelligence and Virtual Environments for Measurement Systems and Applications* (CIVEMSA), Tianjin, June 2019.
2. “Influence of stimuli color combination on online SSVEP-based BCI performance,” *2019 IEEE International Conference on Computational Intelligence and Virtual Environments for Measurement Systems and Applications* (CIVEMSA), Tianjin, June 2019.
3. “A spiking neural network model mimicking the olfactory cortex for handwritten digit recognition,” *The 9th International IEEE/EMBS Conference on Neural Engineering* (NER), pp: 1167-1170, San Francisco, CA, USA, March 2019.
4. “Learning prototype spatial filters for subject-independent SSVEP-based brain computer interface”, *2018 IEEE International Conference on Systems, Man, and Cybernetics* (SMC), Miyazaki, Japan, Oct. 7-10, 2018.

5. “Area-to-area transfer improves single-channel SSVEP classification”, *The 7th International Brain-Computer Interface* (BCI) *Meeting*, Pacific Grove, CA, May 21-25, 2018.
6. “Between-class CCA for SSVEP based BCI”, *The 7th International Brain-Computer Interface* (BCI) *Meeting*, Pacific Grove, CA, May 21-25, 2018.
7. “Change of brain functional connectivity associate with fatigue in SSVEP-BCI applications”, *The 7th International Brain-Computer Interface* (BCI) *Meeting*, Pacific Grove, CA, May 21-25, 2018.
8. “Neurofeedback improves SSVEP-BCI performance on subject with both ‘high’ and ‘low’ performance”, *The 7th International Brain-Computer Interface* (BCI) *Meeting*, Pacific Grove, CA, May 21-25, 2018.
9. “Adaptive Fourier decomposition based R-peak detection for noisy ECG signals”, *The 39th Annual International Conference of the IEEE Engineering in Medicine and Biology Society*, Jeju, Korea, July 11-15, 2017.
10. “Online optimization of visual stimuli for reducing fatigue in SSVEP-based BCIs,” *The 6th International Brain-Computer Interface* (BCI) *Meeting*, Pacific Grove, CA, USA, May 30 – June 3, 2016.
11. “Fatigue evaluation through EEG analysis using multi-scale Entropy in SSVEP-based BCIs,” *The 6th International Brain-Computer Interface* (BCI) *Meeting*, Pacific Grove, CA, USA, May 30 – June 3, 2016.
12. “Frequency recognition based on wavelet-independent component analysis for SSVEP-based BCIs,” *The 12th International Symposium on Neural Networks*, ISNN 2015, Jeju Island, Korea, October 15-18, 2015. Also in X. Hu et al. (eds.): *Advances in Neural Networks – ISNN 2015*: Lecture Notes in Computer Science 9377, pp. 315-323, Springer International Publishing Switzerland 2015.
13. “Fast basis searching method of adaptive Fourier decomposition based on Nelder-Mead algorithm for ECG signals,” *The 12th International Symposium on Neural Networks*, ISNN 2015, Jeju Island, Korea, October 15-18, 2015. Also in X. Hu et al. (eds.): *Advances in Neural Networks – ISNN 2015*: Lecture Notes in Computer Science 9377, pp. 305-314, Springer International Publishing Switzerland 2015.
14. “Beta/theta ratio neurofeedback training effects on the spectral topography of EEG,” in the *Proceedings of the 37th Annual International Conference of the IEEE Engineering in Medicine and Biology Society*, Milan, Aug. 23-29, 2015.
15. “A multi-channel SSVEP-based BCI for computer games with analogue control,” *2015 IEEE International Conference on Computational Intelligence and Virtual Environments for Measurement Systems and Applications*, Shenzhen, China, June 12-14, 2015.
16. “Reliability and sensitivity analysis on the center of pressure measures in healthy young adults using Nintendo Wii balance board,” *2015 IEEE International Conference on Computational Intelligence and Virtual Environments for Measurement Systems and Applications*, Shenzhen, China, June 12-14, 2015.
17. “Adaptive Fourier decomposition approach for lung-heart sound separation,” *2015 IEEE International Conference on Computational Intelligence and Virtual Environments for Measurement Systems and Applications*, Shenzhen, China, June 12-14, 2015.
18. “Beta/Theta neurofeedback training effects in physical balance of healthy people,” *IUPESM World Congress on Medical Physics and Biomedical Engineering* (IUPESM WC 2015), Toronto, Canada, June 7-12, 2015.
19. “How mental strategy affects Beta/Theta neurofeedback training,” *IUPESM World Congress on Medical Physics and Biomedical Engineering* (IUPESM WC 2015), Toronto, Canada, June 7-12, 2015.
20. “Time varying VEP evaluation as a prediction of vision fatigue using stimulated brain-computer interface,” in H. Lijenstrom (ed.) *Advances in Cognitive Neurodynamics* (IV), pp. 157-160, Springer Science + Business Media Dordrecht 2015.

Professional Affiliations

- Senior Member, Institute of Electrical and Electronics Engineering (IEEE)
- Senior Member, Chinese Society of Biomedical Engineering (CSBME)
- Hong Kong – Macau Joint Chapter, The IEEE Engineering in Medicine and Biology Society: Chair (2017), Executive Committee Member (2017-).
- Chairman of Board of Supervisors, Macau Society of Biomedical Engineering (MSBME) (2014-)
- Editorial Board Member, Scientific Reports

Contact Details

Faculty of Science and Technology
University of Macau, E11
Avenida da Universidade, Taipa,
Macau, China

Room: E11-3055
Telephone: (+853) 8822-4473
Fax: (+853) 8822-2426
Email: fwan@um.edu.mo