

### INFORMATION ON DOCTORAL THESIS

1. Full name : Nguyen The Hoang Anh..... 2. Sex: Male.....  
3. Date of birth: 06/16/1986 ..... 4. Place of birth: Thanh Hoa .....  
5. Admission decision number: 394/QĐ-ĐT ...Dated 06/21/2016  
6. Changes in academic process: .....

*(List the forms of change and corresponding times)*

Thesis title changes:

- Current thesis title: *Methods for processing and classifying Electroencephalographical signal for Brain computer interface applications*

Time of change: Oct. 31<sup>st</sup>, 2019 by suggestions of the Council

- Previous thesis title: *Research and develop machine learning based methods to process and analyze Electroencephalographical signal towards brain computer interface implementation*

Time of change: Approved by supervisors and decision number 489/QĐ-ĐT dated 01/06/2018

- Original thesis title: *Develop style learning model for animators in intangible cultural heritage preservation*

7. Official thesis title: Methods for processing and classifying Electroencephalographical signal for Brain computer interface applications .....

8. Major: Computer science ..... 9. Code: 9480101.01 .....

10. Supervisors: .....

*(Full name, academic title and degree)*

The first supervisor: Assoc. Prof. Dr. Bui The Duy

The second supervisor: Assoc. Prof. Dr. Le Thanh Ha

11. Summary of the **new findings** of the thesis:

New findings of the thesis focus on three types of proposals

(1) processing and enhancing EEG signal quality

- Propose a Deep wavelet sparse autoencoder method for online and automatic electrooculographical artifact removal

- Propose an EOG detection method based on wavelet Haar transform

(2) analyzing and classifying EEG signal

- A method to combine SVM and relative wavelet energy for EEG signal classification

- An Artificial Neural Network approach for electroencephalographic signal classification towards brain-computer interface implementation

- A Robust PCA-SURE Thresholding Deep Neural Network Approach for Mental Task Brain Computer Interface

(3) a complete Brain computer interface for smart home device control

- Propose a complete Brain computer interface model for smart home device control

- Propose stacking ensemble learning model for mental state recognition towards implementation of brain computer interface

12. Practical applicability, if any:

- In Brain computer interfaces

- EEG signal enhancing methods to be integrated into EEG recording devices

- Assistant tools and technologies for mental-related disease diagnosis and treatment

13. Further research directions, if any:

- Improve DWSAE with wavelet package

- BCI implementation with proposed methods

- Deploy DWSAE to remove speech signal and image artifacts and noises

- Research and develop BCIs with paradigms such as P300, sensorimotor, motor imagery, etc.

14. Thesis-related publications: .....

*(List them in chronological order)*

[1] Nguyen The Hoang Anh, Thanh Ha Le and The Duy Bui. A deep wavelet sparse autoencoder method for online and automatic EOG artifact removal. Neural Computing and Applications (2020). <https://doi.org/10.1007/s00521-020-04953-0> (ISI-indexed)

[2] Nguyen The Hoang Anh, T. T. Quyen Bui, Nguyen Truong Thang, Thanh Ha Le, The Duy Bui. A Robust PCA-SURE Thresholding Deep Neural Network Approach for Mental Task Brain Computer Interface. Journal of Informatics and Mathematical

Sciences. Journal of Informatics and Mathematical Sciences 11.3-4 (2019): 383-406. ISSN 0975-5748 (online); 0974-875X (print)

[3] Hoang-Anh The Nguyen, Anh Tuan Do, Thanh Ha Le and The Duy Bui. “A deep sparse autoencoder method for automatic EOG artifact removal”, 2019 19th International Conference on Control, Automation and Systems (ICCAS 2019), Oct. 15~18, 2019; ICC Jeju, Jeju, Korea, ISBN: 978-89-93215-18-2. IEEE.

[4] Nguyễn Thế Hoàng Anh, Huy Hoàng Trần, Anh Tuấn Đỗ, Quốc Vương Đỗ and Thanh Hà Lê. “Phương pháp sử dụng mạng tự mã hóa thưa trong loại nhiễu tín hiệu điện não tự động, theo thời gian thực”, Kỷ yếu Hội thảo Quốc gia CNTT lần thứ 22, 2019.

[5] Hoang-Anh The Nguyen, Thanh Ha Le, The Duy Bui. “A Stacking Ensemble Learning Model for Mental State Recognition Towards Implementation of Brain Computer Interface”, the 2019 6th NAFOSTED Conference on Information and Computer Science (NICS), Dec. 12-13, 2019; Hanoi, Vietnam, p. 39-43, ISBN: 978-1-7281-5162-5. IEEE,

[6] Huy Hoang Tran, Hoang Anh T. Nguyen, Quoc-Vuong Do and Thanh Ha Le. “EOG Detection using Haar Wavelet Transform toward implementation of an IOT Brain computer interface”, Kỷ yếu Hội thảo Quốc gia CNTT lần thứ 21, 2018.

[7] Nguyen The Hoang Anh, Tran, H.H., Vu, T.T. and Bui, T.Q. 2016, October. A combination of independent component analysis, relative wavelet energy, and support vector machine for mental state classification. In Control, Automation and Systems (ICCAS), 2016 16th International Conference on (pp. 733-738). IEEE.

[8] Nguyen The Hoang Anh, Hoang, T.H., Thang, V.T. and Bui, T.Q. 2016, November. An Artificial Neural Network approach for electroencephalographic signal classification towards brain-computer interface implementation. In Computing & Communication Technologies, Research, Innovation, and Vision for the Future (RIVF), 2016 IEEE RIVF International Conference on (pp. 205-210). IEEE.

[9] Nguyễn Thế Hoàng Anh, Trần Huy Hoàng, Bùi Thị Thanh Quyên Phương pháp và hệ thống thu nhận tín hiệu điện não để điều khiển thiết bị điện tử trong ứng dụng nhà thông minh (Đơn sáng chế được Cục Sở hữu trí tuệ, Bộ KH-CN chấp nhận đơn hợp lệ).