Cuong Pham

Biomedical Signal Processing | Machine Learning

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PROFESSIONAL INTERESTS

I have a strong interest in data-driven methods and machine learning for digital healthcare research with the goal of enhancing the digitalization of the computer-aid medical system. I analyze multimodal bio-signal datasets associated to different sub-fields of domain knowledge in cardiology and neuroscience.

My current study focus on digital phenotype monitoring for neurological diseases and mental health illness, by leveraging passive sensing data mining techniques, bio-signal processing, and multimodal AI modelling.

EDUCATION

Ritsumeikan University *Shiga, Japan*

M.Eng. in Advanced Information Science and Engineering *2021 – 2023*

- Thesis Advisor: Koji Kashihara
- Committee: Ruck Thawonmas
- Relevant Courses: *Adv. Topics in Global Software Engineering, Adv. Topics in Communication Science, Adv. Topics in Human Factors for System Engineering, Adv. Topics for Knowledge-based Systems.*

VNU-HCM University of Technology (HCMUT) *HCM, Vietnam*

B.Eng. in Physics Engineering *2015 – 2020*

- Biomedical Engineering Specialization
- Bachelor Thesis: *Studying Imagination of Limb Movement in the Brain-Computer Interface System*
- Relevant Courses: *Numerical Methods, Electrical and Electronics Engineering, Digital Signal Processing, Medical Instrumentation and Labs, Sensors and Measurement Techniques*

WORK EXPERIENCE

VNU-HCM International University (HCMIU) *HCM, Vietnam*

Research Assistant *Nov 2023 – Jul 2024*

- Tech-led core implementation for the Motor Imagery study (advised by Dr. Huong Ha), in the collaborative Brain Computer Interface project with VNU University of Engineering and Technology.
- Supported team members in experimental protocol design and calibration with PsychoPy x Electroencephalogram (EEG) data acquisition & management tasks. Taught basic EEG signal processing with Python to undergrad students.
- Analyzed the collected EEG signals: processed and serialized large datasets; developed AI/ML models for classification tasks; benchmarked performance with other data sources; deployed and maintained web apps for data analysis and visualization.
- Researched and developed online-BCI modelling for mouse control system. Proposed the paradigm for offline/online evaluation with real users. Collaborated with the software developer team to build a customized app incorporating user configuration, and user-interface controller.

HATO Medical Technologies Aps *Odense, Denmark*

Machine Learning Engineer *Jun 2022 – Nov 2023*

- Worked with cardiologists and health-tech startup stakeholders to standardize labelling diagnosis for customized usage cases at a local Danish emergency department. Conducted literature reviews, technical documentation, writing materials for research grants.
- Collected and handled electrocardiograph data from public and clinical sources. Designed pipeline for large-scale data processing, data cleaning, and cross-source labelling alignment. Collaborated with software developers to integrate data serialization pipline into in-house product's backend.
- Developed AWS-based internal data management with interactive web app. Conducted training and monitoring ML/AI models on time-series data; deployed models on Cloud machine for real-time abnormalities classification and interpretation, adapted to technical requirements.

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Ritsumeikan University *Shiga, Japan*
Graduate Research Assistant (M.Eng student) *Sep 2021 – Jul 2023*

- Studied the physiological remote photoplethysmography dataset to design pipeline with customized facial ROI tracking, unsupervised optical models, and a deep denoising auto-encoder to enhance forehead-based remote pulse signal.
- Conducted experiments with healthy subjects: synchronized facial video and blood volume pulse signal; collected data with multiple camera settings & subject constraints. Evaluated heart rate benchmarks among different configurations with conventional methods and statistical analysis.
- Investigated the feasibility of stiffness feature assessment via camera on a public RPPG dataset, by using real-time Face-Mesh tracking, a deep 3D-CNN model, and morphology feature extraction technique.

GTOPIA Vietnam. Ltd *HCM, Vietnam*
Signal Processing Engineer *Jan – Jun 2020*

- Designed pipeline for commercial biosensor-based wristbands for data interpretation, including setup API for raw data extraction and cleaning. Conducted research on signal processing and hemodynamic modeling on vital signs data. Compared wearable device's performance under different usage scenarios.
- Partially worked at Ho-Chi-Minh-Heart-Institute for large-scale clinical data collection. Processed, categorized, and digitalized health records of cardiovascular patients.

Biomedical Electronics Laboratory, Shibaura Institute of Technology *Tokyo, Japan*
Research Intern *Sep – Nov 2019*

- Involved data acquisition activities within the Brain Computer Interface experimental team including Auditory and Motor Imagery studies. Conducted research on EEG visualization for motor cortex response neurofeedback. Results were applied to the undergraduate thesis's experiment concept.

Faculty of Applied Science, VNU-HCM University of Technology *HCM, Vietnam*
Undergraduate Research Assistant *Sep 2018 – Mar 2019*

- Tech-lead of a faculty's grants for "stationary bike" project. Designed electrical circuits to automatically adjust the workload adapting to the heart rate acquired via Electrocardiograph signal.
- Conducted a long-term endurance training course for university students, with expert consultations from HCMC Institute of Biomedical Physics, to evaluate maximum oxygen consumption improvement.

PUBLICATIONS

Peer-reviewed Conference Papers

- **C. Pham** and K. Kashihara (2022, March), A Hybrid Controller for Multiple Drug Infusion in Heart Failure using Convolutional Neural Network. *In 2022 IEEE 4th Global Conference on Life Sciences and Technologies (LifeTech) (pp. 340-344).*
- Nguyen, M. T. D., **Pham, C. Q.**, Nguyen, H. N., Le, K. Q., & Huynh, L. Q. (2022), A Statistical Approach to Evaluate Beta Response in Motor Imagery-Based Brain-Computer Interface. In 8th International Conference on the Development of Biomedical Engineering in Vietnam (pp. 203-217).

Poster and Oral Presentations

- Design, implement and evaluate neurofeedback strategies for improving subjects' performance of a motor imagery BCI system. *In the 10th International Conference on the Development of Biomedical Engineering in Vietnam (BME10) – Phan Thiet, Vietnam [July 2024]*
- Evaluation of Cue-based Protocol Implementations in Motor Imagery - based Brain-Computer Interface Experiments. *In the NeuroCoB Society's Brainconnects Hybrid Joint International Neuroimaging Conference & fMRI/PET-CT Workshop (NSNC2024) – Putrajaya, Malaysia [June 2024]*
- Exercise Physiology: Improving Stationary Bike Training Performance Using Heart Rate Variability. *In the Proceedings of International Symposium on Applied Science 2019 (ISAS 2019) – Ho Chi Minh, Vietnam [October 2019]*

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- Research into the relationship between cardiac responses and neural activity to improve classification of EEG-based imaginary action. *In the 6th International Conference on Applied and Engineering Physics (CAEP 2019)- Thai Nguyen, Vietnam [October 2019]*
- Exercise Physiology Application: Cardiac endurance training for students by stationary bike. *In the 13th Southeast Asian Technical University Consortium Symposium (SEATUC 2019) - Ha Noi, Vietnam [March 2019]*

Thesis

- Remote Photoplethysmography Assessment Using Deep Learning. *Master Thesis @ Ritsumeikan University. [Aug 2023]*

AWARDS

- 2nd prize in Startup Weekend Kyoto Competition, by Techstars x KYOTO Design Lab *Aug 2022*
- Gakkai Conference Scholarship by Ritsumeikan University *Feb 2021*
- Monbukagakusho (MEXT) by Japanese Government *Sep 2021*

ACADEMIC ACITIVITIES

* TEACHING

Graduate Teaching Assistant @ CECS, VinUniversity *Sep 2024 – now*

- Course: *Computer Vision (COMP3040).* I prepared quizzed and instructed several hands-on programming practice lab sessions on image processing and machine learning application topics.

Graduate Teaching Assistant @ CISE, Ritsumeikan University *Sep 2022– Jan 2023*

- Course: *Experiments in Artificial and Natural Intelligence.* I instructed students to conduct various experiments with ECG, EMG sensors and to analyze data, using designated equipment/software in the laboratory.

* PROJECTS

Tech-lead | Global Software Engineering course @ GSISE, Ritsumeikan University *Sep 2022 – Jan 2023*

- Team of 7 collaborate with TH-Nurnberg (Germany). Proposed topic mobile solution to recommend the collection time of full trash bins in public spaces using crowdsourcing data. Developed a proof-of-concept model to integrate into Android app features. Evaluated on the preliminary collected data in Shiga, Japan.

Leader | Freelance project @ VNU-HCM University of Technology *Mar– Jul 2017*

- Team of 6; designed a proof-of-concept product of a low-cost device to feed the pet automatically and delivered to our reserved clients. Involved in the process of 3D printing, material, and mechanical design. In charge of designing electrical circuits, programming systems, and IoT platforms with ESP8266 x Blynk (link).

* COMMUNITIY INVOVLEMENT

Teaching Assistant @ CISE, Ritsumeikan University *Jan 2023*

- I organized activities and taught English (speaking / presentation skills) for junior students to attend J2 World Summit Competition at Ritsumeikan University, Kyoto, Japan.

Technical Staff @ IEEE/RSJ International Conference on Intelligent Robots and Systems *Oct 2022*

- Organized guidance information desk; managed attendees' invitations and their materials; set up PC software and equipment at the venue site. In charge of webinar session operations and supported the chair host with technical issues.

Lab Support Group @ VNU-HCM University of Technology *Sep 2020 – Apr 2021*

- I host a weekly knowledge sharing session among Biomedical Engineering Lab members concerning technical issues and practical tips in Polysomnography (PSG) sleep studies. I teach junior undergrad students on EEG analysis with Matlab.

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SELECTED SKILLS

- **Programming**: Python, Jupyter/Colab, Matlab, R, Linux, Git (Jira)
- **Data Analysis**: MySQL, Pandas, Numpy, Scipy, ANOVA,
- **Machine Learning**: Scikit-learn, Keras, PyTorch, Keras, different boosting models
- **Computer Vision**: OpenCV, DeepStream
- **Miscellaneous Tools**: Git, Scrum (Jira), Cloud (AWS), Webapp (Streamlit, Flask)
- **Circuits/Hardware**: Arduino, ESP8266, Raspberry Pi
- **Signal Processing:** spectral analysis, signal transformation, signal filtering, time-frequency analysis
- **Language:** Vietnamese (native), English (fluent)

REFERENCE

Hieu Pham, Ph.D.
Assistant Professor, College of Engineering & Computer Science (CECS),
Scientific Director, Entrepreneurship Lab (E-lab) at VinUniversity.
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Huong Ha, Ph.D.
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