

# Quy Phuong Le

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🎓 Google Scholar | 🌐 Personal Website | 📁 Portfolio | 🐙 Github | in LinkedIn

## Education

### Pukyong National University

Mar 2024 – Feb 2026

#### MS Degree in Industry 4.0 Convergence Bionics Engineering (Full time)

Busan, Republic of Korea

- GPA: 4.17/4.5
- Thesis Topic: Edge Computing Approach for Golf Club Path Recognition using Self-Supervised Learning

### Ho Chi Minh City University of Technology

Aug 2019 – Nov 2023

#### BS Degree in Mechatronic Engineering (Full time)

Ho Chi Minh, Vietnam

- GPA: 8.22/10 (Honors Program)
- Thesis topic: Damage detection of steel beam using CycleGAN

## Research Experience & Projects ■

### NanoBioMechanics Laboratory (NBMLab) 🌐

Mar 2024 – Present

#### Research Assistant, Dept. of Industry 4.0 Convergence Bionics Engineering

Busan, Republic of Korea

During my time at NBM Lab, I developed intelligent systems integrated with AI for smart devices to support senior healthcare applications and sports analytics. I designed and implemented real-time data acquisition pipelines for motion analysis. My research focuses on signal processing, machine learning for biomedical applications collected from smart devices.

#### 1. Smart Wearable Devices for Golf Swing Analyzer System

(📺 Video, 🐙 Code)

- Investigate sensor-based biomechanical modeling for golf swing analysis using wearable inertial and pressure sensors (smart gloves, smart belts, smart insoles).
- Develop algorithms for preprocessing, denoising, feature extraction, and reconstruction of swing motion using an unsupervised latent-space model.
- Propose a similarity scoring metric to compare user motion against expert trajectories quantitatively.
- Conduct experimental evaluation on real swing data; achieve 92% improvement in estimation over baseline methods.
- Built a visualization interface to support human-computer interaction experiments.

#### 2. Non-contact Sensor Vital Signs Monitoring System in Acupuncture

(📺 Video, 🐙 Code)

- Design a non-contact physiological monitoring system capturing BCG signals via a PVDF sensor.
- Develop a hybrid deep-learning architecture integrating GRU and multi-head attention for temporal physiological signal modeling.
- Achieve an MAE of 1.43 bpm for heart rate, respiration rate estimation on the collected dataset.
- Build a cloud-based pipeline and real-time visualization; the system was evaluated on patients in acupuncture.

#### 3. Smart Device with Sensors Fusion for Vital Signs Monitoring

(📺 Video, 🐙 Code)

- Develop a smart chair integrating multiple sensors (BCG, PPG, ECG) to monitor physiological signals continuously.
- Implement sensor fusion algorithms to enhance accuracy in heart rate and respiration measurement.
- Design an AI-assisted system for health status detection and anomaly identification in real time.

#### 4. Wireless body sensor network for motion capture

(📺 Video, 🐙 Code)

- Develop a wireless sensor network to collect and process data from multiple sensor nodes.
- Design a system to reconstruct body movements based on real-time sensor data.
- Implement data synchronization and optimized communication protocols for accurate motion analysis.

### UID Laboratory 🌐

Oct 2021 – Jan 2024

#### Research Assistant, Dept. of Mechanical Engineering

Ho Chi Minh, Vietnam

At UID Lab, I worked on hands-on projects in Machine Learning and Artificial Intelligence. I explored embedded systems and robotics to integrate software and hardware for signals. In addition, I conducted research in signal processing, machine learning algorithms, and deep learning architectures to design and implement neural network modules.

#### 1. PPG Signal and Application in the Medical

(🐙 Code)

- Research and design embedded systems and PCB for PPG signal measurement using the heart rate
- Develop MCU with RTOS and BLE capabilities for signal acquisition and transmission.

## 2. Study on Damage Detection of Steel Beam Using AI

- Utilizing vibration data through signal processing, for anomaly detection in steel beams.
- Develop and deploy using the CycleGAN architecture. Vibration data is encoded to lower dimension and three-sigma rule to detect and visualize damage.

## Technical Skills

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**Programming:** C/C++, C#, Python, Matlab

**Machine Learning & Edge AI:** PyTorch, TensorFlow, Quantization, Pruning, ONNX, TFLite

**Embedded Systems:** MCU, PCB Design, Sensors and Actuators, Analog Front End, RTOS

**IoT & Cloud Integration:** Firebase, Azure, MQTT, TCP/IP, UDP

**Tools:** Bash, Docker, Git, CUDA, TensorBoard

## Publications

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[J.1] Truong Tien Vo\*, **Quy Phuong Le\***, Huynwoo Jung\*, et al. (2025). **Multi-Sensor Smart Glove With Unsupervised Learning Model for Real-Time Wrist Motion Analysis in Golf Swing Biomechanics**. *IEEE Internet of Things Journal*, 12(11), pp. 16574–16586. (Co-First) (**Q1**, IF **8.9**, Top **4.1%**)

[J.2] Thanh Tung Luu, Duc Thien An Nguyen, **Quy Phuong Le**, et al. (2024). **Fatigue Damage Quantification for Structural Health Monitoring of Steel Beam Using CycleGAN**. *Journal of Engineering Science and Technology*, 19(2), pp. 705–724. (Q3, IF 0.5, Indexed by Scopus)

[J.3] **Quy Phuong Le**, Truong Tien Vo, Dogeon Ha, et al. (2025). **On-Chip Machine Learning For In-home Patient Monitoring Using Non-Contact Ballistocardiogram-Based Bed Sensor**. Manuscript is in revision for publication in *IEEE Internet of Things Journal*. (**Q1**, IF **8.9**, Top **4.1%**)

[J.4] Truong Tien Vo\*, **Quy Phuong Le\***, Trong Nhan Nguyen, et al. (2025). **Multi-Task Non-Contact Ballistocardiogram Based Vital Signs Monitoring in Acupuncture**. Manuscript is in revision for publication in *Computers in Biology and Medicine*. (Co-First) (**Q1**, IF **6.3**, Top **5.2%**)

[J.5] **Quy Phuong Le**, Dogeon Ha, Huynwoo Jung, et al. (2025). **On-Device Club Path Recognition with Self-Supervised Learning for Golf Analysis**. Manuscript submitted to *IEEE Sensors Journal*. (**Q1**, IF **4.5**, Top **19.6%**)

[J.6] Dogeon Ha, **Quy Phuong Le**, Truong Tien Vo, et al. (2025). **Golf Swing Measurement with Real-Time Sweet Spot Detection using High-Speed Vision and Deep Neural Network**. Manuscript is accepted for publication in *Measurement Science and Technology*. (**Q1**, IF **3.4**, Top **20.4%**)

[J.7] Truong Tien Vo, Huu Sang Nguyen, Le Hai Tran, **Quy Phuong Le**, et al. (2025). **Multimodal Smart Clothing with Haptic Feedback for Real-Time Muscle Activation Assessment in Self-Coaching Fitness**. Manuscript submitted to *IEEE Internet of Things Journal*. (**Q1**, IF **8.9**, Top **4.1%**)

## Awards

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2025 PKNU Fire Grant – Awarded to students who publish excellent research papers.

2025 Brain Korea BLUE Scholarship Award – Awarded to outstanding graduate students.

## References

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### Prof. Junghwan Oh

Full Professor

Department of Biomedical Engineering

Pukyong National University, Republic of Korea

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### Prof. Sudip Mondal

Assistant Professor

Institute of Information Technology and Convergence

Pukyong National University, Republic of Korea

✉ [smondal@pknu.ac.kr](mailto:smondal@pknu.ac.kr)

### Prof. Jae Sung Ahn

Assistant Professor

Smart Gym-Based Translational Research Center for Active Senior's Healthcare

Pukyong National University, Republic of Korea

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