Quang-Huy Nguyen

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Research Interest

My research interests are *meta-learning*, *domain adaptation*, and *black-box optimization* for general *computer vision* problems. In particular, I am aiming to develop computer vision models that can be optimized with minimal training data or less human supervision and effectively generalize into other domains out of training. I am also interested in exploring the connection between *optimization* and *deep learning*, toward lifelong and open-world machine learning systems.

Education

- **Bachelor in Computer Engineering**   August 2015 - May 2020
  University of Information Technology, VNU-HCM
  - **Graduate thesis**: Detection and classification on sensitive images and videos using deep learning neural network
  - **Thesis grade**: 9.8/10 (highest thesis score in the class)

Research Experience

- **FPT Software AI Center – AI Residency Program**   August 2023 - Now
  AI Research Resident – *Advised by*: Assist. Prof. Dung D. Le   Ho Chi Minh City, Vietnam
  - **Zero-shot Object-level Out-of-distribution Detection**: Proposing a new setting for object-level OOD without access to the training data, considering object detector as black-box function. Leveraging off-the-shelf Diffusion Models to replace detected objects with in-context inpainting, thus recognizing OOD objects that are erroneously predicted by the object detection. (collaborate with team of Prof. Kilian Q. Weinberger, Cornell University).

- **College of Engineering and Computer Science, VinUniversity**   November 2022 - July 2023
  Research Assistant – *Advised by*: Assist. Prof. Dung D. Le   Ha Noi, Vietnam
  - **Multi-objective Black-box Optimization**: Exploring Multi-Objective Black-box Optimization and the unstable performance of Pareto Front Learning when optimizing based on the surrogate Gaussian Process. Developing a two-stage Pareto Set Learning algorithm based on a warm-starting Bayesian Optimization and model re-parameter to stabilize the performance (preprint on arXiv).

- **VinUni-Illinois Smart Health Center, VinUniversity**   January 2022 - June 2022
  Research Assistant – *Advised by*: Assist. Profs. Dung D. Le and Hieu H. Pham   Ha Noi, Vietnam
  - **Few-shot learning for healthcare**: Proposing a new cross-attention mechanism based on Cosine Similarity for a better attention map that further emphasizes the correlation between labeled support and unlabeled query representations. Therefore enhancing transformer-based few-shot algorithms under various settings and scenarios for Few-shot Image Classification (paper accepted at IEEE Access).

- **Department of Computer Engineering, UIT, VNU-HCM**   July 2019 - December 2021
  Undergraduate/Postgraduate Research Student – *Advised by*: Assoc. Prof. Duc-Lung Vu   Ho Chi Minh City, Vietnam
  - **Detecting and classifying sensitive visual content**: Conducting a study on object detection algorithms and designing a pipeline for the adult website filtering system. Designing pipelines for improving Mask R-CNN for video object detection/classification tasks. Building a large-scale instance segmentation dataset for NSFW content.

Selected Preprints and Publications

[1] **Quang-Huy Nguyen***, Jin Peng Zhou*, Zhenzhen Liu, Khanh-Huyen Bui, Kilian Q. Weinberger, and Dung D. Le. Zero-Shot Object-Level Out-of-Distribution Detection with Context-Aware Inpainting. *under review*, 2024.

[2] **Quang-Huy Nguyen***, Long P. Hoang*, Hoang V. Vu, and Dung D. Le. Controllable Expensive Multi-objective Learning with Warm-starting Bayesian Optimization. *under review*, 2024.

[3] **Quang-Huy Nguyen**, Cuong Q. Nguyen, Dung D. Le, and Hieu H. Pham. Enhancing Few-shot Image Classification with Cosine Transformer. *IEEE Access*, 2023.

Research Blogs and Writings

- **Multi-objective Optimization**   July, 2023
  Writing Blog
  Introduction about the Multi-objective Optimization problems for Multi-task learning, their variants, and basic methods for solving the problem.

- **Bayesian Optimization**   December, 2022
  Writing Blog
  Introduction about Bayesian Optimization and its core mechanism with Gaussian Process for surrogate model and Expected Improvement for acquisition function.

- **Introduction to Probability**   September 2022
  Writing Blog
  Summarization of the key concepts of Statistics and Probability (Bayes theorem, random variable, distributions) and their application for basic probabilistic Machine Learning algorithms.

- **Few-shot Learning**   April, 2022
  GitHub Repository
  Summarization of some basic concepts and baseline approaches for few-shot learning. Review and summarize few-shot learning methods for computer vision tasks.

- **Transformers4Vision**   December, 2021
  GitHub Repository
  Summarizing core ViT-based algorithms and basic self-attention mechanisms for computer vision tasks (image classification, object detection, image segmentation).

Honors, Activities, and Awards

- **VSSS'10 Science-A-Thon Challenge – Second-prize Award**   August 26th, 2023
  10th Vietnam Summer School of Science, ICISE

- **10th Vietnam Summer School of Science (VSSS'10)**   August, 2023
  International Centre for Interdisciplinary Science and Education, Rencontres du Vietnam Foundation, & VIASM

- **UIT Office of Excellent Programs Scholarship – Full Scholarship**   Fall 2019
  Office of Excellent Programs – UIT (for student with highest GPA in the faculty)

- **UIT Encouraging Scholarship**   Fall 2018/2019
  Office of Student Affairs – University of Information Technology

- **Science Camp: Artificial Intelligence: Fundamental & Application**   October 2019
  Danang University of Science and Education & Japanese Advanced Institute of Science and Technology

- **Summer Course: Introduction to Machine Learning**   June, 2019
  Ho Chi Minh City University of Science & North Carolina State University

Research and Technical Skills

- **Research Domains**: computer vision, machine learning, meta-learning, domain adaptation, optimization

- **Research Skills**: problem formulation, academic writing, visualization, implementation, data analysis

- **Language**: Vietnamese (native), English (fluent)

- **Programming Languages**: Python

- **Deep Learning Frameworks**: PyTorch, TensorFlow

- **Technologies**: OpenCV, Numpy, Matplotlib, Einops, Pymoo, WandB, Bash Shell, VIM, Draw.io, LaTeX

REFERENCES

1. **Assoc. Prof. Duc-Lung Vu** (Ph.D.), University of Information Technology, Vietnam National University – HCM City.
   lungvd@uit.edu.vn

2. **Assoc. Prof. Tam Nguyen** (Ph.D.), Department of Computer Engineering, University of Dayton.
   tamnguyen@udayton.edu

3. **Assist. Prof. Dung D. Le** (Ph.D.), College of Engineering and Computer Science, VinUniversity.
   dung.ld@vinuni.edu.vn