Hoang Trieu Vy LE

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📍 Paris, France

Research engineer working on large-scale computer vision tasks, deep learning, generative AI, and image processing.

EDUCATION

SEPT 2020 DEC 2023	**Doctor of Philosophy (Ph.D.) AI, Image & Signal Processing** — ECOLE NORMALE SUPÉRIEURE DE LYON Focus: Lightweight Deep Learning Model	Advisor: Prof. Nelly Pustelnik, Dr. Marion Foare Thesis: Variations on Mumford-Shah functional for edge detection in degraded images: from proximal algorithms to unrolled architectures [1]
SEPT 2015 SEPT 2020	**M.Sc. Engineer in Applied Mathematics** — INSA TOULOUSE Focus: Signal & Image Processing, Optimization, Computer Vision, Machine Learning

WORK EXPERIENCE

FEB 2024 — PRESENT

Research Engineer — CEA-LIST—DIGITEO LABS, SACLAY, FRANCE

AI research engineer role in an European project on the tomographic inspection of cargo transport

- Perform research on cutting-edges approaches such as Vision Transformer-based model, Generative models including Diffusion Models, multimodals for 2D tomographic reconstruction.
- Develop toolboxs, author research papers, create presentations, and strategize about new research agendas in collaboration with teams of scientists, engineers, and product group leaders

Achievements:
- Developed a powerful lightweight unfolded neural networks to remove streak artifact in tomographic reconstruction.
- Collaborated with Vision Labs at the University of Antwerp to develope and simulate new CT reconstruction datasets to support the training and evaluation of various deep learning methods. [2]

FEB 2022 — JUNE 2024

Teaching Assistant — EPITA—SCHOOL OF ENGINEERING & COMPUTER SCIENCE, FRANCE

- Developed hands-on courses in Signal & Image processing and Fundamental Machine learning

AUG 2021 — DEC 2023

Research Scientist — PHYSICS LABS — ÉCOLE NORMALE SUPÉRIEURE DE LYON, FRANCE

Worked towards unfolded Neural Networks for: edge detection, segmentation, image restoration

Achievements:
- **BZ-PNN** [3]: Designed high-performance, lightweight models ($\sim 10^4$ fewer parameters compared to SOTA models) focusing edge detection by combining a robust unfolded Neural Network and a simple learnable edge detection layer.
- **Proximal Neural Networks** [4]—[5]: Introduced a novel, highly effective and lightweight neural network designed for image restoration, aimed at creating robust, interpretable deep learning denoising models. An open-source library is available for training and testing, requiring only a small dataset [source]
- **DSH** [6]: Designed a novel Deep Learning architecture to solve large scale texture segmentation playing a critical role in experimental physics for estimating the phases of contact areas, helping at the identification of hydrodynamic regimes

SEPT 2020 — AUG 2021

Visiting Researcher — INMA— UC LOUVAIN, BELGIUM

Worked in Advanced Mathematical Labs to attack large-scale machine learning & optimization problems

- **P-DMS-AT** [7]: A fast algorithms to solve large scale for joint image restoration and edge detection followed by a new strategies of tunning hyperparameters [source]

JAN 2020 — AUG 2020

Research Engineer — OGOXE-MÉTEO FRANCE

Worked on a start-up towards a machine learning solution for river-flow velocity estimation, forest fire prediction

- Developed a Python toolbox and integrated it on edge devices for estimating river-flow velocity using the Particle Image Velocimetry (PIV) method
- Researched and integrated advanced machine learning solutions on edge devices for forest fire prediction in the south of France

JUL 2019 — OCT 2019

Research Engineer — IMFT (TOULOUSE FLUID MECHANICS INSTITUTE), FRANCE

Focus on High Performance Computing, multi-GPU

- Developed the novel **Bucketing-based algorithm** for particles method to faster solve diffusion equation by parallelizing the mesh-less model using MPI-Fortran, Python [source]
- Simulated experiments and compared with the state-of-the-art method to validate the calculating performance
- Wrote hands-on documentation for the software tools

Core Competencies

Optimization, Proximal algorithms, Unfolded Neural Networks, Machine learning, Image Processing, Computer vision Machine Learning (ML), Artificial Intelligence (AI), Generative AI, Research & Innovation, Lightweight ML Systems, Global Interdisciplinary Collaboration, Talent Development, Mentoring

Technical

- **Programming Languages**: Python, MATLAB, Julia, C\C++, Fortran
- **Tools**: AWS, Google Cloud, Docker, PyTorch, TensorFlow, SciKit, Python, Java, C++, CUDA, LaTeX, OpenCV, Jupyter Notebook, Pandas, Git, Visual Studio, Shell, Linux, Anaconda, OpenCV, ONNX, Pycharm, TMUX
- **Concepts**: Unfolded Neural Networks, Generative Modeling, Hyperparameter Optimization, Computer Vision (CV), Few-shot Learning, Time-Series Data
- **Languages**: French (Fluent) , English (Fluent), Vietnamese (Native)

Workshops and Invited Talks

Nov 2023 — "PNN: From proximal algorithms to robust unfolded image denoising networks and Plug-and-Play methods" presented at Workshop DIPOpt

Aug 2022 — "The faster proximal algorithm, the better unfolded deep learning architecture ? The study case of image denoising" presented in EUSIPCO, Belgrade, Serbia

Mar 2021 — "Discrete Exterior Calculus framework and proximal alternating minimization for solving discrete Mumford-Shah and Amborsio-Tortorelli models" presented at Conference on Digital Geometry and Discrete Variational Calculus .

Jul 2021 — "Proximal alternating minimization for solving discrete Mumford-Shah and Amborsio-Tortorelli models" presented at workshop on continuous optimization EUROPT

Awards

2015 — Third prize in Vietnam National Physics Olympiad
2014 — Fourth prize in Vietnam National Physics Olympiad
2013 — Silver medal, Northern Regional Vietnam Physics Olympiad

Selected Publications

[1] Hoang Trieu Vy Le, *Variations on the Mumford-Shah functional for interface detection in degraded images: from proximal algorithms to unrolled architectures*, Ph.D. thesis, Ecole normale supérieure de lyon-ENS LYON, 2023.

[2] Caroline Bossuyt, Arjan den Dekker, Domenico Iuso, Hoang Trieu Vy LE, Julie Escoda, Marius Costin, Jan Sijbers, and Jozef De Beenhouwer, "Deep image prior for sparse-view reconstruction in static, rectangular multi-source x-ray CT systems for cargo scanning," in *Developments in X-Ray Tomography XV*, Bert Müller and Ge Wang, Eds. International Society for Optics and Photonics, 2024, vol. 13152, p. 131520Y, SPIE.

[3] Hoang Trieu Vy Le, Marion Foare, Audrey Repetti, and Nelly Pustelnik, "Embedding blake-zisserman regularization in unfolded proximal neural networks for enhanced edge detection," 2024.

[4] Hoang Trieu Vy Le, Nelly Pustelnik, and Marion Foare, "The faster proximal algorithm, the better unfolded deep learning architecture ? the study case of image denoising," in *2022 30th European Signal Processing Conference (EUSIPCO)*, 2022, pp. 947–951.

[5] Hoang Trieu Vy Le, Audrey Repetti, and Nelly Pustelnik, "Unfolded proximal neural networks for robust image gaussian denoising," *IEEE Transactions on Image Processing*, vol. 33, pp. 4475–4487, 2024.

[6] Hoang Trieu Vy Le, Barbara Pascal, Nelly Pustelnik, Marion Foare, and Patrice Abry, "Algorithmes proximaux rapides déroulés pour l'analyse d'images fractales homogènes par morceaux," in *GRETSI*, 2022.

[7] Hoang Trieu Vy Le, Marion Foare, and Nelly Pustelnik, "Proximal based strategies for solving discrete mumford-shah with ambrosio-tortorelli penalization on edges," *IEEE Signal Processing Letters*, vol. 29, pp. 952–956, 2022.

Additional experience

- Mentored multiple undergraduate students at ENS Lyon
- Served as Reviewer for IEEE Transactions on Signal Processing
- Served as teaching assistant for Machine Learning and Optimization hands-on courses at ENS Lyon.