HA MANH LUU

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PERSONAL STATEMENTS

- I do research for a better life, for a better science community and for a better health care.
- Creating novel methods is good but making them useful and impactful is great.
- Learning is a lifelong process, and problem-solving is what I learnt for.

ACADEMIC POSITIONS

2023-present	**Research Associate** Department of Radiology, Weill Cornell Medical College (Cornell University)
2021-2023	**Postdoctoral Fellow** University of Engineering and Technology (Vietnam National University)
2017-2023	**Lecturer** University of Engineering and Technology (Vietnam National University)

EDUCATION

2011-2017	**Ph.D. in Medical Imaging (Health science)** Erasmus Medical Center **(**Erasmus University)
2007-2010	**M.S. in Electrical and Electronics Engineering** University of Engineering and Technology (Vietnam National University)
2003-2007	**B.S. in Electrical and Electronics Engineering** University of Engineering and Technology (Vietnam National University)

KNOWLEDGE AND SKILLS

- **OS**: LINUX, Windows (WSL2) and MAC platform
- **Medical image processing tools and libraries:** ITKsnap, FreeSurfer, FSL, Mevislab, 3D Slicer, ANTs, Elastix, ITK, VTK, OpenCV, Pytorch, Numpy, Sklearn, Pandas, Pydicom, nibabel, TorchIO, Matplotlib, Jupyter notebook, Pyradiomics
- **Programming:** Bash scripting, MATLAB, Python, C/C++,
- **Hardware integration:** Serial port communication, microcontrollers, PLC

AREA OF INTEREST

- Medical Image Processing
- Biomedical Signal Processing
- Deep Learning / Machine Learning / Artificial Intelligence

- MRI Image Reconstruction & Analysis
- Image Guided Interventions
- Radiation therapy

WORK EXPERIENCE

2023-present **Research Associate at Weill Cornell Medical College (Full-time)**

- ***Research project***: *Paramagnetic Rim Lesion Detection and Segmentation on QSM*
  I developed and evaluated an automatic tool to detect and segment paramagnetic rim lesions in multiple sclerosis (MS) on Quantitative Susceptibility Mapping (QSM). This tool helps to reduce 95% of the manual burden of medical experts in identifying paramagnetic rim lesions.

- ***Other responsibilities:***
  1. Perform daily MRI processing in a pipeline for MS patients using bash scripting on LINUX. This work contains multiple steps such as QSM processing, DTI processing, multi-contrast MRIs co-registration (T2FLAIR, T1w, T2w, DTI, QSM, PHASE, MWF and FASTT2), MS lesion segmentation on T2FLAIR and Freesurfer processing.
  2. Perform troubleshooting for FreeSurfer reconstruction of MS subjects. In this work, I also contribute to a project to develop a tool to reduce the troubleshooting time. By using my developed tool, the troubleshooting time for a difficult case reduces from approximately 1 hour to 15 mins on average.
  3. Perform MS lesion segmentation/labeling correction on T2FLAIR images for the cases in which MS lesion segmentation/labeling by automatic method are not accurate.
  4. Perform image database management, bug reporting, data pulling, and image analysis to support neurologists, data scientists, and research scientists on clinical research projects.
  5. Train junior researchers in using tools such as ITKsnap, FreeSurfer, and bash scripting to carry out their research projects.
  6. Maintain, upgrade, and troubleshoot MAC PC, workstations, and storage for the laboratory.
  7. Perform MRI scanning.

2021-2023 **Postdoctoral Fellow in Vietnam National University (UET) (Part-time)**

- ***Research projects:***
  1. ***Project 1: Quantification of liver-lung shunt fraction on 3D SPECT/CT images for selective internal radiation therapy of liver cancer***

  I led a team to develop Inspect.Liver tool based on CNN and image registration to qualify liver-Lung shunt fraction (LSF) on 3D SPECT/CT images for selective internal radiation therapy (SIRT) of liver cancer. The experimental results show that, by using the developed tool, nuclear medicine doctors can obtain more accurate LSF compared to the conventional method on the Planar image currently used in clinical practice.

2. ***Project 2: 3D medical images compression for liver teleinterventions***

I designed and contributed to the development of an image compression framework to compress the liver CT image in the liver cancer intervention room to transmit on a tele intervention system. The developed framework was able to efficiently reduce the image capacity to 1/6 compared to that of the original image while preserving the visual image quality of the liver region.

3. ***Project 3: Automate scan range of the liver in dose reduced, multiphase CT of the liver***

I designed a CNN-based framework for automatically determining the scan range of the liver in contrast enhanced CT imaging of liver cancer interventions. This helps to reduce 14% of the effective radiation dose on the patients compared to that from conventional scanning of selective internal radiation therapy of liver cancer.

- ***Other responsibilities:***
  1. Assisted the PI to perform laboratory management and maintain workstations of the laboratory.
  2. Organized lab member presentations and quest seminars.
  3. Assisted the PI in teaching courses.
  4. Assisted the PI in organizing conferences.
  5. Supported other junior researchers in their research projects.

2018-2020 **Scientific Consultant in Ecovision company (Part-time)**

- ***Project 1: Primary student face recognition and counting***

  I consulted with a research group in developing a smartphone-based system to recognize and count students on buses from home to school. This project is to help the teachers to prevent students from accidentally being left on the bus.
- ***Project 2: Football players tracking***

  I consulted with a research group in developing a camera-based system to track football players on a field in a football match. This helps to measure statistical performance and positions of the football players during the match.
- ***Project 3: Karyotyping of G-band chromosome***

  I led a team in designing and developing BioChrom.AI, a deep learning-based tool to improve the karyotyping procedure of G-band chromosomes. This tool improves the accuracy of automatic classification of the chromosome images from 87.6% to 95.9%, compared to a conventional tool.

2017-2018 **Research Scientist in VP9 company (Part-time)**

- ***Project: Car plate recognition and tracking***

  I developed a method in C++ to track multiple cars via traffic camera in real-time. The success of this project helps the company success in signing a 200k USD commercial contract.

2017-2023 **Lecturer in Vietnam National University (UET) (Full-time)**

- **Teaching:** I taught several undergraduate and graduate courses in the university:
  1. Signals and systems (ELT2035)
  2. Digital signal processing (ELT3144E)

3. Signal Processing and Bio-medical Imaging (ELT3095)
4. Introduction to Bio-medical image processing (ELT301)
5. Electronics and Communication Practice (ELT3086)

- **Mentoring:** I supervised graduate and undergraduate students to perform their research projects and theses
  1. ***Project 1: Improving classification of curved chromosomes in karyotyping using CNN-based deformation***
     I supervised an undergraduate student who developed a method to straighten chromosome images, which helps to improve the classification accuracy using a CNN network. This work was presented in an oral session in Statistical Signal Processing Workshop.
  2. ***Project 2: Cardio-vascular pulses estimation for dengue fever screening via continuous-wave Doppler radar***
     Under my supervision, a graduate trainee developed a wavelet-based method in MATLAB to estimate the heartbeat of a subject from continuous-wave Doppler radar signal in 5 seconds. This method helps to quickly screen dengue fever with an accuracy of 96%. The finding was published in Biomedical Signal Processing and Control journal.
  3. ***Project 3: Precise ablation zone segmentation on CT images after liver cancer ablation***
     Under my supervision, a master student developed a semi-automatic tool in Python based on CNNs to precisely measure the ablation zone after a Radiofrequency ablation of liver cancer using CT images. This tool reduces the segmentation time by half, in comparison to manual annotation. The results were published in Medical Physics journal.
  4. ***Project 4: Segmentation of hard exudate lesions in color fundus images***
     I supervised an undergraduate student who developed an interactive method in Python based on CNNs to segment hard exudate lesions in color fundus images. The method outperformed several state-of-the-art methods. The results were published in Expert Systems with Applications journal.
  5. ***Project 5: Cascaded multi-scale spatial channel attention-guided network for large 3D deformable registration of liver CT images***
     Under my supervision, a master student developed a CNN-based method to perform non-rigid registration of the liver on CT images from intra- and inter-liver cancer patients. The registration framework outperformed state-of-the-art registration frameworks in this task in accuracy with an execution time within a second (using a modern GPU). The results were published in Medical Image Analysis journal.

PUBLICATIONS

Under review journal papers

1. **Luu HM**, Gauthier S, Kovanlikaya I, Wang Y, Spincemaille P, Sisman M, Vu T and Nguyen DT. QSM-RimDS: A highly sensitive paramagnetic rim lesion detection and segmentation tool for multiple sclerosis lesions. *Submitted to* ***American Journal of Neuroradiology***

Peer-reviewed journal papers

1. Gillen KM, Nguyen TD, Dimov A, Kovanlikaya I, **Luu HM**, Demmon E, Markowitz DM, Bagnato F, Pitt D, Gauthier SA, Yi Wang Y, Quantitative Susceptibility Mapping (QSM) is more sensitive and specific than phase imaging in detecting chronic active MS lesion rims: pathological validation, ***Brain Commun***, 2025
   https://doi.org/10.1093/braincomms/fcaf011

2. Le QA, Pham XL, van Walsum T, Dao VH, Le TL, Franklin D, Moelker A, Le VH, Trung NL, **Luu HM***. Precise ablation zone segmentation on CT images after liver cancer ablation using semi-automatic CNN-based segmentation. ***Med Phys***. 2024 Sep 9.
   https://aapm.onlinelibrary.wiley.com/doi/10.1002/mp.17373.

3. Pham XL, **Luu HM***, van Walsum T, Mai HS, Klein S, Le NH, Chu DT. CMAN: Cascaded Multi-scale Spatial Channel Attention-guided Network for large 3D deformable registration of liver CT images. ***Med Image Anal.*** 2024 Aug;96:103212.
   https://www.sciencedirect.com/science/article/pii/S1361841524001373

4. Do QV, Hoang HT, Vu NV, Jesus DAD, Brea LS, Nguyen HX, Le ATL, Le TN, Dinh DTM, Nguyen MTB, Nguyen HC, Bui ATV, Le HV, Gillen K, Vu TT, **Luu HM***. Segmentation of hard exudate lesions in color fundus image using two-stage CNN-based methods, ***Expert Syst. Appl*** 2024; 241.
   https://www.sciencedirect.com/science/article/pii/S095741742303244X

5. **Luu HM**, Mai SH, Pham LX, Le AQ, Le KQ, Walsum van T, Le HN, Daniel F, Le HV, Adiraan M, Chu CD, Trung LN. Quantification of liver-lung shunt fraction on 3D SPECT/CT images for selective internal radiation therapy of liver cancer using CNN-based segmentations and non-rigid registration. ***Comput Methods Programs Biomed*** 2023; 233: 107453.
   https://www.sciencedirect.com/science/article/pii/S0169260723001190

6. **Luu HM**, Walsum TV, Mai HS, Franklin D, Nguyen TTT, Le TM, Moelker A, Le VK, Vu DL, Le NH, Tran QL, Chu DT, Nguyen TL. Automatic scan range for dose-reduced multiphase CT imaging of the liver utilizing CNNs and Gaussian models. ***Med Image Anal*** 2022;78:102422.
   https://pubmed.ncbi.nlm.nih.gov/35339951

7. **Luu HM**, van Walsum T, Franklin D, Pham PC, Vu LD, Moelker A, Staring M, VanHoang X, Niessen W, Nguyen TL. Efficiently compressing 3D medical images for teleinterventions via CNNs and anisotropic diffusion. ***Med Phys*** 2021;48:2877-90.
   https://pubmed.ncbi.nlm.nih.gov/33656213

8. Nguyen CD, **Luu HM***, Sun G, Le AQ, Pham HV, Tran VA, Tran HT, Tran TD, Nguyen TV, Ishibashi K, Nguyen TL. Short time cardio-vascular pulses estimation for dengue fever screening via continuous-wave Doppler radar using empirical mode decomposition and continuous wavelet transform. ***Biomed Signal Process Control*** 2021;65:102361.
   https://www.sciencedirect.com/science/article/pii/S1746809420304699

9. Hoang SH, Pham PC, van Walsum T, **Luu HM***. Liver segmentation on a variety of computed tomography (CT) images based on convolutional neural networks combined with connected components. ***VNU Journal of Science: Comp Science & Com Eng*** 2020;36:25-37.
https://jcsce.vnu.edu.vn/index.php/jcsce/article/view/241

10. Boulkhrif H, **Luu HM**, van Walsum T, Moelker A. Accuracy of semi-automated versus manual localization of liver tumors in CT-guided ablation procedures. ***Eur Radiol*** 2018;28:4978-84.
https://pubmed.ncbi.nlm.nih.gov/29802572

11. **Luu HM**, Moelker A, Klein S, Niessen W, van Walsum T. Quantification of nonrigid liver deformation in radiofrequency ablation interventions using image registration. ***Phys Med Biol*** 2018;63:175005.
https://pubmed.ncbi.nlm.nih.gov/30063028

12. Gunay G, **Luu HM**, Moelker A, van Walsum T, Klein S. Semiautomated registration of pre- and intraoperative CT for image-guided percutaneous liver tumor ablation interventions. ***Med Phys*** 2017;44:3718-25.
https://pubmed.ncbi.nlm.nih.gov/28498510

13. **Luu HM**, Klink C, Niessen W, Moelker A, van Walsum T. Non-rigid registration of liver CT images for CT-guided ablation of liver tumors. ***PLoS One*** 2016;11:e0161600.
https://pubmed.ncbi.nlm.nih.gov/27611780

14. **Luu HM**, Klink C, Niessen W, Moelker A, van Walsum T. An automatic registration method for pre- and post-interventional CT images for assessing treatment success in liver RFA treatment. ***Med Phys*** 2015;42:5559-67.
https://pubmed.ncbi.nlm.nih.gov/26329002

15. **Luu HM**, Klink C, Moelker A, Niessen W, van Walsum T. Quantitative evaluation of noise reduction and vesselness filters for liver vessel segmentation on abdominal CTA images. ***Phys Med Biol*** 2015;60:3905-26.
https://pubmed.ncbi.nlm.nih.gov/25909487

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Conference papers

1. Pham XL., **Luu HM**, Mai HS, Le NH, van Ginneken, B., & Hering, A.. RegSegNet: A Joint Registration Segmentation Network for Automatic Liver Segmentation from Non-contrast 3D SPECT-CT Images. In ***Medical Imaging with Deep Learning (MIDL).*** 2024
https://openreview.net/pdf?id=SbrRyCrc4v

2. Nguyen QA, Nguyen N. T. C, Nguyen S.H.H, Doan P. T. K, Thinh N H, Tran TH, Luong A. T. L, Le HV, **Luu HM**., "Improving Classification of Curved Chromosomes in Karyotyping using CNN-based Deformation," ***2023 IEEE Statistical Signal Processing Workshop (SSP)***, 2023, pp. 285-289, doi: 10.1109/SSP53291.2023.10208061.
https://ieeexplore.ieee.org/abstract/document/10208061

3. Le QA, Vu DT, Nguyen HHS, Doan TKP, Luong TLA, Do TR, Nguyen TBM, Tran HT, Nguyen HT, Le VH, **Luu HM**. Efficient type and polarity classification of chromosome images using CNNs: A primary evaluation on multiple datasets. In ***Proceedings of 2022 IEEE Ninth International Conference on Communications and Electronics (ICCE)***, pp. 400-5. https://ieeexplore.ieee.org/abstract/document/9852034

4. Iwata Y, Ishibashi K, Sun G, **Luu HM**, Han TT, Nguyen TL, Do TT. Contactless heartbeat detection from CW-Doppler radar using windowed-singular spectrum analysis. ***Annu Int Conf IEEE Eng Med Biol Soc 2020***, pp. 477-80. https://pubmed.ncbi.nlm.nih.gov/33018031

5. Nguyen TH, Nguyen SHH, Pham HTV, Nguyen NTC, Do RT, Nguyen MTB, **Luu HM**. A Web-based tool for semi-interactively karyotyping the chromosome images for analyzing chromosome abnormalities. In ***Proceedings of 2020 7th NAFOSTED Conference on Information and Computer Science (NICS)***, pp. 433-7. https://ieeexplore.ieee.org/abstract/document/9335893

6. Nguyen TT, Dinh TH, Nguyen TL, Tran QTT, **Luu HM**. Dilated residual convolutional neural networks for low-dose CT image denoising. In ***Proceedings of 2020 IEEE Asia Pacific Conference on Circuits and Systems (APCCAS)***, pp. 189-92. https://ieeexplore.ieee.org/document/9301693

7. Nguyen TH, Hoang SH, Chu DTP, Vu DQ, **Luu HM**. A video-based tracking system for football player analysis using efficient convolution operators. In ***Proceedings of 2019 International Conference on Advanced Technologies for Communications (ATC)***, pp. 149-54. https://ieeexplore.ieee.org/abstract/document/8924544

8. Nguyen TT, Trinh HD, Nguyen TL, **Luu HM**. Robust denoising of low-dose CT images using convolutional neural networks. In ***Proceedings of 2019 6th NAFOSTED Conference on Information and Computer Science (NICS)***, pp. 506-11. https://ieeexplore.ieee.org/document/9023861

9. **Luu HM**, Boulkhrif H, Moelker A, van Walsum T. Registration evaluation by de-enhancing CT images. In ***Proceedings of 2018 International Workshop on Biomedical Image Registration***, pp. 83-93. https://link.springer.com/chapter/10.1007/978-3-319-92258-4_8

10. Hoang SH, Pham PC, Franklin D, van Walsum T, **Luu HM**. An evaluation of CNN-based liver segmentation methods using multi-types of CT abdominal images from multiple medical centers. In ***Proceedings of 2019 19th International Symposium on Communications and Information Technologies (ISCIT)***, pp. 20-5. https://ieeexplore.ieee.org/document/8905166

11. Gunay G, Voort SVD, **Luu HM**, Moelker A, Klein S. Local image registration uncertainty estimation using polynomial chaos expansions. In ***Proceedings of 2018 International Workshop on Biomedical Image Registration***, pp. 115-25. https://link.springer.com/chapter/10.1007/978-3-319-92258-4_11

12. Gunay G, van der Voort S, **Luu HM**, Moelker A, Klein S. Parameter sensitivity analysis in medical image registration algorithms using polynomial chaos expansions. In ***Proceedings of 2017 International Conference on Medical Image Computing and Computer-Assisted Intervention (MICCAI)***, pp. 335-43. https://link.springer.com/chapter/10.1007/978-3-319-66182-7_39

13. **Luu HM**, Hoang SH, Nguyen TH, Moelker A, Tran TD, van Walsum T. Impact of enhancement features on image registration for liver cancer interventions using CT images. In ***Proceedings of 2018 International Symposium on Medical Information & Communication Technology (ISMICT)***, pp. 25-9. https://ieeexplore.ieee.org/document/8573700

14. Gunay G, **Luu HM**, van Walsum T, Klein S. Semi-automated registration of pre-and intra-operative liver CT for image-guided interventions. In ***Proceedings of SPIE Medical Imaging 2016: Image Processing***, pp. 444-51. https://www.spiedigitallibrary.org/conference-proceedings-of-spie/9784/97841N/Semi-automated-registration-of-pre--and-intra-operative-liver/10.1117/12.2217206.full

15. **Luu HM**, Moelker A, Klink C, Mendrik A, Niessen W, van Walsum T. Evaluation of diffusion filters for 3d CTA liver vessel enhancement. In ***Proceedings of 2012 International MICCAI Workshop on Computational and Clinical Challenges in Abdominal Imaging***, pp. 168-77. https://link.springer.com/chapter/10.1007/978-3-642-33612-6_18

Conference abstracts

1. **Luu HM**, Gauthier S, Kovanlikaya I, Wang Y, Spincemaille P, Sisman M, and Nguyen T. Rim Lesion Segmentation On 1MM QSM Positive Source: A Comparison between Deep Learning and Conventional Methods. ***International Society for Magnetic Resonance in Medicine (ISMRM)*** *Conference***,** Singapore, 2024 (digital poster)

2. **Luu HM**, Gauthier S, Kovanlikaya I, Wang Y, Spincemaille P, Sisman M, and Nguyen T. Thin Slice Positive Source QSM Improves Deep Learning based Paramagnetic Rim Detection in Multiple Sclerosis Lesions, ***International Society for Magnetic Resonance in Medicine (ISMRM)*** *Conference*, Singapore, 2024 (oral presentation)

3. **Luu HM**, Gauthier S, Kovanlikaya I, Wang Y, Spincemaille P, Sisman M, and Nguyen T. Quantitative Susceptibility Source Separation Improves the Performance in Identification of Chronic Active Multiple Sclerosis Lesions Using Deep Learning-Based Method, Workshop on ***White Matter, Analysis, Translation, Experimental Validation, Evaluation & Reproducibility (WHATEVER)***, Tennessee, 2023 (oral presentation)

Invited Talks

1. **Luu HM.** Hard Exudates Segmentation using Combination of Automatic and Interactive CNN-based Methods, *International Workshop "Diabetes retinopathy diagnosis: from nano and micro material application to practice"*, Hanoi, Vietnam, September 23, 2022.

2. **Luu HM**. Medical image analysis: Some recent studies from Vietnam. Vietnamese Bioinformatics Network, *Bioinformatics Seminar Series*, Online, April 10, 2022.

3. **Luu HM**. Medical image analysis for image guidance interventions of liver cancer treatment. *First ECTI-UEC Workshop on AI and Applications*, Bangkok, Thailand, September 6, 2019.

FUNDING

2021 – 2023 **Postdoctoral research fellow: VNU.2021.TTS.13**

	Quantification of liver-Lung shunt fraction on 3D SPECT/CT images for selective internal radiation therapy of liver cancer
2019 – 2022	**Ministry of Science and Technology Vietnam funding: NDT.69/CHN/19, Co-PI** Investigation on non-contact biomarkers for diabetic retinal, co-investigator
2019 – 2022	**Nafosted Grant (Vietnam): 102.01-2018.316, PI** CT image analysis for liver cancer intervention using convolutional neural networks

HONORS AND AWARDS

NVIDIA Academic Hardware grant	2021
The best award paper, 2019 6th NAFOSTED Conference on Information and Computer Science (NICS)	2021
NVIDIA Academic Hardware grant	2019

OTHER PROFESSIONAL ACTIVITIES

Visiting researcher Biomedical Image Processing Group, Erasmus MC, Rotterdam, The Netherlands	2017-2023
Technical committee member APSIPA Workshop on Signal and Information Processing in Vietnam	2022
Session chair 25th National Conference on Electronics, Communications and Information Technology, Hanoi, Vietnam	2021
16th IEEE Asia Pacific Conference on Circuits and Systems, Ha Long, Vietnam	2020
Technical support 19th International Symposium on Communications and Information Technologies, Ho Chi Minh City, Vietnam	2019

Journal reviewer

IEEE Transactions of Medical Imaging (***TMI***), IEEE Transactions on Biomedical Engineering (***TBME***), Biomedical Signal Processing and Control (***BSPC***), Computer Methods and Programs in Biomedicine (***CMPB***), Physica Medial (***Phys. Med***), European Journal of Nuclear Medicine and Molecular Imaging (***EJNMMI Physics***).

REFERENCENS

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Dr. Guanghao Sun, Assoc. Professor, University of Electro-Communications, Guanghao.Sun@uec.ac.jp