Curriculum Vitae

Axel LARGENT, Ph.D.
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EDUCATION

Ph.D. in biomedical image processing 2015 - 2018
Laboratory of Signal and Image Processing (LTSI), University of Rennes 1, INSERM, Brittany (France)
Link: https://www.ltsi.univ-rennes1.fr/

Master's degree in mathematics for computer graphics and statistics 2011 - 2012
Department of Science and Technology, University of Burgundy, Dijon (France)
Link: https://sciences-techniques.u-bourgogne.fr/la-recherche

Master's degree in applied mathematics and modeling 2009 - 2011
Department of Exact and Natural Sciences, University of French West Indies, Pointe-à-Pitre (Guadeloupe, France)
Link: http://www.univ-ag.fr/

Bachelor's degree in mathematics and computer science (major mathematics) 2006 - 2009
Department of Exact and Natural Sciences, University of French West Indies, Pointe-à-Pitre (Guadeloupe, France)
Link: http://www.univ-ag.fr/

PROFESSIONNAL EXPERIENCES

Research scientist (biomedical image processing) 2022 - 2023
Center for Biomedical Image Computing and Analytics (CBICA), Perelman School of Medicine, University of Pennsylvania, Philadelphia (USA)
Collaboration: Genmab and Radiation Oncology Department of the University of Pennsylvania
Research: Development and evaluation of cutting-edge deep learning methods for overall and progression-free survival predictions of patients diagnosed with locally advanced non-small cell lung cancers.

Post-doctoral fellow (biomedical image processing) 2019 - 2022
Developing Brain Institute, department of diagnostic imaging and radiology, Children's National Hospital, Washington DC (USA)
Supervisors: Prof. Catherine Limperopoulos, Asst. Prof Josepheen De Asiz-Cruz
Collaboration: Assoc. Prof. and MD Jonathan Murnick, department of radiology, Children's National Hospital
Research: (1) Development of novel multi-instance deep learning algorithms for image quality assessment of fetal brain MRIs; (2) Development of cutting-edge Bayesian deep learning methods for automatic brain

segmentation of preterm infants diagnosed with post-hemorrhagic hydrocephalus (performed on MR imaging); (3) Development of Bayesian deep learning methods for automatic brain segmentation of fetuses diagnosed with ventriculomegaly (performed on MR imaging); (4) Development of deep learning methods for automatic assessment of fetuses' gestational age (performed on MR imaging).

Research engineer (biomedical image processing) 2018 - 2019
Laboratory of Signal and Image Processing (LTSI), University of Rennes, INSERM, Brittany (France)
Supervisors: Prof. Renaud de Crevoisier, Prof. Hervé Saint-Jalmes, Assoc. Prof. Jean-Claude Nunes, and Assoc. Prof. Oscar Acosta
Research: (1) Development and evaluation of cutting-edge deep learning, atlas patch-based, and random forest methods for pseudo-CT generation in prostate MRI-based radiotherapy treatment planning; (2) Evaluation of cutting-edge deep learning methods for pseudo-CT generation in head and neck CBCT-based adaptive radiotherapy treatment planning; (3) Development and optimization of a clinical MRI protocol for head and neck MRI-based radiotherapy treatment planning (acquisition in treatment position with a coil system dedicated to radiotherapy).

Research engineer (computer vision and image processing) 2013 - 2014
French alternative energies and atomic energy commission (CEA-LETI) and Pollen Metrology (startup), Grenoble (France)
Supervisors: Jerome Hazart, Ph.D., and Johan Foucher, Ph.D.
Research: (1) Development of image processing algorithms for design control of electronic transistors built on silicon; (2) Implementation of an object detection algorithm for Directed Self-Assembly (DSA) structure localization in SEM images.

PH.D. DISSERTATION

Thesis title: **MRI-only external beam radiotherapy treatment planning**
Supervisors: Prof. Renaud de Crevoisier, Prof. Hervé Saint-Jalmes, Assoc. Prof. Jean-Claude Nunes, and Assoc. Prof. Oscar Acosta
Collaboration: Prof. Jason Dowling and Prof. Peter Greer, CSIRO Australian e-Health Research Center, Herston, Queensland (Australia)
Committee members: Prof. Fabrice Meriaudeau, Prof. Su Ruan, Prof. Juliette Thariat, Med Phys. Robin Garcia
Defense date: December 2018
This thesis demonstrated the feasibility of MRI-based dose calculation in radiotherapy using cutting-edge deep learning methods and novel atlas patch-based methods.
Link: http://www.theses.fr/2018REN1S085

RESEARCH INTEREST

Artificial intelligence and machine learning (notably deep learning), medical image processing and medical image analysis, generative AI (GAN, VAE, diffusion models, machine learning methods for image-to-image translation in medicine), uncertainty assessment for deep learning (Monte Carlo dropout and Bayesian approaches), domain adaptation, semi-supervised learning, medical image segmentation and registration, image classification, image reconstruction, transfer learning, computer vision, survival analysis, statistic and probability, linear algebra, calculus, and medical physics.

ACADEMIC SERVICES

Participation in the writing of a grant from the French National Cancer Institute. This grant was written in collaboration with the Laboratory of Signal and Image Processing (LTSI) from the University of Rennes, the Cancer Center Eugene Marquis (Rennes, France), the CSIRO Australian e-Health Research Center, and the Cancer Center Centre Georges-François Leclerc (Dijon, France).

Reviewing for the Medical Image Analysis Journal; the Medical Image Computing and Computer-Assisted Intervention Society (MICCAI); the International Symposium on Biomedical Imaging (ISBI); the International Journal of Radiation Oncology Biology Physics (red journal); the NPJ Digital Medicine (Nature Portfolio); the IEEE Journal of Biomedical and Health Informatics; the European Journal of Medical Physics (Physica Medica); the Radiation Oncology Journal; and the Computers in Biology and Medicine Journal.

Participation in the 12th IEEE EMBS International Summer School on Biomedical Imaging (Saint-Jacut-de-la-Mer, Brittany, France)

SUPERVISION OF RESEARCH ACTIVITIES

Mentoring Louis Marage during this master's degree internship 2017 - 2018
project: Quantification of MRI distortions for MRI-only external beam radiotherapy treatment planning

Mentoring Ivan Gicquiau during this master's degree internship 2017 - 2018
project: MRI acquisition in treatment position for head-and-neck MRI-only external beam radiotherapy treatment planning

Mentoring several undergraduate students 2016 - 2018

TRANSFER OF TECHNOLOGY

Transfer to clinical research: Deploiement of preterm and neonatal brain segmentation algorithms (developed during my post-doctoral fellowship) in the clinical pipelines of the Developing Brain Institute. These algorithms are currently used by the Developing Brain Development and Radiology Department of Children's National Hospital to monitor the brain development of preterm infants diagnosed with post-hemorrhagic hydrocephalus and fetuses diagnosed with ventriculomegaly.

TECHNICAL SKILLS

OS: Linux, Windows, and Mac OS
Programing language: Python, C/C++, R, and Matlab
C/C++ libraries and Python modules: Pythorch, Tensorflow/Keras, ITK, VTK, OpenCV, Sklearn, Numpy, pandas, Torchmetrics, and HDF5
Software and tools: 3D Slicer, ITK-SNAP, Elastix, NiftyReg, Singularity, Docker, Slurm, Qsub, Jenkins, and Git
Others: Continuous Integration, Model deployment, MLOps, Google Cloud Platform

CERTIFICATIONS

Introduction to Diffusion Models, Diffusion Models from scratch using PyTorch (Udemy, 2025)
Mathematics for Machine Learning and Data Science Specialization (Coursera, 2024)
Linear Algebra for Machine Learning and Data Science (DeepLearning.AI and Coursera, 2024)
Calculus for Machine Learning and Data Science (DeepLearning.AI and Coursera, 2024)
Probability and Statistics for Machine Learning and Data Science (DeepLearning.AI and Coursera, 2024)
Machine Learning in Production (DeepLearning.AI and Coursera, 2024)
Pytorch for Deep Learning Bootcamp (Udemy, 2024)

LANGUAGES

English (fluent), French (fluent)

LIST OF PUBLICATIONS

Journal articles accepted with peer review: 11 (6 as the first author)
Conference articles with full-length peer review proceeding: 3 (2 as the first author)

Le Guevelou, J., Houssayni, A., Key, S., **Largent, A.**, Lafond, C., Acosta, O., Simon, A., De Crevoisier, R., Barateau, A. Defining the potential for sexual structures-sparing for prostate cancer external beam radiotherapy: a dosimetric study. Cancer/Radiotherapie (In press, October 2024)

Largent, A., De Asis-Cruz, J., Kapse, K., Barnett, S., Murnick, J., Basu, S., Andersen, N., Norman, S., Andescavage, N., and Limperopoulos, C. Automatic Brain Segmentation in Preterm Infants with Post-Hemorrhagic Hydrocephalus using 3D Bayesian U-Net. Human Brain Mapping Journal (March 2022)
Link: http://doi.org/10.1002/hbm.25762

Zhao, L., De Asis-Cruz, J., Wu, Y., Kapse, K., **Largent, A.**, Quistorff, J., Lopez, C., and Limperopoulos, C. Automated 3-D Fetal Brain Segmentation using an Optimized Deep Learning Approach. American Journal of NeuroRadiology (February 2022)

Boulanger, M., Nunes, J.C, Chourak, H., **Largent, A.**, Tahri, S., Acosta, O., De Crevoisier, R., Lafond, C., and Barateau, A. Deep learning methods to generate synthetic CT from MRI in radiotherapy: A literature review. Physica Medica. August 2021
Link: https://doi.org/10.1016/j.ejmp.2021.07.027

Largent, A., Kapse, K., Barnett, S. D., De Asis-Cruz, J., Whitehead, M., Murnick, J., Zhao, L., Andersen, N., Quistorff, J., Lopez, C., and Limperopoulos, C. Image Quality Assessment of Fetal Brain MRI Using Multi-Instance Deep Learning Methods. Journal of Magnetic Resonance Imaging. Avril 2021
Link: https://doi.org/10.1002/jmri.27649

Barateau, A., De Crevoisier, R., **Largent, A.**, Mylona, E., Perichon, N., Castelli, J., Chajon, E., Acosta, O., Simon, A., Nunes, J.C. and Lafond, C. Comparison of CBCT-based dose calculation methods in head and neck

cancer radiotherapy: from Hounsfield unit to density calibration curve to deep learning. Medical Physics. July 2020
Link: https://doi.org/10.1002/mp.14387

Largent, A., Marage, L., Gicquiau, I., Nunes, J.C., Reynaert, N., Castelli, J., Chajon, E., Acosta, O., Gambarota, G., De Crevoisier, R. and Saint-Jalmes, H. Head-and-Neck MRI-only radiotherapy treatment planning: From acquisition in treatment position to pseudo-CT generation. Cancer/Radiothérapie. July 2020
Link: https://doi.org/10.1016/j.canrad.2020.01.008

Largent, A., Barateau, A., Nunes, J.C., Mylona, E., Castelli, J., Lafond, C., Greer, P.B., Dowling, J.A., Baxter, J., Saint-Jalmes, H., Acosta, O., and De Crevoisier, R. Comparison of deep learning-based and patch-based methods for pseudo-CT generation in MRI-based prostate dose planning. International Journal of Radiation Oncology, Biology, and Physics, 105(5), pp.1137-1150. December 2019
Link: https://doi.org/10.1016/j.ijrobp.2019.08.049

Largent, A., Nunes, J.C., Saint-Jalmes, H., Baxter, J., Greer, P., Dowling, J., de Crevoisier, R. and Acosta, O. Pseudo-CT Generation for MRI-only Radiotherapy: Comparative Study Between A Generative Adversarial Network, A U-Net Network, A Patch-Based, and an Atlas Based Methods. In 2019 IEEE 16th International Symposium on Biomedical Imaging (ISBI 2019) (pp. 1109-1113). IEEE. April 2019
Link: https://doi.org/10.1109/ISBI.2019.8759278

Largent, A., Barateau, A., Nunes, J.C., Lafond, C., Greer, P.B., Dowling, J.A., Saint-Jalmes, H., Acosta, O. and De Crevoisier, R. Pseudo-CT generation for MRI-only radiation therapy treatment planning: comparison among patch-based, atlas-based, and bulk density methods. International Journal of Radiation Oncology, Biology, Physics, 103(2), pp.479-490. February 2019
Link: https://doi.org/10.1016/j.ijrobp.2018.10.002

Zine-Eddine, K., Bensalah, K., **Largent, A.**, Shariat, S., Verhoest, G., Peyronnet, B., Acosta, O., De Crevoisier, R., and Mathieu, R. Role of quantitative computed tomography texture analysis in the prediction of adherent perinephric fat. World journal of urology 36, no. 10: 1635-1642. October 2018
Link: https://doi.org/10.1007/s00345-018-2292-9

Largent, A., Nunes, J.C, Lafond, C., Périchon, N., Castelli, J., Rolland, Y., Acosta, O., and De Crevoisier, R. Planification à partir d'imagerie par résonance magnétique en radiothérapie. Cancer/Radiothérapie. December 2017
Link: https://doi.org/10.1016/j.canrad.2017.02.007

Largent, A., Nunes, J.C., Saint-Jalmes, H., Simon, A., Perichon, N., Barateau, A., Herve, C., Lafond, C., Greer, P., Dowling, J., De Crevoisier, R. and Acosta, O. Pseudo-CT generation by conditional inference random forest for MRI-based radiotherapy treatment planning. 25th IEEE European Signal Processing Conference (EUSIPCO). p. 46-50. August 2017
Link: https://doi.org/10.23919/EUSIPCO.2017.8081166

Hazart, J., Chesneau, N., Evin, G., **Largent, A.**, Derville, A., Thérèse, R., Bos, B., Bouyssou, R., Dezauzier, C., and Foucher, J. Data fusion for CD metrology: heterogeneous hybridization of scatterometry, CDSEM, and AFM data. In Metrology, Inspection, and Process Control for Microlithography XXVIII, vol. 9050, p. 90502L. SPIE International Society for Optics and Photonics, April 2014
Link: https://doi.org/10.1117/12.2046484

ABSTRACTS IN NATIONAL AND INTERNATIONAL CONFERENCES

Conference abstracts: 12 (7 as the first author)

Largent, A., Murnick, J., Lu, Y.; Kapse, K., Andersen, N., Richmann, T., De Asis-Cruz, J.; Quistorff, J., Lopez, C., Andescavage, N., and Limperopoulos, C. Automatic Assessment of Fetal Gestational Age using Bayesian Deep learning Method. Proceedings of the International Society for Magnetic Resonance in Medicine (ISMRM), 2022

Zhao, L., Feng, X., De Asis-Cruz, J., Wu, Y., Kapse, K., **Largent, A.**, Wu, D., Qing, K., Meyer, and Limperopoulos, C. 3D Fetal brain segmentation using an optimized deep learning approach. Proceedings of the International Society for Magnetic Resonance in Medicine (ISMRM), 2020

Stephane, K., Houssayni, A., Cassard, U., Barateau, A., Duvergé, L., **Largent, A.**, Acosta, O., Nunes, J.C., Messai, T., Simon, A., Dowling, J., Perichon, N., and De Crevoisier, R. MRI only based planning to decrease toxicity in prostate cancer IMRT/IGRT: a dosimetric study. European Society for Radiotherapy Oncology (ESTRO), 2020

Zhao, L., Kapse K., **Largent, A.**, Krishnamurthy, D., Wu, Y., Du Plessis, A.J., and Limperopoulos, C. Automated brain segmentation for fetal ventriculomegaly using a convolutional neural network approach. Pediatric Academic Societies (PAS), 2020

Largent, A., Zhao, L., and Limperopoulos, C. Automatic assessment of fetal MRI quality: A deep learning approach. International Symposium on the Fetal Brain (ISFB). 2019

Largent, A., Barateau, A., Nunes, J.C., Lafond, C., Greer, P., Dowling, J., Baxter, J., Saint-Jalmes, H., Acosta, O., and De Crevoisier, R. A comparison of pseudo-CT generation methods for prostate MRI-based dose planning: deep learning, patch-based, atlas-based and bulk-density methods. French society of medical physics (SFPM), 2019

Gasmi, A., Khene, Z., **Largent, A.**, Commandeur, F., Peyronnet, B. Performance de l'analyse de texture en tomodensitométrie pour prédire la présence de graisse adhérente péri-rénale. 113rd French congres of urology, 2019

Nunes, J.C, **Largent, A.**, Barateau, A., Lafond, C., Greer, P., Dowling, J., Baxter, J., Castelli, J., Chajon, E., Périchon, N., Saint-Jalmes, H., De Crevoisier, R., and Acosta, O. Calcul de dose direct à partir d'IRM et tomographies coniques par méthodes d'apprentissage. French society of radiotherapy oncology (SFRO), 2019.

Largent, A., Barateau, A., Nunes, J.C., Lafond, C., Greer, P., Dowling, J., Saint-Jalmes, H., Acosta, O., and De Crevoisier, R. Comparison of deep learning with three other methods to generate pseudo-CT for MRI-only radiotherapy. European Society for Radiotherapy Oncology (ESTRO), 2019

Largent, A., Barateau, A., Nunes, J.C., Lafond, C., Greer, P., Dowling, J., Saint-Jalmes, H., Acosta, O., and De Crevoisier, R. Calcul de dose à partir d'IRM en radiothérapie de la prostate : comparaison de trois méthodes de génération de pseudo-scanographie. French society of radiotherapy oncology (SFRO), 2018

Largent, A., Barateau, A., Nunes, J.C., Lafond, C., Greer, P., Dowling, J., Saint-Jalmes, H., Acosta, O., and De Crevoisie, R. Pseudo-CT generation for MRI-only radiotherapy treatment planning: comparison between

patch-based, atlas-based and bulk density methods. French society of medical physics (SFPM), 2018

Largent, A., Marage, L., Gicquiau, I., Gambarota, G., Chajon, H., Acosta, O., Nunes, J.C., De Crevoisier, R., and Saint-Jalmes, H. MRI acquisition in radiotherapy treatment position: Sequence optimization for head and neck cancer – European Society for Radiotherapy Oncology (ESTRO), 2018