Axel Herve Patrick Masquelin
Postdoctoral Fellow – Radiology

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Summary:

I am a trained biomedical engineer focused on the utilization of machine learning and mathematical modeling to improve diagnostic outcomes for patients. My current work primarily explores the use of deep learning for early lung cancer detection. Specifically, we are utilizing wavelet decompositions to reduce the number of examples needed for a deep learning algorithm to learn. Other fields of research included differentiation between Tuberculosis and lung cancer nodule from CT and X-ray images, and the application of pharmacokinetics to model drug dispersion/absorption within pulmonary nodules. My work has allowed me to collaborate extensively with numerous other investigators within the Cellular, Molecular, and Biomedical Sciences (CMB), Complex System Center, and the College of Engineering and Mathematical Sciences (CEMS).

Education:

2023-08 – Present	**Harvard Medical School, Cambridge, MA, Post-doctoral in Radiology** Department of Radiology
2018-08 – 2023-08	**University of Vermont, Burlington, VT, PhD in Bioengineering** Department of Electrical & Biomedical Engineering
2013-08 – 2017-05	**Purdue University, West Lafayette, IN, B.S in Engineering** College of Engineering - Biomedical Engineering

Professional Appointments:

2023 - Present	NCI K00 Postdoctoral Fellow, Brigham and Women's Hospital, Somerville, MA.
2022 - 2023	NCI F99 Pre-Doctoral Fellow, University of Vermont, Burlington, VT.
2022 - 2022	ML Research Intern, Recursion, Salt Lake City, UT.
2021 - 2022	NCI F31 Pre-Doctoral Fellow, University of Vermont, Burlington, VT.
2019 - 2021	NHLBI T-32 Pre-Doctoral Fellow, University of Vermont, Burlington, VT.
2018 - 2023	Graduate Research Assistant, University of Vermont, Burlington, VT.
2017 - 2018	Discovery automation Engineer, Eli Lilly & Company, Indianapolis, IN.
2016 - 2018	Hardware Engineer, OmniVis LLC, Lafayette, IN.
2016 - Present	Co-founder/Machine Learning Scientist, Predictive Wear Inc.
2016 - 2017	Operator/Undergrad Research, Purdue Rare Isotope Measurement Laboratory, Lafayette, IN.

Books, Patents, Publications:

Abstracts:

2022   Masquelin A., Cheney N., Bates J.H.T., Kinsey C.M., "Looking at the Negative – Using False Positives to Learn How Deep Neural Nets Classify Lung Cancer CT Images" *American Thoracic Society 2021 International Conference*, 2022.

2021   Masquelin A., Cheney N., Bates J.H.T., Kinsey C.M., "Refocusing Network Attention on Perinodular Features Improves Lung Cancer Classification" *Biomedical Engineering Society Conference,* 2021.

2021   Masquelin A., Cheney N., Bates J.H.T., Kinsey C.M., "Learning the Surrounding – Parenchymal Features Improve Lung Cancer Classification," *American Thoracic Society 2021 International Conference,* 2021.

2020   Masquelin A., Cheney N., Bates J.H.T, Kinsey C.M., "Wavelet Decomposition - Improving Deep Learning Prediction Aided by Pre-existing Knowledge," *Biomedical Engineering Society Conference,* 2020.

2020   Masquelin A., Whitney D., Stevenson C., Spira A., Bates J.H., San Jose Estepar R., Kinsey C. "Radiomics in Deep Learning – Feature Augmentation for Lung Cancer Prediction," *American Thoracic Society 2020 International Conference*. [Online]. Available: https://doi.org/10.1164/ajrccm-conference.2020.201.1_MeetingAbstracts.A7690

2020   Casey D., Masquelin A.H., Bou Jawde S.A., Hermann J., Suki B., Bates J.H.T., "Gene Expression Modules in Idiopathic Pulmonary Fibrosis and Nonspecific Interstitial Pneumonia: A Meta-Analysis," *American Thoracic Society 2020 International Conference*. [Online]. Available: https://doi.org/10.1164/ajrccm-conference.2020.201.1_MeetingAbstracts.A4027

2020   Erdreich B., McClure K., Masquelin A.H., McGinnis R., Wshah S., Bates J.H. "Using Wearable Sensors and Deep learning to Categorize and Detect Different Patterns of Breathing in Healhty Subjects" *American Thoracic Society 2020 International Conference*. [Online]. Available: https://doi.org/10.1164/ajrccm-conference.2020.201.1_MeetingAbstracts.A6164

2019   Masquelin A., Bates J.H.T., Kinsey C.M., "Wavelet Decomposition for Differentiating Benign vs Malignant Lung Nodules," American Thoracic Society 2019 International Conference. [Online]. Available: https://www.atsjournals.org/doi/abs/10.1164/ajrccm-conference.2019.199.1_MeetingAbstracts.A5483

2019   Masquelin A., Alshaabi T., Connolly, S., Elhajj, A., Estepar, R.S.J., Bates, J.H.T., Kinsey, C.M., "Learning Radiomics Diagnostic Important from Machine Learning Algorithms," Biomedical Engineering Society Conference, 2019.

Patents:

2019   Albaugh, M.D., Argote, P., Masquelin, A., Hoilett, O., Drakopoulos, M., "Impedance Based Compression Legging System," U.S. Provisional Pat. Ser. No. 62/856,410, filed [March 5th, 2019].

Publications:

2024   A. H. Masquelin, N. Cheney, R.S.J. Estépar, J.H.T. Bates, C.M. Kinsey, "LDCT Image Biomarkers that Matter Most for the Deep Learning Classification of Indeterminate Pulmonary Nodules", *[Insert Journal]*, vol. #, no. #, [DATE], doi:

2023   A.H. Masquelin, T. Alshaabi, N. Cheney, R.S.J. Estépar, J.H.T. Bates, C.M. Kinsey, "Perinodular Parenchymal Features Improve Indeterminate Lung Nodule Classification," *Acad Radiol.*, vol. 30, no. 6, Jun. 2023, doi: 10.1016/j.acra.2022.07.001.

2021   A. H. Masquelin, N. Cheney, C. M. Kinsey, and J. H. T. Bates, "Wavelet decomposition facilitates training on small datasets for medical image classification by deep learning," *Histochem Cell Biol*, Jan. 2021, doi: 10.1007/s00418-020-01961-y.

2020   K. McClure, B. Erdreich, J. H. T. Bates, R. S. McGinnis, A. Masquelin, and S. Wshah, "Classification and Detection of Breathing Patterns with Wearable Sensors and Deep Learning," *Sensors (Basel)*, vol. 20, no. 22, Nov. 2020, doi: 10.3390/s20226481.

Invited Speaker:

2024   National Cancer Institute F99/K00 Fellowship Conference, "Detangling Morphologies Associated with COPD and NSCLC Using Genetic Variants" Jan. 11th, 2024.

2023   National Cancer Institute F99/K00 Fellowship Conference, "Image Reconstruction of Pulmonary Nodules to Interrogate Deep Neural Networks using Masked U-Net", Aug. 28th, 2023.

2021   University of Vermont Lung Center Seminar, "Learning the Surrounding – Parenchymal Features Improve Lung Cancer Classification", June. 22nd, 2021.

2021   University of Vermont Lung Center Seminar, "Wavelet Decomposition Facilitates Training on Small Datasets for Medical Image Classification by Deep Learning", Jan. 19th, 2021.

2020   American Thoracic Society 2020 International Conference. "Radiomics in Deep Learning – Feature Augmentation for Lung Cancer Prediction", Dec 2nd.

2020   Electrical and Bioengineering Seminar, University of Vermont, "Learning Radiomic Feature Importance for Deep Learning Application", Jan. 24th, 2020.

2020   University of Vermont Lung Center Seminar, "Learning Radiomic Feature Importance for Deep Learning Application", Jan. 7th, 2020.

2019   Biomedical Engineering Society 2019 Conference ""Learning Radiomics Diagnostic Important from Machine Learning Algorithms," Oct. 16-19th.

2019   University of Vermont's Translational Global Infectious Diseases Research Center (TGIR), "Webbing Radiomics and Deep Neural Networks: A Malignancy Story". Oct. 31.

2019   University of Vermont Lung Center Seminar, "Riding the Wavelet – Staying Superficial in Deep Learning", Apr. 16th, 2019.

Awards and Honors

2023   NCI F99/K00 Predoctoral to Postdoctoral Transition Award,
        K00 Postdoctoral Fellowship

2022   NCI F99/K00 Predoctoral to Postdoctoral Transition Award,
        F99 Predoctoral Fellowship

2021   NIH Ruth L. Kirschstein Predoctoral Individual National Research Service Award,
        F31 Predoctoral Fellowship

2021   Abstract Scholarship, American Thoracic Society Conference 2021

2020   Abstract Scholarship, American Thoracic Society Conference 2020

2019   Pre-Doctoral Fellowship, Vermont Lung Center NHLBI T-32

2017   Rice Business Plan Finalist: PathVis

2017   Purdue's Burton D. Morgan Business Plan Competition Finalist (2nd Place)

Outreach and Mentoring

Outreach:

2021   Invited speaker for the UVM Career Center, Topic: STEM Jumpstart: Personal Statement for Graduate Schools.

2021   Invited speaker for South Burlington High "Exploring the Human Machine" science elective, topic: Respiratory system.

Leadership:

2019 - 2021   Elected Member of the Larner College of Medicine Graduate Student Council. Act as liaison between the Postdoctoral Association and Graduate Student Council. Assisted in the organization and advertising of the Postdoctoral Fellowship Workshop in the Larner College of Medicine.

Mentoring:

2021   *Master Student Mentoring:* Alyx Cleveland. Mentoring Alyx Cleveland on the application of deep learning methodologies for medical datasets. Assisting in comprehending electrical impedance tomography principles, chest geometry, and potential correlation between disease state and impedance signals.

2019 - 2020   *High School mentor for Young Scientist:* William Suratt. Supervised and mentored William Suratt on the application of deep learning methodologies within the field of bioengineering and pulmonary medicine. Developed example codes, small demo lectures, and provided feedback on project direction for parameter estimation of nitrogen washout models.

Advisory Boards & Peer Reviewer

Peer reviewer for the following journals:

- Fluctuation and Noise Letters
- Academic Radiology

Member of Biomedical Engineering Society and the American Thoracic Association.