Axel Herve Patrick Masquelin

Pre Doctoral Fellow – Bioengineering

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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:

2018-08 – Present	**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:

2021 – Present	NIH F31 Pre-Doctoral Fellow, University of Vermont.
2019 - 2021	T-32 Pre-Doctoral Fellow, University of Vermont.
2018 - Present	Graduate Research Assistant, University of Vermont.
2017 - 2018	Discovery automation Engineer, Eli Lilly & Company.
2016 - 2018	Hardware Engineer, OmniVis LLC.
2016 - Present	Co-founder/Data Scientist, Predictive Wear Inc.
2016 - 2017	Operator / Undergrad Research, Purdue Rare Isotope Measurement Laboratory.

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:

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:

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

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 T-32

2017 Rice Business Plan Finalist: PathVis

2017 Second place at Purdue's Burton D. Morgan Business Plan Competition

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 - present 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

Member of Biomedical Engineering Society and the American Thoracic Association.