

# Axel Herve Patrick Masquelin

*Pre Doctoral Fellow – Bioengineering*

## Address:

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**GitHub:** <https://github.com/axemasquelin>

## Summary:

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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:

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| <b>2018-08 – Present</b> | <b>University of Vermont, Burlington, VT, PhD in Bioengineering</b><br>Department of Electrical & Biomedical Engineering |
| <b>2013-08 – 2017-05</b> | <b>Purdue University, West Lafayette, IN, B.S in Engineering</b><br>College of Engineering - Biomedical Engineering      |

## Professional Appointments:

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| 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:

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### Abstracts:

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| <b>2022</b> | 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” <i>American Thoracic Society 2021 International Conference</i> , 2022. |
| <b>2021</b> | Masquelin A., Cheney N., Bates J.H.T., Kinsey C.M., “Refocusing Network Attention on Perinodular Features Improves Lung Cancer Classification” <i>Biomedical Engineering Society Conference</i> , 2021.                                   |
| <b>2021</b> | Masquelin A., Cheney N., Bates J.H.T., Kinsey C.M., “Learning the Surrounding – Parenchymal Features Improve Lung Cancer Classification,” <i>American Thoracic Society 2021 International Conference</i> , 2021.                          |
| <b>2020</b> | Masquelin A., Cheney N., Bates J.H.T., Kinsey C.M., “Wavelet Decomposition - Improving Deep Learning Prediction Aided by Pre-existing Knowledge,” <i>Biomedical Engineering Society Conference</i> , 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](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](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 Healthy Subjects” *American Thoracic Society 2020 International Conference*. [Online]. Available: [https://doi.org/10.1164/ajrccm-conference.2020.201.1\\_MeetingAbstracts.A6164](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](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](https://doi.org/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](https://doi.org/10.3390/s20226481).

**Invited Speaker:**

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- 2021** University of Vermont Lung Center Seminar, “Learning the Surrounding – Parenchymal Features Improve Lung Cancer Classification”, June. 22<sup>nd</sup>, 2021.
- 2021** University of Vermont Lung Center Seminar, “Wavelet Decomposition Facilitates Training on Small Datasets for Medical Image Classification by Deep Learning”, Jan. 19<sup>th</sup>, 2021.
- 2020** American Thoracic Society 2020 International Conference. “Radiomics in Deep Learning – Feature Augmentation for Lung Cancer Prediction”, Dec 2<sup>nd</sup>.
- 2020** Electrical and Bioengineering Seminar, University of Vermont, “Learning Radiomic Feature Importance for Deep Learning Application”, Jan. 24<sup>th</sup>, 2020.
- 2020** University of Vermont Lung Center Seminar, “Learning Radiomic Feature Importance for Deep Learning Application”, Jan. 7<sup>th</sup>, 2020.
- 2019** Biomedical Engineering Society 2019 Conference ““Learning Radiomics Diagnostic Important from Machine Learning Algorithms,” Oct. 16-19<sup>th</sup>.
- 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. 16<sup>th</sup>, 2019.

## **Awards and Honors**

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**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**

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### **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**

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Peer reviewer for the following journals:

- Fluctuation and Noise Letters

Member of Biomedical Engineering Society and the American Thoracic Association.