Stephen **Woloszynek**

MD/PhD Candidate · Electrical and Computer Engineering

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Summary

I am a data scientist with experience in bioinformatics, Bayesian statistics, and machine learning who focuses on medical- and biology-related domains. My thesis work focused primarily on algorithm development for microbiome data analysis. Other work included genomics, transcriptomics, sequencing, mouse studies, conservation, computational neuroscience, signal processing, electronic health record analysis, time series analysis, and natural language processing. Thus, I have experience in a variety of programming languages (R, python, C, Stan, Edward, tensorflow, matlab, bash), parallelization approaches (cpu, gpu, cuda), and wet-lab and sequencing techniques.

Education

Drexel University — *Philadelphia, PA*

MD/PhD — *Aug 2012 - May 2020*

- Department of Electrical and Computer Engineering
- Mentor: Gail L. Rosen PhD
- Lab: EESI

Drexel University — *Philadelphia, PA*

Bachelor of Science, Biology — *Sept 2008 - Dec 2010*

- *Magna Cum Laude*

Community College of Philadelphia — *Philadelphia, PA*

Associate of Science — *Jan 2005 - Dec 2012*

- *Summa Cum Laude*

Awards & Honors

2018	**Finalist, Research Excellence Awards**, Drexel University	*Philadelphia, PA*
2018	**Student Scholarship**, StanCon	*Pacific Grove, CA*
2018	**Frank and Agnes Seaman Endowed Fellowship**, Drexel University	*Philadelphia, PA*
2017	**Frank and Agnes Seaman Endowed Fellowship**, Drexel University	*Philadelphia, PA*
2016	**Epstein Fellow**, Interurban Clinical Club	*Philadelphia, PA*
2016	**Lee Smith Traveling Fellowship**, Drexel University	*Philadelphia, PA*
2016	**Study Abroad Asia Fund Travel Grant**, Drexel University	*Philadelphia, PA*
2016	**Medical Student Research Conference Grant**, Drexel University	*Philadelphia, PA*
2016	**Frank and Agnes Seaman Endowed Fellowship**, Drexel University	*Philadelphia, PA*
2016	**Leroy Resser Endowed Fellowship**, Drexel University	*Philadelphia, PA*
2011	**ASPN Presentation Award**, American Society of Pediatric Nephrology	*Denver, CO*
2008-10	**Dean's Scholarship**, Drexel University	*Philadelphia, PA*

Academic Employment

2010-12	**Laboratory Manager**, Gail Hearn PhD, Drexel University	*Philadelphia, PA*
2009-11	**Research Assistant**, GKevin Meyes MD, Children's Hospital of Philadelphia	*Philadelphia, PA*

Professional Affiliations

2019-	**American Society of Anesthesiologists**
2015-	**IEEE**
2015-16	**American Statistical Association**

Scientific Contributions

Peer Reviewed Research

- Price, J.R., **Woloszynek, S.**, Rosen, G.L., and C.M. Sales. Quantifying the influence of nutrient loading and availability on microbial community dynamics and subsequent kinetic behavior. In Review.
- Smith, S. H., O'Connor, M. P., Deal, B., Kotzer, C., Lee, A. Wagner, B., Joffe, J., Peng, L., Carpenter, M., **Woloszynek, S.**, Oliver, K. M., Russell, J. A. Does getting defensive get you anywhere?— Seasonal balancing selection in pea aphids shapes a dynamic infection polymorphism with a protective bacterial endosymbiont. 2019. Submitted for Publication.
- **Woloszynek, S.**, Mell, J. C., Zhao, Z., Simpson, G., O'Connor, M. P., and Rosen, G. Exploring thematic structure and predicted functionality of 16S rRNA amplicon data. 2019. PLoS ONE 14 (12).
- **Woloszynek, S.**, Zhao, Z., Chen, J., and Rosen, G. 16S rRNA sequence embeddings: Meaningful numeric feature representations of nucleotide sequences that are convenient for downstream analyses. 2019. PLoS Comp Bio 15 (2).
- O'Hara, N. B., Reed, H. J., Afshinnekoo, E., Harvin, D., Caplan, N., Rosen, G., Frye, B., **Woloszynek, S.**, Ounit, R., Levy, S., Butler, E., and Mason, C. E. Metagenomic characterization of ambulances across the USA. 2017. Microbiome 5 (1).
- Cronin, D., **Woloszynek, S.**, Morra, W. A., Honarvar, S., Linder, J. M., Gonder, M. K., O'Conner, M. P., and Hearn, G. W. Long–term urban market dynamics reveal increased bushmeat carcass volume despite economic growth and proactive environmental legislation on Bioko Island, Equatorial Guinea. 2015. PLoS ONE 10 (7).
- Kangovi, S., Edwards, M., **Woloszynek, S.**, Mitra, N., Feldman, H., Kaplan, B. S., and Meyers, K. E. Renin–angiotensin–aldosterone system inhibitors in pediatric focal segmental glomerulosclerosis. 2012. Pediatric Nephrology. 27 (5): 813–9.

Chapters and Reviews

- Cullen, C., Aneja, K. K., Beyhan, S., Cho, C. E., **Woloszynek, S.**, Convertino, M., Mccoy, S. J., Zhang, Y., Anderson, M., Alvarez-Ponce, D., Smirnova, E., Karstens, L., Dorrenstein, P. C., Li, H., Gupta, A. S., Cheung, K., Powers, J. G., Zhao, Z., and Rosen, G. Emerging Priorities for Microbiome Research. In Pres. 2020. Frontiers in Microbiology.
- **Woloszynek, S.**, Zhao, Z., Ditzler, G., Price, J. R., Reichenberger, E. R., Lan, Y., Chen, J., Earl, J., Langroodi, S. K., Ehrlich, G., and Rosen, G. Analysis Methods for Shotgun Metagenomics. 2018. Theoretical and Applied Aspects of Systems Biology. Springer.
- Ching, T., Himmelstein, D. S., Beaulieu-Jones, B. K., Kalinin, A.A., Do, B. T., Way, G.P., Ferrero, E., Agapow, P.M., Zietz, M., Hoffman, M.M., Xie, W., Rosen, G. L., Lengerich, B.J., Israeli, J., Lanchantin, J., **Woloszynek, S.**, Carpenter, A. E., Shrikumar, A., Xu, J., Cofer, E. M., Lavender, C. A. Turaga, S. C., Alexandari, A. M., Lu, Z., Harris, D. J., DeCaprio, D., Qi, Y., Kundaje, A., Peng, Y., Wiley, L. K., Segler, M. H. S., Boca, S. M., Swamidass, S. J., Huang, A., Gitter, A., and Greene C. S. Opportunities and obstacles for deep learning in biology and medicine. 2018. Journal of the Royal Society Interface. 15 (141).
- O'Hara, N. B., Reed, H. J., Afshinnekoo, E., Harvin, D., Caplan, N., Rosen, G., Frye, B., **Woloszynek, S.**, Ounit, R., Levy, S., Butler, E., and Mason, C. E. Metagenomic characterization of ambulances across the USA. 2017. Microbiome 5 (1).
- Cronin, D., **Woloszynek, S.**, Pastor, S. J., Mell, J. C., Nandi, N., Sokhansanj, B., and Rosen, G. Engineering human microbiota: influencing cellular and community dynamics for therapeutic applications. 2016. IRCMB. 324: 67-124.

Conference Paper and Abstracts

- Venditti, D., **Woloszynek, S.**, Zhao, Z., Rosen, Morra, W., Ondo nze avomo, J., G. L., Cronin, D., O'Conner, M. P., Hearn, G. W., and Gonder. Understanding an unsustainable Central African bushmeat commodity chain: A multidisciplinary approach. 2020. IPS.
- Venditti, D., **Woloszynek, S.**, Zhao, Z., Rosen, Morra, W., Ondo nze avomo, J., G. L., Cronin, D., O'Conner, M. P., Hearn, G. W., and Gonder. Understanding an unsustainable Central African bushmeat commodity chain: A multidisciplinary approach. 2020. STE.
- Smith, A. H., O'Connor, M. P., **Woloszynek, S.**, Oliver, K. M., and Russell, J. A. Does getting defensive get you anywhere? - Dissecting the causes of rapid symbiont dynamics in the pea aphid. 2018. Wolbachia meetings.
- Price, J., Nan, Y., Wang, Y., Cheng, M., Keshani, S., **Woloszynek, S.**, Rosen, G., Yuan, L., and Sales, C. Predation and parasitism induces community stability and performance within EBPR reactors. 2019. American chemical society 257.
- Mitchell, M. W., **Woloszynek, S.**, Al-Ghalith, G., Clayton, J. B., Rosen, G. L., Gonder, M. K., and Knights, D. Habitat variation impacts chimpanzee gut microbiome diversity in Cameroon. 2018. International Society of Primatologists, Nairobi.
- Vanderkluysen, L., Barber, N., **Woloszynek, S.**, O'Connor, M. P., Mittal, T., Sealing, C., Sprain, C., and Renne, P. Statistical Analysis of Deccan Basalt Geochemistry: An Updated Look at Deccan Chemostratigraphy. 2017. American Geophysical Union.
- Vanderkluysen, L., Barber, N., **Woloszynek, S.**, O'Connor, M. P., Mittal, T., Sealing, C., Sprain, C., and Renne, P. A Modern Look at the Deccan Chemostratigraphic Scheme. 2017. Geological Society of America.
- Cronin, D. T., **Woloszynek, S.**, Long term monitoring of a bushmeat market in Bioko, Equatorial Guinea. 2014. Annual Meeting of the Society for Integrative and Comparative Biology.

Working Papers

- O'Hara, N. B., Reed, H. J., Afshinnekoo, E., Harvin, D., Caplan, N., Rosen, G., Frye, B., Woloszynek, S., Ounit, R., Levy, S., Butler, E., and Mason, C. E. Further Metagenomic characterization of ambulances across the USA.
- Zhao, Z., **Woloszynek, S.**, Agbavor, F., Mell, J. C., and Rosen, G. L. Learning, Visualizing and Exploring 16S rRNA Structure Using an Attention-Based Deep Neural Network.
- Venditti, D., **Woloszynek, S.**, Zhao, Z., Rosen, G. L., Cronin, D., O'Conner, M. P., Hearn, G. W., and Gonder, M. K. Long–term urban bushmeat market dynamics on Bioko Island, Equatorial Guinea.
- Owens, J. R., **Woloszynek, S.**, Lei, B. W., Hou, R., Qi, D., Kilham, B., Spotila, J. R., Yi, S., Spotila, J. T., and Zhang, Z. Reintroduction conditioning and the influence of human interactions and care on the behavior of giant pandas.
- Nan, Y., Price, J. R., Keshani, S., **Woloszynek, S.**, Rosen, G. L., and Sales, C. M. Evidence of predation and parasitism affecting EBPR performance through microbial community instability.
- Mitchell, M. W., **Woloszynek, S.**, Al-Ghalith, Featherstone, B. S., G., Clayton, J. B., Rosen, G. L., Gonder, M. K., and Knights, D. Environmental drivers shape the chimpanzee gut microbiome in a biodiversity hotspot.

Invited Talks

- **Woloszynek, S.**, Mell, J. C., Simpson, G., and Rosen, G. Identifying microbial subcommunities associated with host metadata via a topic modelling framework. 214th Meeting of the Interurban Clinical Club. November 4, 2016. University of Pennsylvania. Philadelphia, PA.
- **Woloszynek, S.**, Mell, J. C., Simpson, G., and Rosen, G. Identifying microbial subcommunities associated with host metadata via a topic modelling framework. International Symposium on Molecular Medicine and Infectious Disease. September 15, 2016. Drexel University College of Medicine. Philadelphia, PA.

Poster Presentations

- **Woloszynek, S.**, Zhao, Z., O'Connor, M., Mell, J. C., Simpson, G., and Rosen G. Themetagenomics: Uncovering thematic structure in 16S rRNA marker gene survey. (1) Discovery Day. Drexel University, Philadelphia, PA, 2018. (2) Emerging Graduate Scholars Conference. Drexel University, Philadelphia, PA, 2018. (3) DIG's 10th Annual Research Symposium, Drexel University, Philadelphia, PA, 2018, **2nd place**. (4) Microbiome, Host Resistance and Disease X4. Banff, Alberta, Canada, 2018.
- **Woloszynek, S.**, Mell, J. C., Simpson, G., and Rosen, G. Identifying Microbial Subcommunities Associated with Host Metadata via a Topic Modelling Framework. (1) Penn PROMOTES Retreat, University of Pennsylvania, Philadelphia, PA, 2017. (2) DIG's 9th Annual Research Symposium, Drexel University, Philadelphia, PA, 2017, (3) IHMC 2016. Houston, TX, 2016. (4) Third Annual Microbiome Symposium. Children's Hospital of Philadelphia. Philadelphia, PA, 2016. (5) 2016 Mid Atlantic Bioinformatics Conference. Children's Hospital of Philadelphia. Philadelphia, PA, 2016. (6) Discovery Day 2016, Drexel University College of Medicine, Philadelphia, PA, 2016.
- **Woloszynek, S.**, Mell, J. C., and Rosen, G. Uncovering Metagenomic Topics Associated with Host Metadata. (1) Bridging Biomedical Worlds 2016. Hong Kong, China, 2016.
- **Woloszynek, S.**, Tabb, L. P., and Rosen, G. Accounting for Zero-Inflation and Taxon-Correlations in Human Microbiome Data. DIG's 8th Annual Research Symposium, Drexel University, Philadelphia, PA, 2016.
- **Woloszynek, S.**, Tabb, L. P., and Rosen, G. A Zero–Inflated MVPLN Model for Correlated OTU Abundances. Discovery Day 2015, Drexel University College of Medicine, Philadelphia, PA, 2015.
- **Woloszynek, S.**, Tabb, L. P., and Rosen, G. Overcoming Zero Inflation in Sparse OTU Tables. DTRA/NSF Workshop: Algorithms for Threat Detection, NSF, Arlington, VA, 2015.
- **Woloszynek, S.**, Rosen, G. Prediction of Host Traits through Microbiota Composition via Supervised LDA. Research Day 2015, Drexel University, Philadelphia, PA, 2015.
- **Woloszynek, S.**, Sperling, M., Sharan, A., and Jacobs, J. Electrocorticographic Recordings Reveal Distinct Neural Patterns for Working Memory Performance. (1) NE Regional APSA Meeting, Temple University, Philadelphia, PA, 2013. (2) Discovery Day 2013, Drexel University College of Medicine, Philadelphia, PA, 2013.
- Cronin, D.T., **Woloszynek, S.**, Morra, W.A., Honarvar, S., Linder, J.M., O'Connor, M.P., Hearn, G.W. Emergent trends in an urban bushmeat market on Bioko Island, Equatorial Guinea. XXIV. Congress of the International Primatological Society, Cancun, Mexico, 2012.
- Cronin, D.T., **Woloszynek, S.**, O'Connor, M.P., Hearn, G.W. Bushmeat Hunting on Bioko Island, Equatorial Guinea Suggests a Network of Organized Crime. 14th Annual Research Day, Drexel University, Philadelphia, PA, 2012.
- Cronin, D.T., **Woloszynek, S.**, O'Connor, M.P., Hearn, G.W. Bushmeat Hunting on Bioko Island, Equatorial Guinea Suggests a Network of Organized Crime. 6th College of Arts and Sciences. Research Day, Drexel University, Philadelphia, PA, 2012.
- Kangovi, S., Edwards, M., **Woloszynek, S.**, Feldman, H., Kaplan, B. S., and Meyers, K. RAAS Inhibitor Monotherapy in Pediatric FSGS Patients. Pediatric Academic Societies' and Asian Society for Pediatric Research Joint Meeting, Denver, CO, 2011.
- Cronin, D. T., **Woloszynek, S.**, Morra, W., Biacho, R. A., and Hearn, G. Changing composition of the Malabo bushmeat market, Bioko Island, Equatorial Guinea, XXIII Congress of the International Primatological Society, Kyoto, Japan, 2010.

Software and Packages

- Themetagenomics. **Woloszynek, S.**, R package version 1.0.0., github.com/sw1/themetagenomics
- Theseus. Price, J. R. and **Woloszynek, S.**, R package version 0.1.0., github.com/sw1/theseus
- Biomod2EZ. Sesnek Clee, P. R., **Woloszynek, S.**, and Gonder, M. K. 2017., github.com/psesinkclee/biomod2ez

Media Coverage

- "Laws Prohibiting Bush Meat Are Actually A Boon For The Bush Meat Biz." NPR. August 2015.
- "Hunting Of Primates Increases With Economic Growth." IFLScience. August 2015.

Invited Peer Reviewer

- Frontiers Microbiology, Editor: Michele Guindani

Didactic

Teaching

Cafe STEM Summer Camp — *Drexel University*
Bianca Marrero — *2017*
- Lecturer: Junior high level biology concepts

Multi-disciplinary DSP — *Drexel University*
Gail L. Rosen PhD — *2017*
- Lecturer: dynamic programming, alignment

Statistical Analysis of Metagenomes — *Drexel University*
Gail L. Rosen PhD — *2016*
- Lecturer: R, OTU picking, dada2, multiple Comparisons, hypothesis testing, QIIME, parallel computing, bash

Advances in DSP: Biological Signal Processing — *Drexel University*
Gail L. Rosen PhD — *2016*
- Lecturer: neural networks, topic models, variational inference

Bioinformatics — *Drexel University*
Gail L. Rosen PhD — *2016*
- Lecturer: R, Alignment, Dynamic Programming
- Teaching assistant

Applied Bayesian Analysis — *Drexel University*
Loni Tabb PhD — *2016*
- Teaching assistant

Introduction to Statistical Computing — *Drexel University*
Loni Tabb PhD — *2016*
- Teaching assistant

Introduction to Statistical Computing — *Philadelphia Futures*
Helena Miller PhD — *2012 - 2013*
- Tutor: algebra, trigonometry, english

Mentoring

Felix Agbavor — *Drexel University*
Undergraduate, Biomedical Engineering — *2017 - 2019*
- Projects: microbiome functional prediction; microbiome embeddings

Dhantha Gunarantha — *Drexel University*
Undergraduate, Electrical and Computer Engineering — *2017 - 2019*
- Projects: microbiome functional prediction

Conferences Attended

2018	**StanCon**	*Pacific Grove, CA*
2017	**4th Annual Microbiome Symposium**	*Philadelphia, PA*
2016	**CCP's Ask Me How I Became Successful,** Speaker	*Philadelphia, PA*
2016	**StanCon**	*New York, NY*
2015	**ASA Traveling Course: Bayesian Methods and Computing**	*Philadelphia, PA*

Skills

Programming R, Python, C, Matlab, Stan, TensorFlow, Bash, Git, LaTeX
Web HTML5