

# JAMES (JAMIE) T. MORTON

(513) · 907 · 9853 ◊ jamietmorton@gmail.com ◊ <https://github.com/mortonjt>

## RESEARCH INTERESTS

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High dimensional statistics, Bayesian inference, multi-omics data fusion, spatial-temporal analysis and machine learning with applications to microbial ecology and evolution with special interests in functional genomics, microbial metabolism and microbial niche differentiation.

## EDUCATION

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<b>Graduate</b> 2015 - Present	University of California, San Diego, CA PhD candidate in the Department of Computer Science Expected Graduation Date: December 2018 PhD Thesis: “Making sense of microbial populations from representative samples”
<b>Graduate</b> 2014 - 2015	University of Colorado, Boulder, CO PhD student in the Department of Computer Science Integrative Quantitative Biology Program
<b>Undergraduate</b> 2010 - 2014	Miami University, Oxford, OH B.S. Computer Science (Cum Laude) B.S. Electrical Engineering (Cum Laude) B.S. Mathematics and Statistics B.S. Engineering Physics
<b>Study Abroad</b> Spring 2012	Hong Kong University of Science and Technology, Hong Kong

## HONORS

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- **NSF Graduate Fellow**, 2014 - present
- **Integrated Quantitative Biology Fellowship**, University of Colorado Boulder, 2014 - 2015
- **National Barry Goldwater Scholar**, 2013
- **Benjamin Harrison Scholar**, Miami University, 2010-2014
- **First place team member**, Institute of Navigation Autonomous Snowplow Competition, 2014
- **NSF REU**, Cold Spring Harbor Laboratories, Summer 2012
- **Provost Academic Achievement Award**, Miami University, 2012
- **Ohio Space Grant Scholar Award**, NASA, 2012 - 2014
- **Dean's List**, Miami University, 2010-13
- **R.L. Edwards Scholarship**, Department of Physics, Miami University, 2011, 2013
- **Mary Jeannette & Clifford Harvey Scholarship**, Mathematics Department, Miami U., 2013
- **Mary Jean & Joseph R. Priest Scholarship**, Physics Department, Miami U., 2012
- **President List**, Miami University, 2010-11
- **Nestle Scholar**, Computer Sci. and Software Eng. Dept, Miami University, 2011
- **Faculty Prize**, Department of Mathematics, Miami University, 2011
- **Joseph A. Culler Award**, Department of Physics, Miami University, 2010, 2011
- **NSF Travel Grant**, Coupling, Energetics, & Dynamics of Atmospheric Regions Workshop, 2010
- **Wright Scholar**, Air Force Research Laboratory, Wright Patterson Air Force Base, 2009

## PUBLICATIONS

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1. **Morton, J. T.**, Sanders, J., Quinn, R. A., McDonald, D., Gonzalez, A., Vazquez-Baeza, Y., Navas-Molina, J. A., Song, S. J., Metcalf, J. L., and Hyde, E. R. (2017). Balance trees reveal microbial niche differentiation. *mSystems*, 2(1):e00162–16
2. **Morton, J. T.**, Toran, L., Edlund, A., Metcalf, J. L., Lauber, C., and Knight, R. (2017). Uncovering the horseshoe effect in microbial analyses. *mSystems*, 2(1):e00166–16
3. Washburne, A. D., **Morton, James T.**, Sanders, J., McDonald, D., Zhu, Q., Oliverio, A. M., and Knight, R. (2018). Methods for phylogenetic analysis of microbiome data. *Nature Microbiology*, 3(6):652
4. Kapon, C. A., **Morton, James T.**, Bouslimani, A., Melnik, A. V., Orlinsky, K., Knaan, T. L., Garg, N., Vázquez-Baeza, Y., Protsyuk, I., Janssen, S., et al. (2018). Creating a 3D microbial and chemical snapshot of a human habitat. *Scientific reports*, 8(1):3669
5. Thompson, L. R., Sanders, J. G., McDonald, D., Ladau, J., Locey, K. J., Navas-Molina, J. A., Prill, R. J., Gibbons, S. M., Gonzalez, A., Amir, A., Tripathi, A., Song, S. J., Vazquez-Baeza, Y., Kopylova, E., **Morton, J. T.**, Mirarab, S., Haroon, M. F., Kosciolk, T., Xu, Z. Z., Bokulich, N. A., Humphrey, G. C., Ackermann, G., Owens, S. M., Janssen, S., Brislawn, C. J., Lefler, J., Hampton-Marcell, J., Zhu, Q., Kanbar, J., Berg-Lyons, D., Fierer, N., Shade, A., Pollard, K. S., Goodwin, K. D., Jansson, J. K., Gilbert, J. A., Knight, R., and the Earth Microbiome Project Consortium (2017). A communal catalogue reveals Earth’s multiscale microbial diversity. *Nature*
6. McDonald, D., Hyde, E., Debelius, J. W., Morton, J. T., Gonzalez, A., Ackermann, G., Aksenov, A. A., Behsaz, B., Brennan, C., Chen, Y., et al. (2018). American Gut: an Open Platform for Citizen Science Microbiome Research. *mSystems*, 3(3):e00031–18
7. Lavrinienko, A., Mappes, T., Tukalenko, E., Mousseau, T. A., Moller, A. P., Knight, R., **Morton, J. T.**, Thompson, L. R., and Watts, P. C. (2017). Environmental radiation alters the gut microbiome of the bank vole *Myodes glareolus*. *ISME*
8. McCall, L.-I., **Morton, J. T.**, Bernatchez, J. A., de Siqueira-Neto, J. L., Knight, R., Dorrestein, P. C., and McKerron, J. H. (2017). Molecular cartography of experimental cardiac infection by the parasite *Trypanosoma cruzi*. *Analytical Chemistry*, 89(19):10414—10421
9. Amato, K. R., Sanders, J. G., Song, S. J., Nute, M., Metcalf, J. L., Thompson, L. R., **Morton, James T.**, Amir, A., McKenzie, V. J., Humphrey, G., et al. (2018). Evolutionary trends in host physiology outweigh dietary niche in structuring primate gut microbiomes. *The ISME journal*, page 1
10. Vazquez-Baeza, Y., Callewaert, C., Debelius, J., Hyde, E., Marotz, C., **Morton, J. T.**, Swafford, A., Vrbanc, A., Dorrestein, P. C., and Knight, R. (2017). Impacts of the human gut microbiome on therapeutics. *Annual Reviews*, 58
11. Knight, R., Vrbanc, A., Taylor, B. C., Aksenov, A., Callewaert, C., Debelius, J., Gonzalez, A., Kosciolk, T., McCall, L.-I., McDonald, D., et al. (2018). Best practices for analysing microbiomes. *Nature Reviews Microbiology*, page 1
12. Jiang, L., Amir, A., **Morton, J. T.**, Heller, R., Arias-Castro, E., and Knight, R. (2017). Discrete false discovery rate improves identification of differentially abundant microbes. *mSystems*
13. Metcalf, J. L., Song, S. J., **Morton, James T.**, Weiss, S., Seguin-Orlando, A., Joly, F., Feh, C., Taberlet, P., Coissac, E., Amir, A., et al. (2017). Evaluating the impact of domestication and captivity on the horse gut microbiome. *Scientific reports*, 7(1):15497

14. Maier, T. V., Lucio, M., Lee, L. H., VerBerkmoes, N. C., Brislawn, C. J., Bernhardt, J., Lamendella, R., McDermott, J. E., Bergeron, N., Heinzmann, S. S., et al. (2017). Impact of dietary resistant starch on the human gut microbiome, metaproteome, and metabolome. *MBio*, 8(5):e01343–17
15. Amir, A., McDonald, D., Navas-Molina, J. A., Debelius, J., **Morton, J. T.**, Hyde, E., Robbins-Pianka, A., and Knight, R. (2017). Correcting for microbial blooms in fecal samples during room-temperature shipping. *mSystems*, 2(2):e00199–16
16. Amir, A., McDonald, D., Navas-Molina, J. A., Kopylova, E., **Morton, J. T.**, Zhenjiang, Z. X., Kightley, E. P., Thompson, L. R., Hyde, E. R., Gonzalez, A., and Knight, R. (2017). Deblur rapidly resolves single-nucleotide community sequence patterns. *mSystems*, 2(2)
17. Vazquez-Baeza, Y., Gonzalez, A., Smarr, L., McDonald, D., **Morton, J. T.**, Navas-Molina, J. A., and Knight, R. (2017). Bringing the dynamic microbiome to life with animations. *Cell Host & Microbe*, 21(1):7–10
18. Vrbanc, A., Debelius, J. W., Jiang, L., **Morton, J. T.**, Dorrestein, P., and Knight, R. (2017). An Elegan (t) screen for drug-microbe interactions. *Cell Host & Microbe*, 21(5):555–556
19. Hill-Burns, E. M., Debelius, J. W., **Morton, J. T.**, Wissemann, W. T., Lewis, M. R., Wallen, Z. D., Peddada, S. D., Factor, S. A., Molho, E., Zabetian, C. P., Knight, R., and Payami, H. (2017). Parkinson’s disease and Parkinson’s disease medications have distinct signatures of the gut microbiome. *Movement Disorders*, 32(5):739–749
20. Hemmings, S. M., Malan-Muller, S., van den Heuvel, L. L., Demmitt, B. A., Stanislawski, M. A., Smith, D. G., Bohr, A. D., Stamper, C. E., Hyde, E. R., **Morton, J. T.**, Marotz, C. A., Siebler, P. H., Braspenning, Maarten Irand Van Crieke, W., Irand Hoisington, A. J., Brenner, L. A., Postolache, T. T., McQueen, M. B., Krauter, K. S., Knight, R., Seedat, S., and Lowry, C. A. (2017). The microbiome in posttraumatic stress disorder and trauma-exposed controls: an exploratory study. *Psychosomatic Medicine*, 79(8):936–946
21. Reber, S. O., Siebler, P. H., Donner, N. C., **Morton, J. T.**, Smith, D. G., Kopelman, J. M., Lowe, K. R., Wheeler, K. J., Fox, J. H., Jr., J. E. H., Greenwood, B. N., Jansch, C., Lechner, A., Schmidt, D., Uschold-Schmidt, N., Füchsl, A. M., Langgartner, D., Walker, F. R., Hale, M. W., Perez, G. L., Treuren, W. V., González, A., Halweg-Edwards, A. L., Fleshner, M., Raison, C. L., Rook, G. A., Peddada, S. D., Knight, R., , and Lowry, C. A. (2016). Immunization with a heat-killed preparation of the environmental bacterium *Mycobacterium vaccae* promotes stress resilience in mice. *Proceedings of the National Academy of Sciences*, 113(22):201600324
22. Gilbert, J. A., Quinn, R. A., Debelius, J., Zhenjiang, Z. X., **Morton, J. T.**, Garg, N., Jansson, J. K., Dorrestein, P. C., and Knight, R. (2016). Microbiome-wide association studies link dynamic microbial consortia to disease. *Nature*, 535(7610):94–103
23. Nellore, A., Collado-Torres, L., Jaffe, A. E., Alquicira-Hernández, J., Wilks, C., Pritt, J., **Morton, J. T.**, Leek, J. T., and Langmead, B. (2016). Rail-RNA: Scalable analysis of RNA-seq splicing and coverage. *Bioinformatics*, page btw575
24. Petras, D., Nothias, L.-F., Quinn, R. A., Alexandrov, T., Bandeira, N., Bouslimani, A., Castro-Falcón, G., Chen, L., Dang, T., Floros, D. J., Hook, V., Garg, N., Hoffner, N., Jiang, Y., Kapono, C. A., Koester, I., Knight, R., Leber, C. A., Ling, T.-J., Luzzatto-Knaan, T., McCall, L.-I., McGrath, A. P., Meehan, M. J., Merritt, J. K., Mills, R. H., **Morton, J. T.**, Podvin, S., Protsyuk, I., Purdy, T., Satterfield, K., Searles, S., Shah, S., Shires, S., Steffen, D., White, M., Todoric, J., Tuttle, R., Wojnicz, A., Sapp, V., Vargas, F., Yang, J., Zhang, C., and Dorrestein, P. C. (2016). Mass spectrometry-based visualization of molecules associated with human habitats. *Analytical Chemistry*, 88(22):10775–10784. PMID: 27732780g
25. Barberán, A., Dunn, R. R., Reich, B. J., Pacifici, K., Laber, E. B., Menninger, H. L., **Morton, J.**

- T.**, Henley, J. B., Leff, J. W., Miller, S. L., and Fierer, N. (2015). The ecology of microscopic life in household dust. *Proceedings of the Royal Society of London B: Biological Sciences*, 282(1814)
26. **Morton, J. T.**, Freed, S. D., Lee, S. W., and Friedberg, I. (2015). A large scale prediction of bacteriocin gene blocks suggests a wide functional spectrum for bacteriocins. *BMC bioinformatics*, 16(1):381
  27. **Morton, J. T.**, Abrudan, P., Figueroa, N., Liang, C., and Karro, J. E. (2014). SCOPE++: Sequence Classification Of homoPolymer Emissions. *Genomics*, 104(3):157–162
  28. Quinn, R. A., Comstock, W., Zhang, T., **Morton, J. T.**, Silva, R. d., Tran, A., Aksenov, A., Nothias-Scaglia, L.-F., Wangpraseurt, D., Melnik, A. V., Ackerman, G., Conrad, D., Klapper, I., Knight, R., and Dorrestein, P. C. (Submitted, August 2017). Niche partitioning of a polymicrobial infection driven by chemical gradients. *Science Advances*

## MANUSCRIPTS SUBMITTED FOR PUBLICATION

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1. Martino, C., **Morton, J. T.**, Marotz, C., Thompson, L. R., Tripathi, A., Knight, R., and Zengler, K. (Submitted to *mSystems* on November 2018). Inference across the vast unobserved microbial space with matrix completion. *mSystems*
2. **Morton, J. T.**, Aksenov, A., Nothias-Scaglia, L.-F., Foulds, J., Quinn, R. A., Song, S. J., Anderson, B., Dutton, R., Dorrestein, P. C., and Knight, R. (Submitted to *RECOMB* on November 2018). Multimodal models learn microbe-metabolite interactions
3. **Morton, J. T.**, Marotz, C., Washburne, A., Silverman, J., Edlund, A., Zengler, K., and Knight, R. (Submitted to *Nature Biotechnology* on November 2018). Establishing microbial composition measurement standards with reference frames

## MANUSCRIPTS UNDER PREPARATION

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1. **Morton, J. T.**, Foulds, J., Silverman, J., Washburne, A., McDonald, D., Thompson, L., and Knight, R. (To be submitted to *ISME*). Online scalable annotation of microbes across the globe

## SELECTED CONFERENCE PRESENTATIONS

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- **Morton J. T.** (2017). The microbiome and sex differences. Sex and the Kidneys: Sex Differences in Renal Disease Workshop in Bethesda, MD
- **Morton, J. T.**, Sanders, J., Quinn, R. A., McDonald, D., Gonzalez, A., Vazquez-Baeza, Y., Navas-Molina, J. A., Song, S. J., Metcalf, J. L., and Hyde, E. R. (2017). Balances reveal microbial niche differentiation. CODAwork in Abbadia San Salvatore, Siena, Italy
- **Morton, J. T.**, Freed, S., Lee, S., and Friedberg, I. (2014). Prediction of Bacteriocin Associated Operons. Rocky Mountain Bioinformatics Conference, Aspen, CO
- **Morton, J. T.**, Richard, M., and Robert, C. (2013). Redblade Miami University’s autonomous vehicle. Institute of Navigation (ION) Autonomous Snowplow Competition, St. Paul, MN

## SELECTED POSTER PRESENTATIONS

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- **Morton, J. T.**, Sanders, J., Quinn, R. A., McDonald, D., Gonzalez, A., Vazquez-Baeza, Y., Navas-Molina, J. A., Song, S. J., Metcalf, J. L., and Hyde, E. R. (2017). From probabilities to balances: an alternative approach. Information Theory and Applications Workshop in San Diego, CA
- **Morton, J. T.**, Sanders, J., Quinn, R. A., McDonald, D., Gonzalez, A., Vazquez-Baeza, Y., Navas-Molina, J. A., Song, S. J., Metcalf, J. L., and Hyde, E. R. (2017). From probabilities to

balances: an alternative approach. Random Processes and Time Series: Theory and Applications in San Diego, CA

- Reber, S. O., Siebler, P. H., Donner, N. C., **Morton, J. T.**, Smith, D. G., Kopelman, J. M., Lowe, K. R., Wheeler, K. J., Fox, J. H., Jr., J. E. H., Greenwood, B. N., Jansch, C., Lechner, A., Schmidt, D., Uschold-Schmidt, N., Füchsl, A. M., Langgartner, D., Walker, F. R., Hale, M. W., Perez, G. L., Treuren, W. V., González, A., Halweg-Edwards, A. L., Fleshner, M., Raison, C. L., Rook, G. A., Peddada, S. D., Knight, R., , and Lowry, C. A. (2016). An immunization strategy for prevention of post-traumatic stress disorder (PTSD) promotes stress resilience in mice. University California San Diego Pediatrics Symposium in San Diego, CA
- **Morton, J. T.**, Lladser, M., and Knight, R. (2015). Uncovering the Unknown: a new approach in analyzing microbiome data. NSF Data Science Workshop in University of Washington, Seattle, WA
- **Morton, J. T.**, Freed, S., and Lee, S. Friedberg, I. (2014). Discovering the next antibiotic. Ohio Space Grant Consortium in Cleveland, OH
- **Morton, J. T.**, Abrudan, P., Karro, J., and Liang, C. (2013). Sequence classification of homopolymer emissions (SCOPE). Great Lakes Bioinformatics Conference, Pittsburgh, PA
- **Morton, J. T.**, Abrudan, P., Karro, J., and Liang, C. (2012). Sequence classification of homopolymer emissions (SCOPE). IEEE 2nd International Conference on Computational Advances in Bio and Medical Sciences, ICCABS , Las Vegas, NV
- **Morton, J. T.**, Karro, J., and Liang, C. (2011). A novel approach for identifying poly(A) tails in raw cDNA sequence data using Hidden Markov Models. Genome Informatics in Cold Spring Harbor, NY
- Santana, J., **Morton J. T.**, and Zhou, Q. (2010). A fuzzy logic approach to extract plasma line frequencies from Arecibo incoherent scatter radar measurements. Coupling, Energetics, and Dynamics of Atmospheric Regions Workshop, Boulder, CO

## PROFESSIONAL MEMBERSHIPS

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- International Society of Computational Biology Student member, 2014-Present
- Association for Computing Machinery Student member, 2011-Present
- Sigma Pi Sigma, Tau Beta Pi, Eta Kappa Nu, 2014
- National Society of Collegiate Scholars, 2012 - 2013
- Institute of Electrical and Electronics Engineers (IEEE) Student member, 2011-2016
- IEEE Miami Student Chapter Treasurer, 2011 - 2012

## PROFESSIONAL SERVICES

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- Organized the 2018 Probabilistic Microbial Modeling Symposium, engaging over 120 participants.
- Poster Reviewer for ISMB 2015
- Coordinated activities for UCSE CSE 2018 Visit Day

## TEACHING

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- Teaching Assistant. A Practical Introduction to Probability and Statistics, Fall 2018
- Instructor. Qiime2 workshop. Colorado State University, November 20-21, 2017
- Instructor. Qiime2 workshop. UBC Vancouver, August 23-25, 2017
- Instructor. Qiime2 workshop. UBC Kelowna, August 21-22, 2017
- Teaching Assistant. Qiime2 workshop. Las Vegas, NV, June 21-23, 2017
- Teaching Assistant. STAMPS, Woodshole, MA, August 2-13, 2016

## MENTORING

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- Kalen Cantrell, undergraduate student, 2017-2018
- Thant Htoo Zaw, undergraduate student, 2017-2018
- Yimeng Yang, undergraduate student, 2017-2018
- Andrew Nyugen, undergraduate student, 2017-2018
- Jue Wang, undergraduate student, Summer 2017
- Cameron Martino, undergraduate student, Spring 2017
- Josh Lefler, undergraduate student, Fall 2016
- Liam Toran, masters student, Summer 2016
- Kayla Orlinsky, undergraduate student, Spring 2016

## SKILLS

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### Foreign Language Skills

- Chinese – Fluent in Mandarin and competent in written Chinese

### Highly skilled in the following languages and computational platforms

- Python      • C/C++    • Java    • Javascript    • Stan    • Matlab    • R      • Unix
- Tensorflow    • SQL      • ROS    • Hadoop    •  $\text{\LaTeX}$     • OpenCL    • CUDA    • git

## OPEN SOURCE CONTRIBUTIONS

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- [Gneiss](#) (Lead Developer)
- [Maestro](#) (Lead Developer)
- [Songbird](#) (Lead Developer)
- [BOA](#) (Lead Developer)
- [SCOPE](#) (Lead Developer)
- [scikit-bio](#) (Developer)
- [Emperor](#) (Developer)
- [Micronota](#) (Developer)
- [Qiime2](#) (Developer)
- [Deblur](#) (Developer)
- [Rail-RNA](#) (Contributor)
- [Statsmodels](#) (Contributor)
- [Scipy](#) (Contributor)
- [Biopython](#) (Contributor)

## PERSONAL INTERESTS

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- Music: Piano, Cello, Guitar, and Voice (base).
- Sports: Surfing, Scuba Diving, Ice Hockey, Skiing, Hiking, Biking, Kung Fu
- Others: Traveling, Cooking