

Julia Chifman

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PROFESSIONAL POSITIONS

- Assistant Professor, 2016 – Present.
Department of Mathematics and Statistics, American University.
- Postdoctoral Researcher, 2015 – 2016.
Department of Statistics, The Ohio State University.
- Postdoctoral Fellow, 2011 – 2015.
Department of Cancer Biology, Wake Forest School of Medicine.
2012 – 2015: Lance Miller's Lab.
2011 – 2012: Suzy Torti's Lab.
- Postdoctoral Research Fellow, 2009 – 2011.
Mathematical Biosciences Institute, The Ohio State University.
- Visiting Scholar, 2009 – 2013.
Virginia Bioinformatics Institute, Virginia Tech.

EDUCATION

- Ph.D., Mathematics, University of Kentucky, May 2009.
Advisor: James C. Beidleman, University of Kentucky.
Thesis: Direct products and the intersection map of certain classes of finite groups.
- M.A., Mathematics, University of Kentucky, 2005.
- B.S., Mathematics, King's College, Wilkes-Barre, PA, 2003.

AREAS OF RESEARCH

Phylogenetics; Systems Biology; Evolution of Cancer; Cancer Informatics.

PUBLICATIONS

PUBLISHED RESEARCH

- Gao, Y., Gaither, J., **Chifman, J.**, and Kubatko, L. (2022). A phylogenetic approach to inferring the order in which mutations arise during cancer progression. *PLoS Computational Biology*, 18(12). doi:[10.1371/journal.pcbi.1010560](https://doi.org/10.1371/journal.pcbi.1010560)
- Bassier-Ravitz, E., Darbar, A., and **Chifman, J.** (2022). Cyclic attractors of nonexpanding q-ary networks. *Journal of Mathematical Biology*, 85(5). <https://link.springer.com/article/10.1007/s00285-022-01796-2>
- A. C. Knapp, Sordo Vieira L., Laubenbacher R., and **Chifman J.** (2022). SteadyCellPhenotype: A web-based tool for the modeling of biological networks with ternary logic, *Bioinformatics*. <https://doi.org/10.1093/bioinformatics/btac097>
- A.K. Pullikuth, Routh E.D., Zimmerman K.D., **Chifman J.**, Chou J.W., Soike M.H., Jin G., Su J., Song Q., Black M.A., Print C., Bedognetti D., Howard-McNatt M., O'Neill S.S., Thomas A., Langefeld C.D., Sigalov A.B., Lu Y., Miller L.D. (2021). Bulk and Single-Cell Profiling of Breast Tumors Identifies TREM-1 as a Dominant Immune Suppressive Marker Associated With Poor Outcomes. *Frontiers in Oncology*;11:734959. PubMed Central PMCID: PMC8692779.
- E. D. Routh, Pullikuth A. K., Jin G., **Chifman J.**, Chou J. W., D'Agostino R. B., Seino Ken-ichiro, Wada H., Print C. G., Zhang W., Lu Y., Miller L. D. (2020). Transcriptomic Features of T Cell-barren Tumors are Conserved Across Diverse Tumor Types. *Frontiers in Immunology*, 11:57, <https://doi.org/10.3389/fimmu.2020.00057>
- L. Kubatko and **Chifman, J.** (2019). An invariants-based method for efficient identification of hybrid species from large-scale genomic data. *BMC Evolutionary Biology*, 19(1). doi.org/10.1186/s12862-019-1439-7
- P. D. Blischak, **J. Chifman**, A. D. Wolfe, and L. S. Kubatko. (2018). HyDe: a Python Package for Genome-Scale Hybridization Detection, *Systematic Biology*, syy023, <https://doi.org/10.1093/sysbio/syy023>
- **J. Chifman**, Arat, S., Deng, Z., Lemler, E., Pino, J. C., Harris, L. A., Kochen, M. A., Lopez, C. F., Akman, S. A., Torti, F. M., Torti, S. V., and Laubenbacher, R. (2017). Activated Oncogenic Pathway Modifies Iron Network in Breast Epithelial Cells: A Dynamic Modeling Perspective. *PLoS Computational Biology*, 13(2), e1005352.
- **J. Chifman**, Pullikuth, A., Chou, J. W., Bedognetti, D., & Miller, L. D. (2016). Conservation of immune gene signatures in solid tumors and prognostic implications. *BMC Cancer*, 16, 911.
- L. D. Miller, J. A. Chou, M. A. Black, C. Print, **J. Chifman**, A. Alistar, T. Putti, X. Zhou, D. Bedognetti, A. Pullikuth, J. Rennhack, E. R. Andrechek, S. Demaria, E. Wang, F. M. Marincola. (2016). Immunogenic subtypes of breast cancer delineated by gene classifiers of immune responsiveness, *Cancer Immunology Research*.
- **J. Chifman**. (2016) Phylogenetic Invariants. In: Kliman, R.M. (ed.), *Encyclopedia of Evolutionary Biology*. vol. 3, pp. 257–263. Oxford: Academic Press.

- **J. Chifman** and L. Kubatko, Identifiability of the unrooted species tree topology under the coalescent model with time-reversible substitution processes, site-specific rate variation, and invariable sites. *J. Theor. Biol.* 374 (2015), 35-47.
- **J. Chifman** and L. Kubatko, Quartet inference from SNP data under the coalescent model. *Bioinformatics* (2014), 30 (23), 3317-3324, doi: 10.1093/bioinformatics/btu530.
- **J. Chifman**, R. Laubenbacher, and S. V. Torti. A systems biology approach to iron metabolism. In S. J. Corey, M. Kimmel, and J. N. Leonard, editors, *A Systems Biology Approach to Blood*, volume 844 of *Advances in Experimental Medicine and Biology*, pages 201-225. Springer New York (2014).
- **J. Chifman**, A. Kniss*, P. Neupane*, I. Williams*, B. Leung*, Z. Deng, P. Mendes, V. Hower, F.M. Torti, S.A. Akman, S.V. Torti, and Laubenbacher R. (2012). The core control system of intracellular iron homeostasis: A mathematical model. *J. Theor. Biol.* 300: 91-99.

* Undergraduate students from REU program (VBI, Virginia Tech).

- **J. Chifman**, Note on direct products of certain classes of finite groups. *Communications in Algebra*, (2009) 37:5, 1831-1842.
- J.C. Beidleman, and **J. Chifman**, The intersection map of subgroups and the classes PST_c , PT_c and T_c . *Ricerche mat.* (2008) 57:301-309.
- **J. Chifman**, and Petrovic, S., Toric ideals of phylogenetic invariants for the general group-based model on claw trees. *Proceedings of the Second international conference on Algebraic Biology*, (eds. H. Anai, K. Horimoto and T. Kutsia), Springer LNCS, 4545, Springer-Verlag, 307-321, 2007.

CONFERENCE PROCEEDINGS

- Sordo Vieira, L., Masison, J., Torti, S., Laubenbacher, R., **Chifman, J.** (July (3rd Quarter/Summer) 2019). "Abstract 2442: Assessing how macrophages attain distinct iron handling phenotypes in a tumor via a mathematical model" in *Cancer Research*. (vol. 79, no. 13 Supplement). American Association for Cancer Research. 10.1158/1538-7445.AM2019-2442.
- E. D. Routh, **J. Chifman**, A. Pullikuth, and L. D. Miller. Abstract 4753: Bone morphogenetic protein 7 is a candidate promoter of cancer immune evasion. *Cancer Research*, 78(13 Supplement):4753-4753, 2018.
- A. K. Pullikuth, **Chifman, J.**, Routh, E. D., Chou, J., Jin, G., Black, M. A., Miller, L. D. "Abstract 3791: Triggering receptor expressed in myeloid cells 1 (TREM1) is a predictive marker for breast cancer therapeutics" in *American Association for Cancer Research*. (vol. 78, no. 13 Supplement). 10.1158/1538-7445.AM2018-3791, 2018.
- F. Marini, **J. Chifman**, J. Tooze, C. Gomez-Manzano, K. M. Bussard. Osteoblasts are educated into a tumor-associated stromal cell by disseminated breast cancer cells and mediate breast cancer cell proliferation in the bone microenvironment [abstract]. In: *Proceedings of the American Association for Cancer Research Annual Meeting 2017*; 2017 Apr 1-5; Washington, DC. Philadelphia (PA): AACR; *Cancer Res* 2017;77(13 Suppl): Abstract nr 5890. <http://doi.org/10.1158/1538-7445.AM2017-5890>.

- A. T. Alistar, **J. Chifman**, R. D’Agostino Jr, and L. D. Miller, Gene expression signatures of effector immune cell abundance are significantly associated with recurrence risk in colon cancer (abstract). *Cancer Immunology Research*, (1 Supplement): A011-A011, (2016).

SUBMITTED

- L. Kubatko, Leonard, A., and **Chifman, J.** (2020). Identifiability of speciation times under the multispecies coalescent (submitted to *Journal of Theoretical Biology*; revising). Preprint available from bioRxiv <https://doi.org/10.1101/2020.11.24.396424>

GRANTS (PENDING)

- Chifman, J. (PI), Knapp, A. (PI-UF). “Collaborative Research: Advancing Inference of Phylogenetic Trees and Networks Under Multispecies Coalescent with Hybridization and Gene Flow,” NSF. Submitted March 28, 2023 (pending).

GRANTS (COMPLETED)

- Kubatko, L. (PI); Chifman, J. (Co-PI) “Title: Coalescent-based Species Tree Inference Using Algebraic Statistics,” (OSU, Statistics/WFSM, Cancer Biology); DMS -1106706 - NSF, October 2011- September 2016, \$180,000.

INTERNAL FUNDING

- “Computationally efficient framework for inferring the evolutionary history of a tumor,” Spring 2020 NASA DC Space Grant Consortium American University Faculty STEM Research Competition. \$3,200 (faculty) (2020-2021)
 - This grant also provided additional support for one graduate student and one undergraduate student.
- “Discrete models in system biology: toward fast and user-friendly software,” CAS, American University, Mellon Grant. \$3,800 (2018 - 2019)
 - The software has been completed and published in Bioinformatics <https://doi.org/10.1093/bioinformatics/btac097>

TEACHING EXPERIENCE

AMERICAN UNIVERSITY

COURSES TAUGHT:

- Computational and Systems Biology, Fall 2022.
- Linear Algebra, Fall 2016, 2019.
- Differential Equations, Fall 2016, 2017, 2019; Spring/Fall 2020, Spring/Fall 2021, Spring /Fall 2022; Spring 2023.

- Introduction to Stochastic Processes, Spring 2017.
- Abstract Algebra, Fall 2017, 2018, 2020, 2021.
- Calculus III, Spring 2018, 2020, 2021, 2023.
- Rings and Fields, Spring 2018, 2022.
- Probability, Fall 2018.
- Calculus II, Summer 2019.

CURRICULUM DEVELOPMENT

- Stat 423/623 – Topics in Biostatistics: Computational and Systems Biology (Fall 2022).
 - Designed and taught a new course not previously offered at AU. Since there was no single unified book that could accommodate different levels of students, the course material was based on multiple books and sources. All slides, R scripts, tutorials, and exercises (small assignments and case studies) were written from the ground up.
 - This course included undergraduate and graduate students at different levels. To make sure that all students can understand and actually participate in course activities, multiple R tutorials have been developed. These tutorials had step-by-step instructions about how to perform analyses, multiple questions, and exercises labeled "now on your own". Furthermore, the course had a hands-on format; specifically, my slides included small code chunks that students could try during lectures.

MASTER'S THESIS RESEARCH

- **Student:** Janvier Richardson
Topic: Transcriptomic blood biomarkers in human tuberculosis.
 Spring 2023 – Summer 2023.

INDEPENDENT STUDY READING COURSES:

- Introduction to Stochastic Modeling, Spring 2022 (one student; reading course 3.0 credit hours).
- Advanced Linear Algebra, Fall 2021 (one student; reading course 3.0 credit hours).
- Algebraic Geometry, Spring 2021 (one student; reading course 3.0 credit hours).
- Rings and Fields, Spring 2020 (three students; reading course 3.0 credit hours).
- Topics in Statistical Genetics, Spring 2019 (one student; reading course 3.0 credit hours).
- Modeling Infectious Diseases, Spring 2018 (one student; reading course 3.0 credit hours).
- Peptide Vaccine Design, Spring 2017 (one student).
- Senior capstone project supervisor for an undergraduate, Spring 2017 (one student).

STUDENT RESEARCH PROJECTS SUPERVISION:

- Supervised Research, Lia Dolive (Undergraduate), contributed to my ongoing research ideas about iron trafficking in tumor microenvironment. Student was supported by the NASA District of Columbia Space Grant Consortium (DCSGC) and by the CAS Mathias Research Fellowship during the summer of 2022.
 - Lia was a winner of the 2nd place - NASA Student Video Research Poster Competition in January 2023.
 - Lia also was a recipient of the Robyn Rafferty Mathias Student Research Conference Award in March 2023.
- Supervised Research, Boren Song (Undergraduate). Topic: Algebraic geometry with a focus on robotics. Student was supported by the Blair Jones Mathematics Endowment. Summer 2022.
 - Boren was accepted to joint Engineering degree program in partnership with Columbia University.
- Supervised Research, Charles Ingulli (Graduate), contributed to my ongoing research. Topic: computationally efficient framework for inferring the evolutionary history of a tumor, Project Completed (June 2020 - August 2021).
- Supervised Research, Yon Garber (Undergraduate), Topic: SIR as an Agent Based Model, Project Completed, (June 2020 - August 2020).
- Supervised Research, Adam Rodriguez (Undergraduate). Topic: The phylogenetic tree space, Project Completed, (June 2020 - August 2020).
- Supervised Research, Charles Ingulli (Graduate). Topic: Estimation of branch lengths in cancer phylogenetic models, Project Completed. (May 2019).
- Supervised Research, Yuchen Ma (Undergraduate). Topic: Generalized Boolean models and Petri Nets, Project Completed, (Summer 2019).
- Supervised Research, Sergio Guerra Abril (Undergraduate). Topic: Identifiability of cancer model, Project Completed, (January - May, 2019).
- Supervised Research, Moriah Mitchell. Topic: Involvement of iron in cell cycle, Project Completed, (Summer 2018).
- Supervised Research, Jacqueline Adams (Undergraduate). Topic: Macrophages and Iron Phenotypes in Cancer: Iron 3D Model and Beyond, Project Completed (Summer 2018).
- Supervised Research, Sergio Guerra Abril (Undergraduate). Topic: Phylogenetic Invariants and Fourier Transform Under the Coalescent Model, Project Completed (Spring 2018).
- Supervised Research, Linoy Kotler (Undergraduate). Topic: Site pattern genotype probabilities on the tumor tree and rank conditions of flattenings of the 4-dimensional probability distribution, Project Completed (January 2018 - May 2018).
- Supervised Research, Jacqueline Adams (Undergraduate), Sergio Guerra Abril (Undergraduate), Viktor Belay (Undergraduate), Linoy Kotler (Undergraduate). Topic: Oncogenic Pathways and Iron Phenotypes in Breast Cancer, (Summer 2017).

STUDENT OUTREACH OUTSIDE OF AMERICAN UNIVERSITY

- Supervised Research, Leon Fields (Bard High School Early College) and Chau Nguyen (Woodrow Wilson High School), “Boolean Models in Biology.” Students were supported by the Blair Jones Mathematics Endowment. Summer 2021.
 - Chau Nguyen is now undergraduate at the University of Toronto and is continuing to research with my collaborator Adam Knapp and I about dynamical systems over discrete domains under logical operators max/min/not.
- Supervised research project from Spring 2020 – September 2021 for two high school students from Sidwell Friends High School in DC: Etan Bassier and Arman Darbar. Both students are now undergraduates at Yale University and NYU, respectively.
 - This research was published <https://link.springer.com/article/10.1007/s00285-022-01796-2>

WAKE FOREST SCHOOL OF MEDICINE

- Bioconductor tools for the analysis of Affymetrix arrays, Cancer Biology Tutorials, Wake Forest School of Medicine, graduate course, Fall 2014.
- Introduction to Microarray Data Analysis using R/Bioconductor, Wake Forest School of Medicine, graduate course, Fall 2013.

UNIVERSITY OF KENTUCKY

- Calculus IV, Primary Instructor, University of Kentucky, Spring 2008.
- Intermediate Algebra, Primary Instructor, University of Kentucky, Fall 2007.
- Matrix Algebra, Primary Instructor, University of Kentucky, Summer 2005.
- Finite Mathematics, Primary Instructor, University of Kentucky, Spring 2005.
- Elementary Calculus, Primary Instructor, University of Kentucky, Fall 2004.
- Calculus III, Teaching Assistant, University of Kentucky, Spring 2004.

UConn Health

- Introduction to Expression Microarray Analysis Using R/Bioconductor, A Bioinformatics Short Course, Center for Quantitative Medicine, UConn Health, Farmington, CT, May 2, 2014.

OTHER RESEARCH PROJECT SUPERVISION

- Mentor for RUMBA program (Research for Undergraduates: adventures in Mathematical Biology and its Applications), The Ohio State University. Project Title: Identifiability of Species Phylogenies Under the Coalescent Model, 2010-2011.
- Mentor for REU program: Modeling and Simulation in Systems Biology, Virginia Bioinformatics Institute, Virginia Polytechnic Institute and State University, Summer of 2010 and 2011. Project: Iron metabolism.

PROFESSIONAL SERVICE AND ACTIVITIES

AMERICAN UNIVERSITY DEPARTMENTAL SERVICE

- Committee Member, Major Program Review Committee - self-study report (September 2021 - March 2022).
- Committee Member, Departmental website committee (October 2019 – July 2022).
- Committee Member, Colloquia (August 2019 - December 2021).
- Committee Member, Student Research Committee (2016 – present).
- Committee Member, Graduate Studies Committee, Mathematics (September 2017 – Present).
- Committee Member, Merit Committee (August 2018 – August 2019)
- Committee Member, Departmental working group: Senate's Beyond SETs Portfolio Model for Reappointment and Promotion. (November 2020)
 - Worked on the draft proposal toward adopting or adapting the Senate's Beyond SETs Portfolio Model for Reappointment and Promotion

AMERICAN UNIVERSITY SERVICE

- Elected Member, Faculty Senate Committee on Scholarship, Starting July 2023.
- Academic Integrity Code Review Panel. (2016 – present).
- Senate Committee on Graduate Curriculum. (September 2017 – 2019).

SUPPORT OF THE OFFICE OF MERIT AWARDS AND/OR MERIT BASED FELLOWSHIPS

- Provided letters of recommendation to the
 - Goldwater Scholarship
 - Rhodes Scholarship
 - Fannie and John Hertz Foundation.

PROFESSIONAL HONORS AND AWARDS

- "Outstanding Performance or Innovation in Online Teaching," Award, American University (April 2022).
- "Outstanding Performance or Innovation in Online Teaching," Award, American University (March 2021).

EXTERNAL SERVICE

- Workshop Organizer, Evolutionary Dynamics in Cancer, Columbus OH. (November 4, 2019 - November 6, 2019).
- Reviewed manuscripts for: PLOS Computational Biology, Bulletin of Mathematical Biology, Annals of Applied Statistics, Systematic Biology, Nature Communications, BMC Systems Biology, BioSystems, SIAM Undergraduate Research Online (SIURO), European Journal of Combinatorics.

OTHER PROFESSIONAL SERVICE

- Member of Ph.D. advisory committee: Jacob Keaton, Ph.D. student, Molecular Genetics and Genomics, Wake Forest School of Medicine, 2014.
- National Science Foundation Panel.
- Organized Postdoc Seminar: Mathematical Biosciences Institute, The Ohio State University, January-June, 2011.
- Workshop committee member: 2010 Workshop for Young Researchers in Mathematical Biology (WYRMB) at the Mathematical Biosciences Institute. August 30 – September 2, 2010.
- Member of the Evolutionary Biology Working Group, 2008-2009
 - Statistical and Applied Mathematical Sciences Institute (SAMSI), Research Triangle Park, NC.
- Mathematics Outreach: Algebra Cubed, University of Kentucky, August 2006 - July 2007. To increase the mathematical conceptual understanding and procedural fluency of Middle and High school students in Bath and Powell counties.
- Organized Graduate Student Colloquium, Department of Mathematics, University of Kentucky, Spring 2005-Fall 2005.

PRESENTATIONS/ POSTERS

- Chifman J., “Cancer evolution: mathematical models and inference methods,” Society for Mathematical Biology Annual Meeting – 2023. Invited to give a talk at the mini-symposium titled “Current trend in phylogenetics.” Talk scheduled on July 18, 2023 <https://2023.smb.org/ECOP/ECOP-1-MS04.html>
- Chifman, J., "Computationally-efficient framework for inferring the evolutionary history of a tumor given single-cell sequencing data," NCI: Biostatistics Branch seminar series, NCI. (Gave a talk on June 5, 2019).
- My journey into mathematical and computational biology: there is no common formula. University of Kentucky Alumni Day, Lexington KY. (Gave a talk on March 29, 2019).
- Modeling the Evolutionary History of a Tumor. Biology and Medicine Through Mathematics Conference (BAMM), SIAM, VCU, VCU, Richmond, VA. (Gave a talk on May 31, 2018)
- Modeling the Evolutionary History of a Tumor Given Single-Cell Sequencing Data. AMS Sectional Meeting, American Mathematical Society, Ohio State University, Columbus, OH. (Gave talk on March 17, 2018)
- An Invariants-Based Method for Efficient Identification of Hybrid Species under the Coalescent Model, SIAM Conference on Applied Algebraic Geometry, Society for Industrial and Applied Mathematics, Georgia Institute of Technology, Atlanta, GA. (Gave a talk on August 2, 2017)

- Phylogenetic models on species trees under the coalescent, Phylogenetics and Evolutionary Biology Seminar, North Carolina State University, December 3, 2015, (invited talk).
- Identifiability of the Unrooted Species Phylogeny Under the Coalescent Model (poster), NSF/CBMS Mathematical Phylogeny Conference, Winthrop University, Rock Hill, SC, June 28 – July 2, 2014.
- Comparison of Immune Signatures in Solid Tumors, RPR Seminar, Wake Forest School of Medicine, May, 2013.
- Intracellular Model of Iron Homeostasis, Mathematical Biology and Physiology Seminar, Penn State, April, 2013 (invited talk).
- Identifiability of Species Phylogenies Under the Coalescent Model
 - Penn State, April, 2013 (invited talk).
 - International Conference on Advances in Interdisciplinary Statistics and Combinatorics, UNCG, October 2012.
- A systems biology approach to iron metabolism, VBI, Virginia Tech, March, 2012.
- A systems biology approach to iron metabolism in cancer cells, MBI, Ohio State, November 2010.
- Phylogenetic invariants of the general group-based DNA model, SAMSI, Research Triangle Park, NC, November 18, 2008.
- Phylogenetic invariants (poster). Opening workshop of the SAMSI program on Algebraic Methods in Systems Biology and Statistics, Research Triangle Park, NC, September 2008.
- Toric ideals of phylogenetic invariants. 29th Ohio State University - Denison Mathematics Conference, Columbus, OH, May, 2008.
- The intersection map and the classes PST_c , PT_c , and T_c . Symposium to Mark the 70th Birthday of Professor Derek J. S. Robinson, Auburn University at Montgomery, AL, March, 2008.
- A note on direct products of solvable PST -groups. Zassenhaus 2007 (group theory conference), Saint Louis University, St. Louis, MO, March 2007.

FELLOWSHIPS, ASSISTANTSHIPS AND AWARDS – UNDERGRADUATE/GRADUATE

- Kentucky Opportunity Fellowship, July 2008 - June 2009.
- Algebra Cubed Fellowship, NSF sponsored fellowship, University of Kentucky, 2006 - 2007.
- Graduate School Fellowship, University of Kentucky, August 2003- July 2004.
- Summer Research Support Award, Summer 2008.
- Edgar Enoch Algebra Scholarship, University of Kentucky, May 2007.
- Summer Research Support Award, Summer 2006.

- Research Assistant for Appalachian Math Science Partnership (AMSP), University of Kentucky, Fall 2005- Spring 2006.
- The Reverend James E. Kline Award for Mathematics, King's College, 2003.
- Outstanding Adult Learner of the Year, King's College, 2003.
- Delta Epsilon Sigma Undergraduate Scholarship, King's College, 2002-2003.
- Certificate of Honor from the President and Faculty of King's College, 2002.