

# Iain Carmichael

✉ [iain@unc.edu](mailto:iain@unc.edu)

🔗 <https://idc9.github.io/>

🐙 <https://github.com/idc9>

## EMPLOYMENT

---

<b>Assistant Professor</b> Department of Pathology & Laboratory Medicine, University of North Carolina at Chapel Hill School of Data Science and Society, University of North Carolina at Chapel Hill	2024-
<b>Neyman Visiting Assistant Professor</b> Department of Statistics, UC Berkeley	2022-24
<b>Postdoctoral Fellow</b> Division of Computational Pathology at the Brigham and Women's Hospital, Harvard Medical School	2021-2022
<b>NSF Mathematical Sciences Postdoctoral Research Fellowship</b> Department of Statistics, University of Washington	2019 - 2021

## AFFILIATIONS

---

Member, UNC Lineberger Comprehensive Cancer Center	2024-
Visiting Assistant Professor, Department of Pathology, UCSF	2024-
Adjunct Visiting Assistant Professor, Department of Pathology, UCSF	2022-24
Research Affiliate, Berkeley Institute of Data Science	2024-
Visiting Scientist, Memorial Sloan Kettering Cancer Center	2024-

## EDUCATION

---

<b>The University of North Carolina at Chapel Hill</b> Ph.D. Statistics Department of Statistics and Operations Research Thesis: <i>Probabilistic and geometric approaches to the analysis of non-standard data</i> Advisors: Shankar Bhamidi, J.S. Marron	2019
<b>Cornell University</b> B.A. Mathematics, Physics	2014
<b>Budapest Semesters in Mathematics</b> Semester abroad	Spring 2013

## PUBLICATIONS

---

Links to all publicly available manuscripts may be found at <https://idc9.github.io/research.html>

1. **Carmichael, I.**, Thomas, K., Giertych, N., Williams, J.P. (2023+). yaglm: a Python package for fitting and tuning generalized linear models that supports structured, adaptive and non-convex penalties. *arXiv preprint arXiv:2110.05567*.
2. Olayinka, O., **Carmichael, I.**, Gaeta Gazzola, M., Dimeola, K.A., Zheng, Z., Madden, L.M., Beitel, M., Barry, D.T. (2023). Sex Differences Among Individuals With Chronic Pain and Opioid Use Disorder Entering Outpatient Methadone Treatment. *Manuscript available upon request*.

UNDER REVIEW

3. Goldgof, G.M., Shenghuan, S., Van Cleave, J., Brown, L., Lucas, F., Baik, J., Dogan, A., Goldgof, D.M., Wang, L., **Carmichael, I.**, Prakash, S., Butte, A (2023). DeepHeme: A generalizable, bone marrow classifier with hematopathologist-level performance. *Under review*.
4. **Carmichael, I.** (2022). The folded concave Laplacian spectral penalty learns block diagonal sparsity patterns with the strong oracle property. *Under review*.
5. **Carmichael, I.** (2022). Learning sparsity and block diagonal structure in multi-view mixture models. *Under review*.

PUBLISHED

6. Gaeta Gazzola, M., **Carmichael, I.**, Thompson, E., Hoffman, K., Beitel, M., Madden, L.M., Saeed, G., Hammouri, M., Hsaio, C., Barry, D.T. (2023). A Quantitative Examination of Illness Models Among People with Opioid Use Disorder Receiving Methadone Treatment. *Journal of Addiction Medicine. In Press*.
7. Yang, Xi., Hannig, J., Hoadley, K.A., **Carmichael, I.**, Marron, J.S. (2023). Measure of Strength of Evidence for Visually Observed Differences between Subpopulations. *Journal of Computational and Graphical Statistics, DOI: 10.1080/10618600.2023.2276113*
8. Gazzola Gaeta, M., **Carmichael, I.**, Christian, N., Zheng, X., Madden, L., Barry, D. (2023). A National Study of Homelessness, Social Determinants of Health, and Treatment Engagement Among Outpatient Medication for Opioid Use Disorder-Seeking Individuals in the United States. *Substance Abuse, 44(1), 62-72*.
9. Gazzola Gaeta, M., Maclean, E., Beitel, I., **Carmichael, I.**, Cammack, K.M., Eggert, K.F., Roehrich, T., Madden, L.M., Jegede, O., Zheng, X., Bergman, E., Barry, D. (2022). What's in a name? Terminology preferences among patients receiving methadone treatment. *Journal of General Internal Medicine, 38 (3), 653-660*.
10. Banerjee, S., Bhamidi, S., **Carmichael, I.** (2022). Fluctuation bounds for continuous time branching processes and nonparametric change point detection in growing networks. *The Annals of Applied Probability, 33 (4), 2919-2980*
11. **Carmichael, I.**, Song, A.H., Chen, R.J., Williamson, D.F.K., Chen, T.Y., Mahmood, F. (2022). Incorporating intratumoral heterogeneity into weakly-supervised deep learning models via variance pooling. *The International Conference on Medical Image Computing and Computer Assisted Intervention. To appear*.
12. Gazzola, M.G., **Carmichael, I.**, Madden, L.M., Dasgupta, N., Beitel, M., Zheng, X., Eggert, K., Farnum, S., Barry, D. (2022). A cohort study examining the relationship among housing status, patient characteristics, and retention among individuals enrolled in low-barrier-to-treatment-access methadone maintenance treatment. *Journal of Substance Abuse Treatment, p.108753*.
13. **Carmichael, I.**, Marron, J.S. (2021). Geometric insights into support vector machine behavior using the KKT conditions. *Electronic Journal of Statistics, 15(2), pp.6311-6343*.
14. Perry, R., Mischler, G., Guo, R., Lee, T., Chang, A., Koul, A., Franz, C., Richard, H., **Carmichael, I.**, Ablin, P. and Gramfort, A. (2021). mvlearn: multiview machine learning in Python. *Journal of Machine Learning Research, 22(109), pp.1-7*.

15. **Carmichael, I.**, Calhoun, B.C., Hoadley, K.A., Troester, M.A., Geradts, J., Couture, H.D., Olsson, L., Perou, C.M., Niethammer, M., Hannig, J., Marron, J.S. (2021). Joint and individual analysis of breast cancer histologic images and genomic covariates. *The Annals of Applied Statistics*, 15(4), pp.1697-1722.
16. **Carmichael, I.**, Williams, JP. (2018). An exposition of the false confidence theorem. *Stat*, 7(1), e201.
17. **Carmichael, I.**, Marron J.S. (2018). Data science vs. statistics: two cultures?. *Japanese Journal of Statistics and Data Science*, 1(1), 117-138.
18. **Carmichael, I.**, Wudel, J., Kim, M., Jushchuk, J. (2017). Examining the evolution of legal precedent through citation network analysis. *NCL Rev.* 96 (2017): 227.

---

## CONFERENCE POSTERS AND ORAL PRESENTATIONS

---

Yin, Z., Sun, S., Van Cleave., Isgor, I., Sardana, R., Lopez, K., **Carmichael, I.**, Dogan, A., Goldgof, G. LeukoLocator: A Comprehensive Leukocyte Detection Pipeline for Peripheral Blood Whole Slide Images. United States and Canadian Academy of Pathology Poster. March, 2024.

Gaeta Gazzola, M., **Carmichael, I.**, Christian, N., Zheng, X., Madden, L.M., Barry, D.T. A National Study of Correlates of Homelessness and Retention Among Outpatient Medication for Opioid Use Disorder-Seeking Individuals in the United States. Accepted for oral presentation at The Association for Multidisciplinary Education and Research in Substance use and Addiction (AMERSA) Conference 2022. Boston, Massachusetts. November, 2022.

**Carmichael, I.**, Song, A.H., Chen, R.J., Williamson, D.F.K., Chen, T.Y., Mahmood, F. Incorporating intratumoral heterogeneity into weakly-supervised deep learning models via variance pooling. Digital Pathology & AI Congress USA. New York, NY. June, 2022.

Olayinka, O., **Carmichael, I.**, Gaeta Gazzola, M., Dimeola, K.A., Zheng, Z., Madden, L.M., Beitel, M., Barry, D.T. Sex Differences among Individuals with Chronic Pain and Opioid Use Disorder Entering Methadone Maintenance Treatment. College on Problems of Drug Dependence. Minneapolis, Minnesota. June, 2022.

Gaeta, M., **Carmichael, I.**, Madden, L., Beitel, M., Eggert, K., Barry, D.T. Patient Characteristics and Retention among Homeless Patients Enrolled in a Low-Barrier-To Treatment-Entry Medication for Opioid Use Disorder Program. College on Problems of Drug Dependence. Online. June, 2021.

**Carmichael, I.**, Marron, J.S., Hannig, J. Fusion of image and genetic data with convolutional neural networks and AJIVE. Poster Presented at the Bayesian, Fiducial, and Frequentist (BFF) Conference. Durham, NC, April, 2019. [https://idc9.github.io/assets/carmichael\\_bff\\_2019\\_compressed.pdf](https://idc9.github.io/assets/carmichael_bff_2019_compressed.pdf)

**Carmichael, I.**, Marron, J.S., Hannig, J. Angle-based joint and individual variation explained. Poster Presented at the Joint PI Meeting: NSF BIGDATA and Big Data Hubs & Spoke. Alexandria, VA. June, 2018 [https://idc9.github.io/assets/ajive\\_carmichael\\_nsf\\_bigdata2018\\_poster.pdf](https://idc9.github.io/assets/ajive_carmichael_nsf_bigdata2018_poster.pdf)

---

## INVITED TALKS

---

“Computational Approaches to Characterizing the Tumor Microenvironment,” *University of North Carolina at Chapel Hill, Department Pathology & Laboratory Medicine*, Chapel Hill, NC, Jan, 2023.

“Computational Approaches to Characterizing the Tumor Microenvironment,” *Grand Rounds Mechanism of Diseases, UCSF Department Anatomic Pathology & Laboratory Medicine*, San Francisco, CA, Sept, 2022.

“The folded concave Laplacian spectral penalty learns block diagonal sparsity patterns with the strong oracle property,” *University of California, Berkeley, Department of Biostatistics*, Berkeley, CA, Feb, 2022.

“The folded concave Laplacian spectral penalty learns block diagonal sparsity patterns with the strong oracle property,” *Center for Computational Mathematics, Flatiron Institute*, NYC, NY, Feb, 2022.

“The folded concave Laplacian spectral penalty learns block diagonal sparsity patterns with the strong oracle property,” *University of Michigan, Department of Biostatistics*, Ann Arbor, MI, Jan, 2022.

“The folded concave Laplacian spectral penalty learns block diagonal sparsity patterns with the strong oracle property,” *Rutgers University, Department of Statistics*, New Brunswick, NJ, Dec, 2021.

“The folded concave Laplacian spectral penalty learns block diagonal sparsity patterns with the strong oracle property,” *NYU Grossman School of Medicine, Division of Biostatistics*, NYC, NY, Nov, 2021.

“The folded concave Laplacian spectral penalty learns block diagonal sparsity patterns with the strong oracle property,” *UNC Chapel Hill, STOR Department*, Chapel Hill, NC, September, 2021.

“The folded concave Laplacian spectral penalty learns block diagonal sparsity patterns with the strong oracle property,” *University of Washington, Department of Statistics*, Seattle, WA, June, 2021.

“Sparsity structure estimation for multi-view mixture models,” *University of Washington, Department of Statistics*, Seattle, WA, May, 2020.

“Joint and individual analysis of breast cancer histologic images and genomic covariates,” *Harvard Medical School*, Boston, MA, December, 2019.

“Joint and individual analysis of histopathology images and genetic covariates,” *Computational Medicine Group*, Chapel Hill, NC, May, 2019.

“Angle-based joint and individual variation explained with applications to image and genetic data,” *University of Illinois Urbana–Champaign, Department of Statistics*, Urbana, IL, February, 2019.

“Angle-based joint and individual variation explained with applications to image and genetic data,” *University of Wisconsin–Madison, Department of Statistics*, Madison, WI, January, 2019.

“Angle-based joint and individual variation explained with applications to image and genetic data,” *Harvard University, Department of Biostatistics*, Boston, MA, January, 2019.

“Angle-based joint and individual variation explained with applications to image and genetic data,” *FocuStat Combo Kitchen*, Oslo, Norway, November, 2018.

“Joint analysis of H&E stained images and genetic covariates using deep learning and AJIVE,” *GenStat Group*, Chapel Hill, NC, September, 2018.

“Word embeddings for computational humanities,” *UNC Digital Innovation Lab*, Chapel Hill, NC, October 2017. [https://github.com/idc9/word\\_embed\\_tutorial](https://github.com/idc9/word_embed_tutorial)

“Data science and the undergraduate curriculum,” *UNC STOR Department Colloquium*, Chapel Hill, NC, September 2017. [https://idc9.github.io/assets/data\\_science\\_stor\\_colloquium.pdf](https://idc9.github.io/assets/data_science_stor_colloquium.pdf)

“Open data, networks and the law,” *PyData Carolinas*, Raleigh, NC, October, 2016.

## OTHER PROFESSIONAL EXPERIENCE

---

**Consultant**, Reese News Lab, *Chapel Hill, NC* 2017

**Research Scientist**, Gamalon Machine Intelligence, *Cambridge, MA* Summer 2016

## TEACHING

---

**Instructor**, Stat20: Introduction to Probability and Statistics, *UC Berkeley* Fall 2022

**Instructor**, STOR-BIOS Linear Algebra Summer Boot Camp, *UNC Chapel Hill* Summer 2017

**Instructor**, STOR 390: Introduction to Data Science, *UNC Chapel Hill* Spring 2017

- Created and taught the first data science course for UNC’s undergraduate statistics major that is now a permanent part of the curriculum.

<b>Graduate Research Consultant</b> , JOMC 390: Data Driven Journalism, <i>UNC Chapel Hill</i>	Spring 2016
<b>Teaching Assistant</b> , <i>UNC Chapel Hill</i>	
· STOR 634: Measure Theory	Fall 2015
· STOR 113: Decision Models for Business and Economics	2014 - 2015

## AWARDS

---

Discover Brigham Research Excellence Award, <i>Brigham and Women's Hospital</i>	2022
NSF Mathematical Sciences Postdoctoral Research Fellowship (\$150,000), <i>University of Washington</i>	2019-2021
The Walter Deemer Excellence in Teaching Award, <i>UNC Chapel Hill</i>	2018
Dean's Graduate Fellow in the College of Arts and Sciences, <i>UNC Chapel Hill</i>	2018-2019
Grant from Data@Carolina for development of a data science class (\$5,000), <i>UNC Chapel Hill</i>	2016
Regional Citadel) Datathon winner (\$20,000), <i>Duke University</i>	2017

## PROFESSIONAL SERVICE AND ACTIVITIES

---

Referee for: Journal of Machine Learning Research, IEEE Transactions on Neural Networks and Learning Systems, Journal of Applied Probability, STAT, Journal of Computational and Graphical Statistics, SIAM Journal on Mathematics of Data Science, Bioinformatics, The Conference on Uncertainty in Artificial Intelligence, Medical Image Analysis, Nature Communications, PNAS

JMLR Editorial Board Reviewer	2020-
Reader for the UW statistics department's graduate admissions committee	2021
Allen Institute for Brain Science, Summer Workshop on the Dynamic Brain	Summer 2019
UNC middle/high school science exposition, <i>UNC, Chapel Hill, NC</i> <a href="https://github.com/idc9/UNC_science_expo_2018">https://github.com/idc9/UNC_science_expo_2018</a>	2018
Member of Evidence, Analysis, Interpretation, and Critique task force for UNC's Curriculum Development Committee, <i>UNC, Chapel Hill, NC</i>	2017
Coach of UNC's undergraduate team competing in DataFest, <i>Duke University, Durham, NC</i>	2016 - 2017
Tutorials on R, Python, data science, optimization and natural language processing can be found on my github page ( <a href="https://github.com/idc9">github.com/idc9</a> )	
Data Crunch for Social Good hackathon hosted by NC Data4Good	2015

## STUDENT MENTORSHIP AND ADVISING

---

### PhD students

· Alex Lee, Qualification Exam, Department of Biomedical Informatics, UCSF	2023
· Shenghuan (Harry) Sun, Thesis Committee, Biological and Medical Informatics Program, UCSF	2022-2023
· Huong Vu, Thesis Committee, Department of Statistics, UC Berkeley	2022-2023
· Neo Yin, Department of Statistics, UC Berkeley	2022-2023

### Masters students

- Kaitlin Smith, Department of Statistics, UC Berkeley 2022-2023

## Undergraduate

- Reva Vir, Independent Study, Department of Statistics, UC Berkeley 2022-2023
- Kevin Zhou, Independent Study, Department of Statistics, UC Berkeley 2022-2023
- Jerry Li, Independent Study, Department of Statistics, UC Berkeley 2022-2023
- Charles Tang, Senior Thesis, Department of Computer Science, UNC 2019
- Michael Kim, Senior Thesis, Department of Statistics and Operations Research, UNC 2016-2017
- Ethan Koch, Senior Thesis, Department of Statistics and Operations Research, UNC 2017-2018
- James Jushchuk, Senior Thesis, Department of Computer Science, UNC 2016-2018
- Scott Garcia, Independent Study, Department of Statistics and Operations Research, UNC 2016
- Kate Cho, Independent Study, Department of Statistics and Operations Research, UNC 2016

## REFERENCES

---

### **J.S. Marron**

Amos Hawley Distinguished Professor of Statistics  
Department of Statistics and Operations Research  
The University of North Carolina at Chapel Hill

(919) 962-2188  
marron@unc.edu

### **Faisal Mahmood**

Assistant Professor of Pathology  
Brigham and Women's Hospital  
Harvard Medical School

(617) 525-8953  
faisalmahmood@bwh.harvard.edu

### **Sandrine Dudoit**

Professor of Statistics and Associate Dean for Faculty and Research  
Department of Statistics  
UC Berkeley

(510) 642-2781  
sandrine@stat.berkeley.edu

### **Zoltan Laszik**

Professor of Clinical Pathology  
Department of Pathology  
UC San Francisco

(415) 353-7546  
Zoltan.Laszik@ucsf.edu