Iain Carmichael

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Work

Neyman Visiting Assistant Professor 2022-
Department of Statistics, UC Berkeley

Postdoctoral Fellow 2021-2022
Division of Computational Pathology at the Brigham and Women's Hospital, Harvard Medical School

NSF Mathematical Sciences Postdoctoral Research Fellowship 2019 - 2021
Department of Statistics, University of Washington

Education

The University of North Carolina at Chapel Hill 2019
Ph.D. Statistics
Department of Statistics and Operations Research
Thesis: *Probabilistic and geometric approaches to the analysis of non-standard data*
Advisors: Shankar Bhamidi, J.S. Marron

Cornell University 2014
B.A. Mathematics, Physics

Budapest Semesters in Mathematics Spring 2013
Semester abroad

Publications

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

In preparation, manuscript available

1. **Carmichael, I.**, Thomas, K., Giertych, N., Williams, J.P. (2021). 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. Bassir, A.N., Parvez, L., Madden, L.M., Beitel, M., Gazzola, M.G., **Carmichael, I.**, Barry, D. (2022). Cannabis use and lifetime trauma history in treatment-seeking individuals with opioid use disorder. *Manuscript available upon request.*

Under Review

3. Gazzola Gaeta, M., **Carmichael, I.**, Christian, N., Zheng, X., Barry, D. (2022). A National Study of Correlates of Homelessness and Retention Among Outpatient Medication for Opioid Use Disorder-Seeking Individuals in the United States. *Under review.*
4. 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. *Under review.*

5. **Carmichael, I.**. (2021). The folded concave Laplacian spectral penalty learns block diagonal sparsity patterns with the strong oracle property. *Under review.*

6. **Carmichael, I.**. (2020). Learning sparsity and block diagonal structure in multi-view mixture models. *Under review.*

Published

7. 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. To Appear.*

8. **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.*

9. 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.*

10. **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.*

11. 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.*

12. **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.*

13. **Carmichael, I.**, Williams, JP. (2018). An exposition of the false confidence theorem. *Stat, 7(1), e201.*

14. **Carmichael, I.**, Marron J.S. (2018). Data science vs. statistics: two cultures?. *Japanese Journal of Statistics and Data Science, 1(1), 117-138.*

15. **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

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

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

Invited talks

"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

"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

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

Professional Experience

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

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

Teaching

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

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

- Created and taught the first data science course for UNC's undergraduate statistics major. https://idc9.github.io/stor390/
- Covered topics such as: R programming, machine learning, and ethics for data science.
- The course is now a permanent part of the undergraduate curriculum and is taken by over 400 students a year.

Graduate Research Consultant, JOMC 390: Data Driven Journalism, *UNC, Chapel Hill, NC* Spring 2016

Teaching Assistant, *UNC, Chapel Hill, NC*

- STOR 634: Measure Theory Fall 2015
- STOR 113: Decision Models for Business and Economics 2014 - 2015

Undergraduate Student Thesis Supervisor (co-advising with Prof. Bhamidi), *UNC, Chapel Hill, NC*

- Kate Cho (statistics) 2016
- Michael Kim (statistics) 2016 - 2017
- James Jushchuk (computer science) 2016 - 2018
- Scott Garcia (statistics) 2016
- Ethan Koch (statistics) 2017 - 2018
- Charles Tang (computer science) 2019

Awards

The Walter Deemer Excellence in Teaching Award, *UNC, Chapel Hill*, NC 2018

Dean's Graduate Fellow in the College of Arts and Sciences, *UNC, Chapel Hill*, NC 2018-2019

Grant from Data@Carolina (with Prof. Bhamidi), *UNC, Chapel Hill*, NC 2016

Regional Datathon winner (team of 4 winning $20,000 data science competition sponsored by Citadel), *Duke University, Durham, NC* 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

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, *UNC, Chapel Hill, NC* 2018
https://github.com/idc9/UNC_science_expo_2018

Member of Evidence, Analysis, Interpretation, and Critique task force for UNC's Curriculum Development Committee, *UNC, Chapel Hill, NC* 2017

Coach of UNC's undergraduate team competing in DataFest, *Duke University, Durham, NC* 2016 - 2017

Tutorials on R, Python, data science, optimization and natural language processing can be found on my github page (github.com/idc9)

Data Crunch for Social Good hackathon hosted by NC Data4Good 2015

References

J.S. Marron
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The University of North Carolina at Chapel Hill

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The University of North Carolina at Chapel Hill

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